Chapter 19
Changes in Tree Species Distribution Along Altitudinal Gradients of Montane Forests in Malaysia

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19.1 Introduction

Due to the variation in biogeography, habitat, and disturbance, tree species in tropical forest varies greatly from place to place in terms of composition and diversity (Whitmore 1998). Altitudinally, the changes in community structure and species composition are influenced by the variation of soil and climatic factors. In addition, other factors such as historical processes, biotic interaction, competition, natural disturbance, and microclimatic are being recognized to play important roles.

In Malaysia, five forest zones are developed from climatic climax formations, i.e., lowland Dipterocarp forest (0–300 m above sea level (a.s.l.)), hill Dipterocarp forest (300–800 m a.s.l.), upper hill Dipterocarp forest (800–1100 m a.s.l.), oak-laurel forest (1100–1600 m a.s.l.) and montane ericaceous forest (above 1600 m a.s.l.) (Symington 2004). These forests are characterized by species composition. The first three forest types are mostly dominated by trees from the Dipterocarpaceae family, hence they are termed as dipterocarp forests. Montane ericaceous and oak-laurel are characterized by an abundance of trees from Fagaceae–Lauraceae and Ericaceae families, respectively. They can be distinguished by a number of structural characters which include the size of canopy height, canopy layer, leaves, and the presence of vascular and nonvascular epiphytes and climbers (Table 19.1). The montane forest also differs from lowland in having fewer and smaller emergent trees, flattish canopy surfaces, gnarled limbs, and denser sub-crowns (Whitmore 1984). The montane ericaceous and oak-laurel forests are moist and are characterized by a thick layer of moss and bryophytes.

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Table 19.1 Structural differences between five forest formations. (van Stennis 1984; Whitmore 1984; Wyatt-Smith 1963; Kiew 1992)

Structural properties	Lowland dipterocarps forest	Hill diptero-carps forest	Upper hill dipterocarps forest	Montane ericaceous forest	Oak-Laurel forest
Canopy height (m)	25–45	25–45	15–33	15–33	1.5–18
Tree canopy layer	Three	Three	Three	Two/one	One
Leaf size	Mesophyll	Mesophyll	Mesophyll	Mesophyll/ microphyll	Mesophyll/ pachyphyll
Vascular epiphytes	Abundant	Abundant	Abundant	Frequent	Rare
Nonvascular epiphytes	Occasional/ abundant	Occasional/ abundant	Occasional/ abundant	Abundant	Abundant
Climbers	Frequent/ abundant	Frequent/ abundant	Frequent/ abundant	Frequent	Very few
Buttress	Frequent/large	Frequent/ large	Frequent/ large	Uncommon/ absent	Uncommon/ absent
Cauliflory	Frequent	Frequent	Frequent	Uncommon/ absent	Uncommon/ absent

In Peninsular Malaysia, montane rainforest communities are scattered and few. With the exception of Cameron Highlands and Fraser's Hill, they are mainly minimally disturbed, undisturbed, or totally protected such as Gunung Benom in Krau Wildlife Reserve (Latiff and Mohd Shaffea 2011) and Gunung Tahan in Taman Negara Pahang. While both montane ericaceous and oak-laurel forests occupy a relatively small land area in the country, according to Soepadmo (1987), about 25 % of flora in Peninsular Malaysia is confined to these forests. This suggests that floristic composition of montane can be considered as rich in species which is partly due to endemism.

Despite being recognized as among the oldest pristine tropical rain forests in Malaysia, the uniqueness and endemic variety of flora of Imbak Canyon and Mount Ledang have not been fully explored and is scientifically documented. In recognizing the need of providing an inventory of tree species occurring in this area, this chapter aims at identifying the major forest types and tree communities in these areas, studying changes in tree species along altitudinal gradients and presenting the list of tree species collected in the these two areas ranging from lowland forest extending to hill, upper hill, montane, and oak-laurel forest trails. Such basic information is of importance to the understanding of the species distribution, conservation requirements, and economic potential of tree resources which may contribute towards developing and managing the available resources on a sustainable basis.

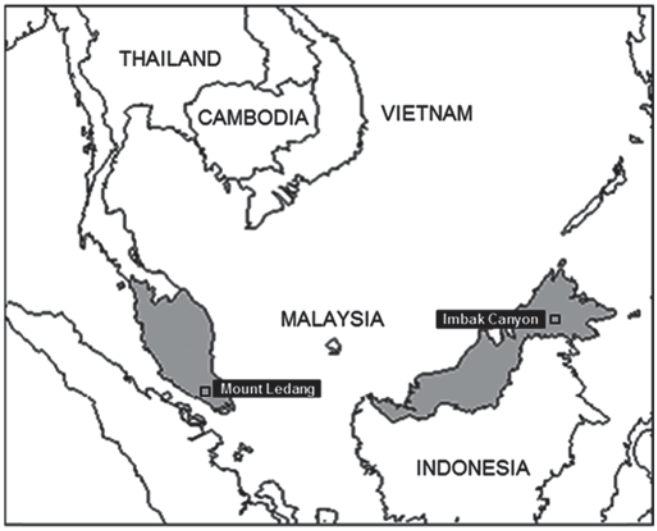

Fig. 19.1 Locations of Mount Ledang and Imbak Canyon, Malaysia

19.2 Material and Methods

19.2.1 Study Areas

19.2.1.1 Imbak Canyon, Sabah

Imbak Canyon is located on the south of Telupid (5°6′34.49″°N, 117°0′9.01″ E) within the Sabah Foundation Conservation Area in the state of Sabah, Malaysia (Fig. 19.1). Landscape of Imbak Canyon is varied from nearly flat, low undulating with river valleys to the hill and montane forest habitats (Fig. 19.2). The orientation and shape of the canyon follow the main river system of Imbak River. The floor of the 25-km canyon lies about 150 m a.s.l., whereas the rim of Canyon rises to more than 1500 m a.s.l. Imbak Canyon is part of Borneo, the third largest island in the world and has been acknowledged as one of the most well-known centers of plant diversity in the world (Soepadmo and Wong 1995). In certain localities in Sabah, where extensive botanical exploration has been conducted, much has been written that the species diversity is extremely high. For example, according to Beaman and Beaman (1990), the Mount Kinabalu Park contains not less than 4000 species of vascular plants in 180 families and 980 genera.

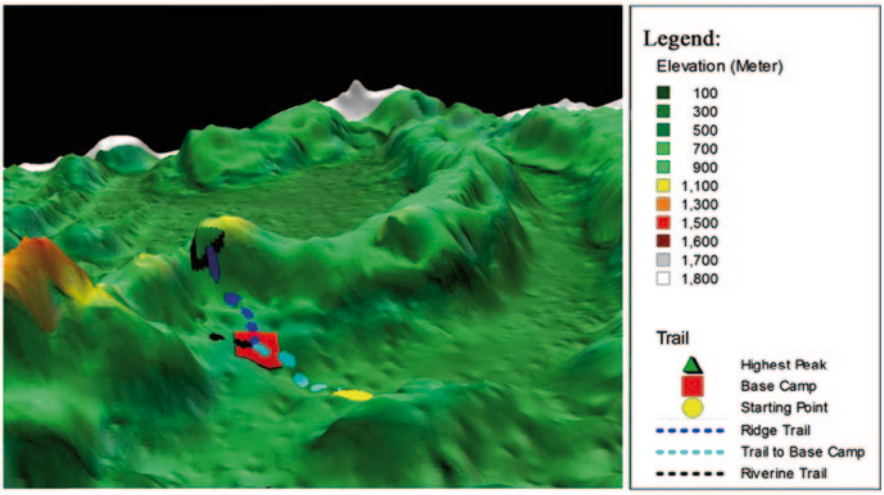

Fig. 19.2 Digital elevation model shows the topography of Imbak Canyon and the expedition trails

19.2.1.2 Mount Ledang National Park, Johor

Mount Ledang, also known as Mount Ophir, is a mountain situated at Gunung Ledang National Park (2°22′27″ N, 102°36′28″ E) in the state of Johor, Malaysia (Fig. 19.1). The mountain is standing at an altitude of 1276 m a.s.l. in the area of 8675.2 ha, and is located between the states of Johor and Malacca. Mount Ledang was gazzetted as a National Park in 2003. The park holds four distinct vegetation types which include lowland dipterocarp forest, hill dipterocarp forest, lower montane, and montane ericaceous.

19.2.1.3 Specimen Collection

Specimen collections in Imbak Canyon were conducted in three localities, viz: (1) the vicinity of the principal base camp of Mount Kuli Research Station, (2) along the riparian forests from the base camp to waterfall (referred to as Riverine trail), and (3) along the forest trail from base camp to the highest point of heath montane forest (known as Ridge trail) (Fig. 19.1). In Mount Ledang, botanical specimens were collected at two trails. These were (1) the forest trail from dam base camp to the upper montane forest at the plateau base camp and continued to the highest point where the telecommunication tower was erected (Fig. 19.3), and (2) along the riparian forest from the park rangers' office.

During the surveys in both locations, attempts were made to make a collection of fresh leaves along with flowers or fruits with the assistance from tree climbers. As collecting complete specimens from canopy tree is often difficult, fallen leaves,

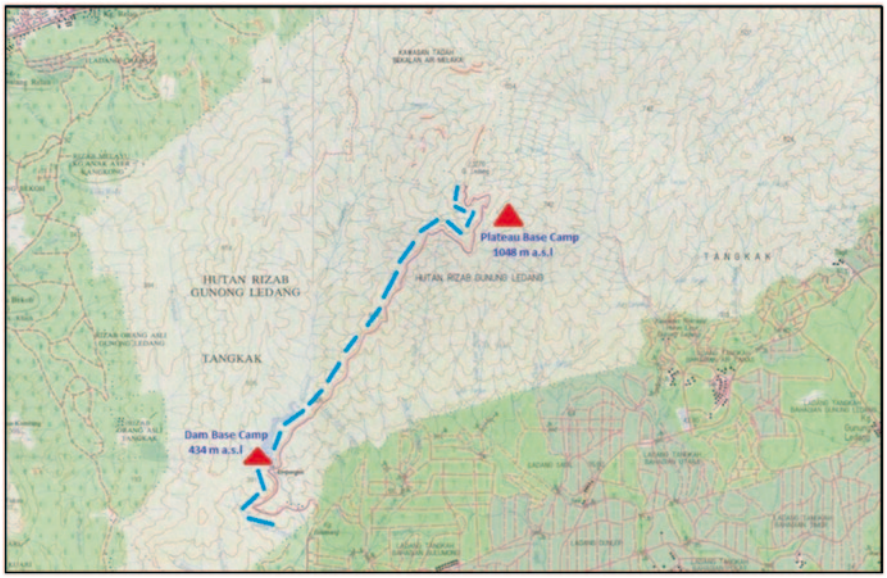

Fig. 19.3 Topographic map of Mount Ledang shows the topography, expedition trail (*blue dotted lines*) and base camp location (in *red triangles*)

fruits, and flowers were collected from the ground. Specimens collected, where possible, were identified during the collection. A GPS receiver was used to determine the topographic elevation of the specific points in the trails. Trail elevation profiles for Imbak Canyon and Mount Ledang were then produced to study the altitudinal changes in tree species distribution along the gradients.

All botanical specimens collected were deposited in the herbarium laboratory of the Centre of Biodiversity and Sustainable Development, Universiti Teknologi MARA, Puncak Alam, Malaysia. Whenever possible, the conservation status of the species was cross-checked with the information from the International Union for Conservation of Nature (IUCN) Red Listdatabase (IUCN 2013). The IUCN red list provides taxonomic, conservation status, and distribution information on taxa that are facing a risk of extinction.

19.3 Results and Discussion

All tree species collected from Imbak Canyon and Mount Ledang were identified and are alphabetically listed in Appendix 1. For Imbak Canyon, the Sabah's vernacular names in the list were referred from the Preferred Check-List of Sabah Trees (Sabah Forestry Department 2005). Whenever possible, the conservation status for the species listed were included based on the information from the IUCN Red List (IUCN 2011).

19.3.1 Tree Communities of Imbak Canyon

From the analysis, it was observed the pristine Imbak Canyon forest holds a high diversity of trees. In all study sites combined, the total number of tree families enumerated along the study trails amounted to 40. Figure 19.4 shows the distribution of tree families found in the study areas in relation to the number of taxa they belong to. Detailed analysis on individual specimens revealed that the families consist of a total of 85 genera and 149 taxa. In terms of tree family, the areas surveyed are rich with the species from the family of Dipterocarpaceae. Specifically, a total of 38 taxa from Dipterocarpaceae family were encountered in the study trails. The second common family is Guttiferae with 13 taxa, followed by Lauraceae (9 taxa), and Leguminosae and Myristicaceae, both account for 8 taxa from the total taxa encountered during the survey periods. Other important families that occur in the study trails include Burseraceae, Euphorbiaceae, Myrtaceae, Rubiaceae, Sterculiaceae, and Podocarpaceae.

19.3.1.1 Riverside Forest and Stream Vegetation

Within and outside the principal base camp in Imbak Canyon are riparian forests that harbor some interesting plant life. Elevation profile of riverine trial associated with the common tree species encountered in the expedition trails is shown in Fig. 19.5. Smaller trees and treelets that are especially common in the riparian forests include *Psychotria* sp., *Rennellia speciosa* (Rubiaceae), *Calophyllum obliquinervium* (Guttiferae), *Canarium denticulatum* (Burseraceae), and *Dillenia excelsa* (Dilleniaceae). Tree species from Dipterocarpaceae (i.e., *Dipterocarpus kunstleri, Shorea macrophylla, Shorea parvifolia,* and *Parashorea tomentella*) are common big trees encountered on both flat ground and farther away from the stream. Besides these, *Hopea nervosa* was frequent and easy to identify by its stilt roots. Below canopy level, the medium-sized to smaller tree species found include *Casearia clarkei* (Flacourtiaceae) and *Neesia* sp. (Bombacaceae). Joining the medium-sized trees are a number of canopy-height trees including *Octomeles sumatrana* (Datiscaceae), *Lithocarpus curtisii* (Fagaceae), and *Duabanga moluccana* (Sonneratiaceae), the latter is characterized by its monopodial branching. A common emergent non-dipterocarp tree species along the riverside is *Koompassia excelsa* (Leguminosae). In openings or gaps of the stream banks, it is not usual to find pioneer species of *Artocarpus anisophyllus* (Moraceae), *Macaranga triloba, Macaranga hypoleuca,* and *Macaranga gigantea* (Euphorbiaceae). Along some open banks and forest edges, the small tree *Vitex pinnata* (Verbanaceae) and *Leea indica* (Leeaceae) are occasionally found.

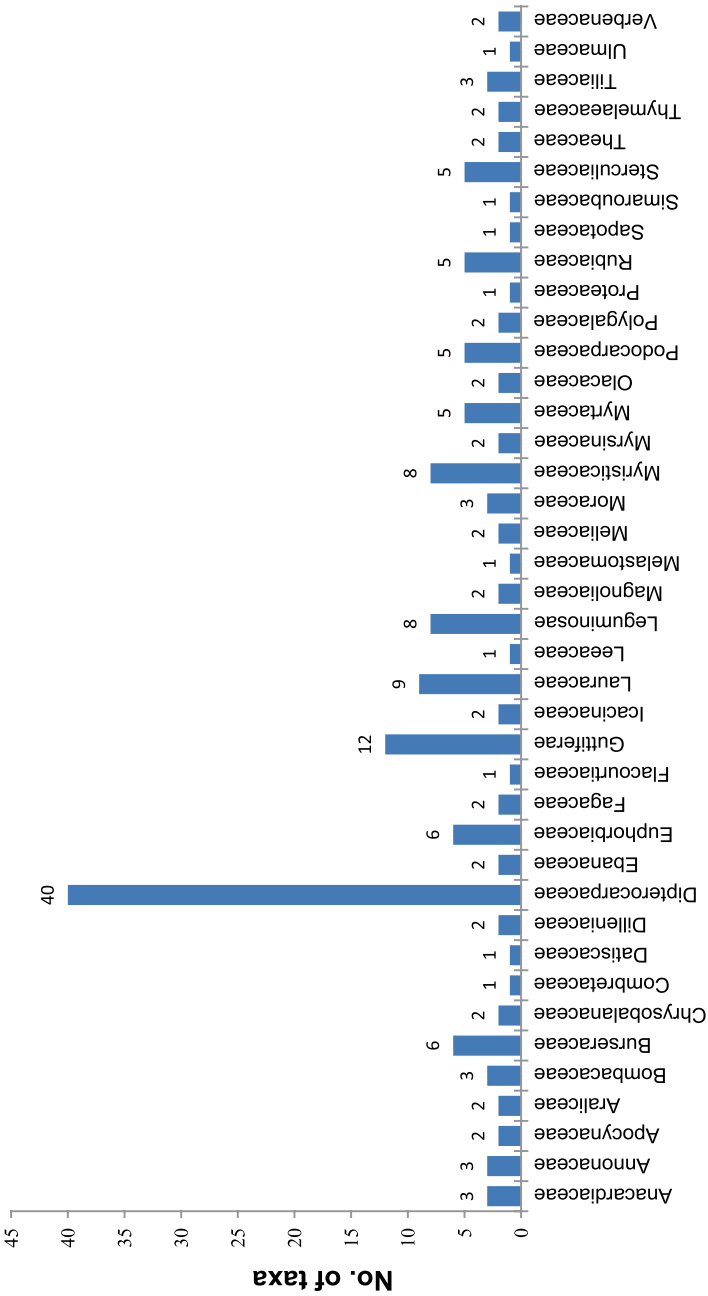

Fig. 19.4 Family-wise distribution of tree species collected from Imbak Canyon, Sabah

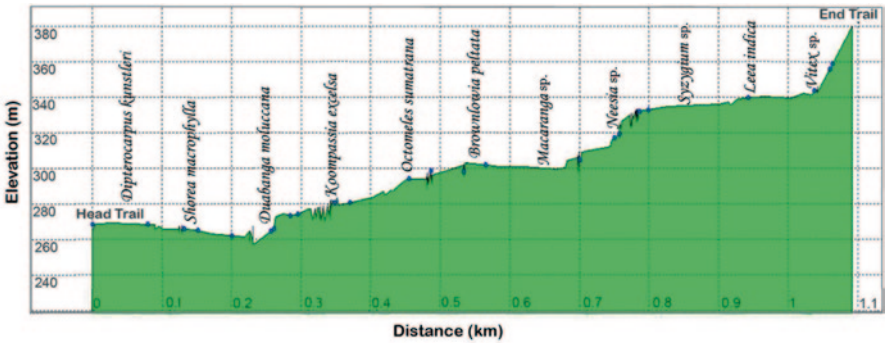

Fig. 19.5 Elevation profile of riparian trails of Imbak Canyon and some common species encountered

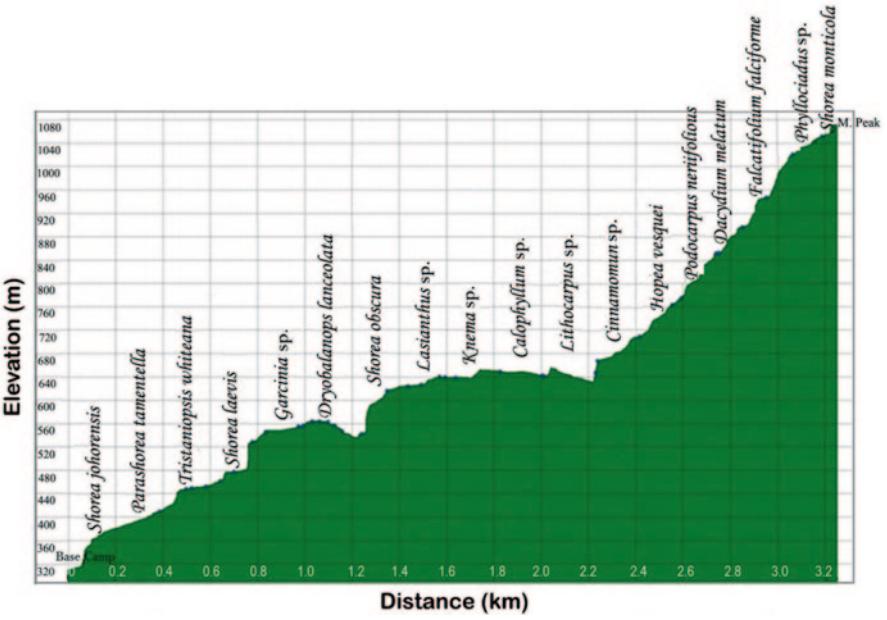

Fig. 19.6 Elevation profile of ridge trail of Imbak Canyon and some common species encountered

19.3.1.2 Lowland, Hill, and Upper Dipterocarp Forests

Figure 19.6 shows an elevation profile of the ridge trail that shows altitudinal changes of tree species. Lowland dipterocarp forests in the expedition areas of Imbak occur from 270 m a.s.l. As the name implies, an interesting character of the lowland dipterocarp forest is the occurrence of dipterocarps within six out of nine

genera. These include *Shorea johorensis, Dipterocarpus caudiferus, Parashorea tomentella, Hopea nervosa, Vatica maingayi,* and *Dryobalanops lanceolata*.

Many other groups of plants contribute to the complexity of the forest in Imbak Canyon. A variety of palms (tall palms, understorey palms, and rattans) are especially common, while lianas and epiphytes are frequently encountered in the lowland forests. Small trees that are common in this area include *Glochidion borneensis* (Euphorbiaceae), *Magnolia* sp. (Magnoliaceae), *Actinodaphne pruinosa* (Lauraceae), and *Fordia curtisii* (Leguminosae), whereas the common medium-sized trees include *Knema stenophylla* subsp. *longipedicellate, Horsfieldia polyspherula* (Myristicaeae), *Heritiera javanica* (Sterculiaceae), *Mezzettia leptopoda* (Anonaceae), and *Garcinia* sp. (Guttiferae). *Horsfieldia and Knema* can be identified by their red sap from the inner bark. Along the trail, different tree communities were observed towards higher elevation to ridge trail. Here, *Tristaniopsis whiteana* (Myrtaceae) is common, distinctive by its peeling barks with mixed reddish brown to gray-white hues. *Diospyros wallichii* (Ebenaceae) grows occasionally and is conspicuous in this forest by its black bark. Other tree includes *Gluta aptera* (Anacardiaceae), which can be identified among other trees by its black sap from the inner bark.

Within the hill dipterocarp forests, tree species from the genus of *Shorea* (Dipterocarpaceae) are common big trees encountered along the trails. These include *Shorea obscura, Shorea laevis, Shorea maxwelliana,* and *Shorea guiso*. They are much encountered on the upper hill dipterocarp forests. Together with these emergent dipterocarps are a number of big non-dipterocarp trees such as *Lithocarpus ewyckii* (Fagaceae), *Parinari oblongifolia* (Chrysobalanaceae), *Campnosperma squamatum* (Anacardiaceae), and *Sindora echinocalyx* (Leguminosae). Smaller trees occasionally encountered along the upper hill forests include *Lasianthus* sp. (Rubiaceae), *Dysoxylon* sp. (Meliaceae), *Payena maingayi* (Sapotaceae), and *Polyalthia cauliflora* (Anonaceae). At the time of the study, *Polyalthia cauliflora* was among a few flowering trees with the inflorences borne on the main trunk.

19.3.1.3 Lower Montane Forest

Lower montane forest was observed before the peak of ridge trails with the presence of lower montane vegetation at 895 m a.s.l. At this elevation, dipterocarps and other common lowland families such as Leguminosae, Euphorbiaceae, and Myristiceae begin to diminish and replace by a diversity of species from tree families such as Myrtaceae, Fagaceae, and Lauraceae. At this elevation, *Syzygium* sp. (Myrtaceae), and *Calophyllum nodusum, Calophyllum depresinervosum* (Guttiferae), and *Schefflera* sp. (Araliaceae) form the main tree association. At 950 m altitude, the forest is mossy and is characterized with low-statured vegetation and devoid of emergent trees.

19.3.1.4 Summit Zone of Ridge Trail

The summit zone occurs on the ridge trail (1080 m a.s.l), among highest peaks in Imbak Canyon. The forest type in summit zone is montane heath forest. Heath forest, also known as kerangas forest occurs on acidic sandy soils that are result of the area's siliceous parent rocks. Within the summit zone, trees from the family of Podocarpaceae are very common montane taxa such as *Podocarpus neriifolius*, *Dacrydium elatum, Falcatifolium falciforme,* and *Phyllocladus* sp. The first two species are much encountered before the summit, whereas *Falcatifolium falciforme* and *Phyllocladus* sp. are distinctly common around the summit zone. This elevation zone also supports a large variety of pitcher plants. Other montane taxa such as *Acronychia* sp. (Rutaceae) as well as *Lindera montanoides* (Lauraceae) also occur. An interesting finding of the montane health forest of Imbak Canyon is the occurrence of the only dipterocarp *Shorea monticola* in the summit zone despite its absence in the lower elevation (Fig. 19.5).

19.3.2 Tree Species of Special Interest in Imbak Canyon

Imbak Canyon is an interesting conservation area in terms of landscape variation and conservation potential. It shelters species that are endemic to the area although they may be found in other parts of Borneo. Of all trees documented, four taxa are reported to be endemic to Borneo. These include *Knema stenophylla* subsp. *longipedicellate, Dryobalanops lanceolata, Actinodaphne montana,* and *Shorea monticola* (Appendix 1). *Knema stenophylla* subsp. *longipedicellate* normally occurs in lowland dipterocarp forest to lower montane forests (de Wilde 2000). In this survey, the species was found at the ridge trail of about 795 m a.s.l. Ashton (2004) reported that *Dryobalanops lanceolata* is common and widespread in Sabah, Sarawak, and Brunei. In this study, this taxon was observed to form abundant saplings under the closed canopy mostly on the lowland areas and lower slopes up to 700 m altitude.

Shorea monticola is another endemic species of Borneo commonly found in the upper limits of upper dipterocarp forests at 600–1500 m altitude. In Imbak Canyon area, this species is found at the peak of ridge trail of 1080 m altitude. Ashton (2004) reported that this taxon also commonly occurs in Kinabalu National Park and Mulu National Park in Sarawak.

The IUCN Red List data were used to provide the information on the conservation status of some of listed tree species collected from this survey. Based on the list, five species from the family of Dipterocarpaceae, viz, *Parashorea malaanonan*, *Vatica maingayi*, *Dipterocarpus grandiflorus*, *Dipterocarpus kunstleri*, and *Shorea johorensis,* are reported to be critically endangered (Appendix 1) which may require a combination of sound research and some conservation attention.

19.3.3 Forest Communities and Tree Flora of Mount Ledang

19.3.3.1 Family of Trees

Mount Ledang equally holds a high diversity of trees with a total number tree families enumerated from all study areas amounting to 62. Figure 19.7 shows the distribution of tree families that occur in the study area in relation to the number of taxa. Observations of specimens indicated that the tree families consist of 143 genera and 222 taxa. Generally, the areas surveyed are rich with the species from the family of Myrtaceae. Overall, a total of 24 taxa which belong to Myrtaceae family were encountered in the study trails. The second was the family of Euphorbiaceae with 21 taxa, followed by Moraceae (18 taxa), Dipterocarpaceae (17 taxa), and Rubiaceae (15 taxa). The next five important tree families that occur in the study trails include Theaceae, Guttiferae, Apocynaceae, Leguminosae, and Hypericaceae, with a number of taxa ranging from 10 to 13. Twelve families recorded the number of taxa between 5 and 9, and the remaining 40 families with the range of 1–4 taxa (Fig. 19.7).

19.3.3.2 Tree Communities in the Riparian Forests of Mount Ledang

Riparian forests are narrow, ribbon-like corridors that occur adjacent to many streams (Baker et al. 2002). The ecological structure and function of riparian forests and the associated streams are profoundly intertwined. According to Damasceno-Junior et al. (2005), variations in topography, landform, and soils in riparian forests have strong effects on species composition, distribution, and structure. Near the park rangers' office of Mount Ledang National Park are riparian forests that harbor some interesting plant life. The river flows down through rocky mountain and many cascades at different heights which created many small pools. Smaller trees and treelets that are especially common in the moist areas include *Ixora* sp., *Rennellia elliptica, Canthium didymium* (Rubiaceae), *Barringtonia macrostachya* (Lecythidaceae)*, Baccaurea parviflora* (Phyllanthaceae), and *Microcos latifolia* (Tiliaceae). Besides these, *Saraca multiflora* (Leguminosae) was frequent and easy to identify by its purple young leaves hanging from the ends of the branchlets.

Tree species from Dipterocarpaceae (i.e., *Shorea multiflora*), Moraceae (i.e., *Artocarpus elasticus*), Sapotaceae (i.e., *Palaquium obovatum*), and Leguminosae (i.e., *Sindora coriacea* and *Dialium platysepalum*) are big trees encountered on farther away from the stream. *Dillenia reticulata* (Dilleniaceae) can be identified from its big obovate leaves and stilt roots. Other medium-sized tree species found include *Knema scortechinii* (Myristicaceae), *Diospyros styraformis* (Ebenaceae), and *Ixonanthes reticulata* (Ixonanthaceae). *Knema* is distinguished by its red sap produced from the stem from a slight incision made on the bark, whereas *Diospyros* by its distinctive black bark, and *Ixonanthes* by its bole which often fluted. In the openings or gaps of the stream banks, it is not usual to find pioneer species from Euphorbiaceae (i.e., *Croton argyratus, Croton laevifolius,* and *Macaranga* sp.).

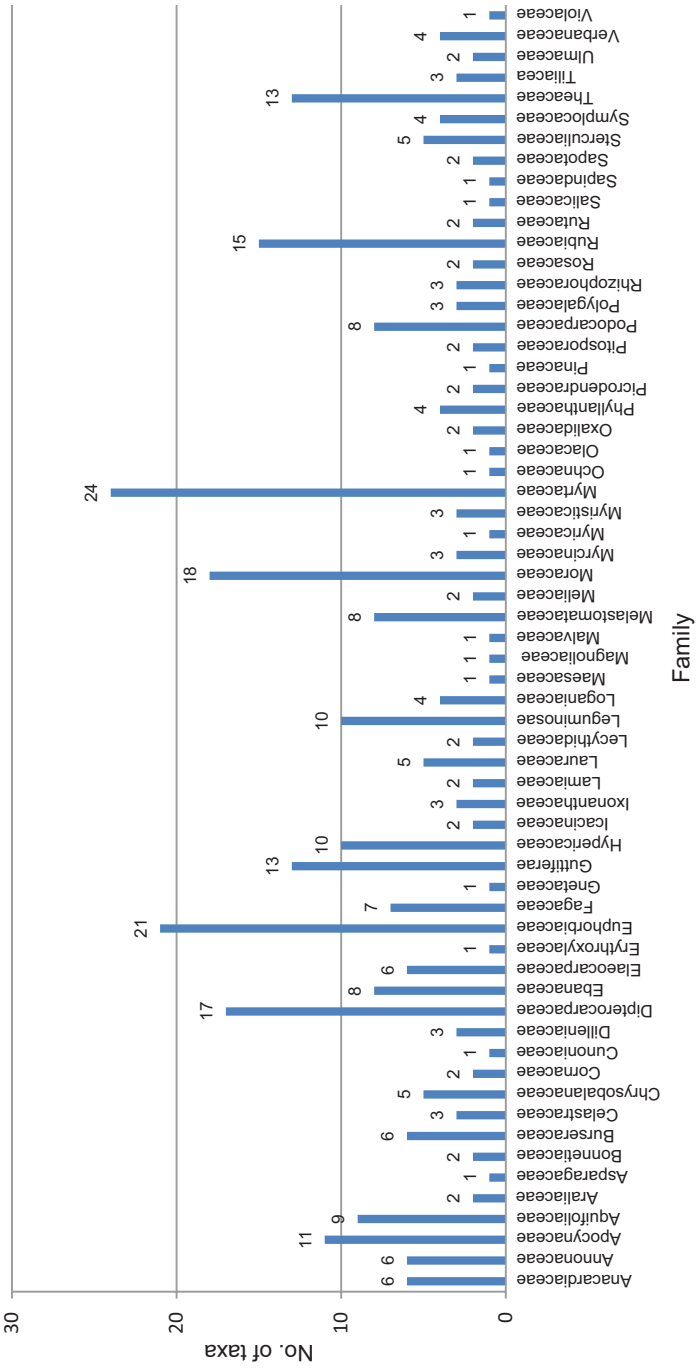

Fig. 19.7 Family-wise distribution of tree species collected from Mount Ledang

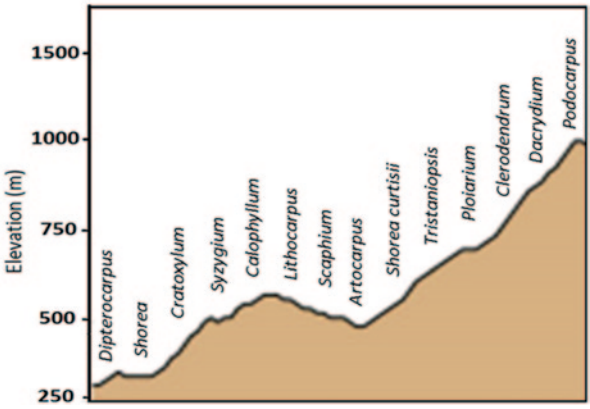

Fig. 19.8 Trail elevation profile and some common genus encountered in Mount Ledang

19.3.3.3 Lowland, Hill, and Upper Hill Dipterocarp Forests

The expedition trail and its elevation profile for the journey to the peak of Mount Ledang are presented in Figs. 19.3 and 19.8, respectively. The exploration began from the lowland dipterocarp forest zone at 257 m altitude. As the name implies, the Dipterocarpaceae are mainly lowland rainforest trees. Trees from this family are the most important timber in Malaysia. A number of *Dipterocarpus* and *Shorea* were found in this area. These include *Dipterocarpus crinitus, Dipterocarpus cornutus, Dipterocarpus kerrii,* and *Dipterocarpus kunstleri*. Five species of *Shorea* encountered along the trails were *Shorea leprosula, Shorea macroptera, Shorea parvifolia, Shorea pauciflora,* and *Shorea ovalis*. Other dipterocarps found within this elevation include *Anisoptera curtisii*. Trees from Dipterocarpaceae can be identified from the barks which usually produce resins. Other emergent trees from non-dipterocarp group found in this area include *Koompassia malaccensis* (Leguminosae), *Ochanostachys amentacea* (Olacaceae), and *Dyera costulata* (Apocynaceae).

Small and medium-sized trees that are common in this area include *Cinnamomum iners* (Lauraceae), *Gardenia tubifera* (Rubiaceae), *Gnetum gnemon* (Gnetaceae), *Memecylon cantleyi* (Melastomataceae), and *Pimelodendron griffithianum* (Euphorbiaceae). *Cinnamomum* can be identified by its aromatic smell from the inner bark and its trinerved leaf characters. Other than timber trees, many other groups of plants contribute to the complexity of the lowland dipterocarp forests. For example, a variety of bamboo, rattans, and palms are especially common as well as climbers and epiphytes.

Different tree communities occurred in the higher elevation along the trail to the peak of Mount Ledang. In the hill dipterocarp forests, *Shorea platyclados* (Dipterocarpaceae) is common. Tree non-dipterocarp species such as *Cratoxylum formosum* (Hypericaceae), *Syzygium filifrome* (Myrtaceae), *Calophyllum* sp. (Guttiferae), and *Gluta wallichii* (Anacardiaceae) grow occasionally in this

zone. *Cratoxylum* is distinctive from its iodine-colored sap from the inner bark and its prickly stem. *Syzygium* can be indentified from its simple opposite leaf arrangement and *jambu* smell characters, whereas *Calophyllum* also from its simple and opposite leaf arrangement but with parallel secondary veins. Meanwhile, *Gluta* can be distinguished from other trees by its black sap from the inner bark.

In the open sites of hill dipterocarp forest, some pioneer species such as *Macaranga gigantea, Macaranga triloba, Sapium baccatum, Endospermum diadenum* (all from Euphorbiaceae), and *Cratoxylum cochinchinense* (Hypericaceae) are common. Together with these secondary species, a number of medium-sized non-dipterocarp trees such as *Lithocarpus* sp. (Fagaceae), *Scaphium macropodum* (Sterculiaceae), and *Artocarpus scortechinii* (Moraceae) were encountered along the hill dipterocarp forests.

Within the upper hill dipterocarp forest, tree species of *Shorea* (Dipterocarpaceae) are very common big trees along the trails. These include *Shorea curtisii* and *Shorea exelliptica. Shorea curtisii is* a typical member of upper hill forest habitat, specifically in valleys of the hill. It is a large emergent tree with a straight and fissured bole. Together with these emergent dipterocarps are a number of non-dipterocarp trees such as *Gynotroches axillaris* (Rhizophoraceae), *Elaeocarpus floribundus* (Elaeocarpaceae), and *Tristaniopsis razakiana* (Myrtaceae). *Tristaniopsis* is distinctive in terms of its peeling barks with mixed reddish brown to gray-white hues. Smaller trees occasionally encountered along the upper hill trails include *Randia scortechinii, Timonius wallichianus* (Rubiaceae), *Scutinanthe brunnea* (Burseraceae), and *Gynotroches axillaris* (*Rhizophoraceae*).

19.3.3.4 Lower Montane Forest

During the expedition, lower montane forest was observed before the peak of trails with the presence of lower montane vegetation (e.g., *Ploiarium alternifolium*—Bonnetiaceae) at 1018 m altitude. At this altitude, dipterocarps and other common lowland families such as Leguminosae, Euphorbiaceae, and Myristiceae begin to diminish and are replaced by a diversity of species from tree families such as Myrtaceae and Theaceae At this elevation, *Baeckea frutescens, Leptospermum flavescens* (Myrtaceae), and *Eurya nitida* (Theaceae) form the main tree association. At 1030 m altitude, the forest is mossy and is characterized with low-statured vegetation and devoid of emergent trees.

19.3.3.5 Upper Montane Forest

The upper montane zone occurs on area of telecommunication tower at the end of the trail (1190 m altitude) which is among the highest peaks in Mount Ledang. Within the zone, trees from the family of Podocarpaceae are very common montane

Fig. 19.9 *Maesa fraseriana*

taxa such as *Podocarpus neriifolius, Dacrydium elatum,* and *Dacrydium beccarii.* They are also much encountered along the trails before the summit. Together with these communities are *Magnolia montana* (Magnoliaceae), *Ardisia retinervia* (Myrcinaceae), and *Mastixia retinervia* (Cornaceae) which distinctly common around the summit zone. This elevation zone also supports a large variety of pitcher (Nepenthacaeae) and ginger (Zingiberaceae) plants. Other montane taxa such as *Clerodendrum* sp. (Lamiaceae), *Schima wallichii* (Theaceae)*, Leptospermum flavescens* (Myrtaceae), as well as *Ficus* cf. *sinuata* (Moraceae) also occur.

19.3.4 Maesa fraseriana: A Potential New Record for Mount Ledang

Maesa fraseriana, belonging to Maesaceae, is a small shrub (up to 2 m tall) or woody climbers (up to 7 m tall) that is endemic to montane forest of Fraser's Hill (Fig. 19.9). Utteridge (2012) reported that this species is known from five localities based on ten collections. All collection was from Fraser's Hill except for a single outlier from Ulu Klang. However, according to Utteridge (2012), it is possible that *Maesa fraseriana* is found within the central range of Peninsular Malaysia with an extent of occurrence of the collection within 1000 km^2. Due to the evidence of habitat decline in Fraser's Hill, this species was assigned a rating of Endangered B1 ab (iii).

It is interesting to note that, during this expedition, this taxon was found at the moist forest edge (1048 m altitude) near the roadside of plateau base camp, together with other montane taxa such as *Dacrydium elatum, Eurya nitida,* and *Podocarpus neriifolius*. Identification of this species was made possible from a consultation with Forest Research Institute Malaysia's (FRIM's) herbarium personnel and a thorough literature review. According to Kiew (1992), as compared to lowland forests, endemic species in montane forest may only be confined to a single mountain peak

or group of peaks in which in this expedition, this phenomenon is illustrated by the discovery of *Maesa fraseriana*. In contrast, the geological distribution for the species in the lowland forests is wider. Therefore, the discovery of a new record from the montane forest may have profound implications of conservation as disturbance in the small habitat could affect the survival of the species.

19.3.5 Other Species of Interest

Mount Gunung is an interesting area in terms of geographical variation, species composition, and conservation potential. It shelters species that are endemics and endangered not to the area but also from other parts of Malaysia. The IUCN Red List data were used to provide the information on the conservation status of the listed tree species collected from this survey. In terms of conservation status, among all trees documented, *Anisoptera curtisii* and *Dipterocarpus cornutus* are assigned as Critically Endangered (IUCN 2013). The other four species from the family of Dipterocarpaceae, viz, *Shorea leprosula, Shorea platyclados, Shorea pauciflora,* and *Dipterocarpus kerrii,* are reported to be endangered (Appendix 1) which may require a combination of sound research and some conservation attention.

Conclusion

Imbak Canyon and Mount Ledang cover a diverse range of landscape elements and natural vegetation communities from streamside vegetation, lowland, hill, and upper hill mixed dipterocarps up to lower montane heath forests. While information from this survey may provide reference for ecologically useful species as well as species of special concern, sufficiently large-range surveys are still required to gather more comprehensive information to identify conservation efforts for sustainability of forest biodiversity. The areas are likely to harbor a significant number of endemic species; however, the data collected from this expedition were inadequate to document comprehensive information on species richness, endemism, and checklists of rare and endangered species for the area. While information from this survey may provide reference for ecologically useful species as well as species of special concern, follow-up plant inventories are necessary to assess the conservation importance of a particular species.

Appendix 1: List of Trees in Alphabetical Order Documented for the Imbak Canyon and Mount Ledang, Malaysia

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
1	*Acronychia porteri*		Rutaceae	Lower risk/least concern	ML/IC
2	*Acronychia* sp.		Rutaceae		IC
3	*Actinodaphne montana*	Medang paying	Lauraceae	Lower risk/least concern/ endemic	IC
4	*Actinodaphne pruinosa*	Medang payung gunung/Medang serai	Lauraceae	Lower risk/least concern	IC/ML
5	*Actinodaphne* sp.	Medang serai	Lauraceae		IC
6	*Adinandra dumosa*	Tetiup	Theaceae		ML
7	*Adinandra maculosa*	Bawing	Theaceae		IC
8	*Aglaia eximia*	Bekak	Meliaceae		ML
9	*Aglaia* sp.	Bekak	Meliaceae		ML
10	*Agrostistachys longifolia*	Jenjulong	Euphorbiaceae		ML
11	*Alstonia angustiloba*	Pulai/Pulai bukit	Apocynaceae		IC/ML
12	*Alstonia macrophylla*	Pulai penipu bukit	Apocynaceae		ML
13	*Anaxagorea javanica*	Bunga pompun	Annonaceae		ML
14	*Anisoptera cutisii*	Mersawa durian	Dipterocarpaceae	Critically endangered	ML
15	*Aporusa microstachya*		Phyllanthaceae		ML
16	*Aquilaria malaccensis*	Gaharu	Thymelaeaceae	Vulnerable	IC
17	*Ardisia retinervia*		Myrcinaceae		ML
18	*Ardisia* sp.	Serusop	Myrsinaceae		IC/ML
19	*Arthrophyllum diversifolium*	Terentang	Araliaceae		ML

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
20	*Artocarpus anisophyllus*	Terap ikal	Moraceae		IC
21	*Artocarpus dadah*	Tampang bulu	Moraceae		ML
22	*Artocarpus elasticus*	Terap nasi	Moraceae		IC/ML
23	*Artocarpus heterophyllus*	Nangka	Moraceae		ML
24	*Artocarpus lanceifolius*	Keledang-keledang	Moraceae		ML
25	*Artocarpus scortechinii*	Terap hitam	Moraceae		ML
26	*Arytera littoralis*		Sapindaceae		ML
27	*Austrobuxus nitidus*		Picrodendraceae		ML
28	*Baccaurea parviflora*	Kunau-kunau/Rambai hutan/Set-ambun taik	Euphorbiaceae		IC/ML
29	*Baeckea frutescens*	Chuchor atap	Myrtaceae		ML
30	*Barringtonia macrostachya*	Putat	Lecythidaceae		ML
31	*Bouea oppositifolia*	Kudang daun kecil	Anacardiaceae		ML
32	*Brackenridgea palustris*	Mata ketam	Ochnaceae	Lower risk/near threatened	ML
33	*Breynia* sp.		Phyllanthaceae		ML
34	*Brownlowia peltata*	Pinggau-pinggau	Tiliaceae		IC
35	*Buchanania sessifolia*	Otak udang daun tajam	Anacardiaceae		ML
36	*Callerya atropurpurea*	Tulang daing	Leguminosae		ML
37	*Calophylllum tetrapterum*	Bintangor	Guttiferae	Lower risk/least concern	IC
38	*Calophyllum* sp.	Bintangor	Guttiferae		ML
39	*Calophyllum depresinervosum*	Bintangor	Guttiferae		IC
40	*Calophyllum dioscurii*	Bintangor	Guttiferae		IC
41	*Calophyllum macrocarpum*	Bintangor	Guttiferae		ML
42	*Calophyllum nodosum*	Bintangor	Guttiferae		IC
43	*Calophyllum obliquinevium*	Bintangor	Guttiferae		IC

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
44	*Calophyllum* sp. 1	Bintangor	Guttiferae		IC
45	*Calophyllum* sp. 2	Bintangor	Guttiferae		IC
46	*Calophyllum wallichianum var wallichianum*	Bintangor	Guttiferae		IC
47	*Campnosperma auriculatum*	Terentang daun besar	Anacardiaceae		IC/ML
48	*Campnosperma squamatum*	Terentang daun kecil	Anacardiaceae		IC
49	*Canarium denticulatum*	Kedondong	Burseraceae		IC
50	*Canarium littorale*	Kedondong gergaji	Burseraceae	Lower risk/least concern	IC/ML
51	*Canarium pilosum*	Kendondong	Burseraceae		IC
52	*Canthium didymum*		Rubiaceae		ML
53	*Carallia brachiata*	Meransi	Rhizophoraceae		ML
54	*Casearia clarkei*		Flacourtiaceae		IC
55	*Castanopsis megacarpa*	Beranggang gajah/getek tangga	Fagaceae		ML
56	*Castanopsis megacarpa*	Gertik tangga	Fagaceae		ML
57	*Chisochiton ceramicus*	Berindu	Meliaceae		IC
58	*Cinnamomum iners*	Kayumanis/Medang teja	Lauraceae		IC/ML
59	*Cinnamomum javanicum*	Kayu manis	Lauraceae		IC
60	*Cinnamomum* sp.	Medang	Lauraceae		IC
61	*Clerodendrum* sp.		Lamiaceae		ML
62	*Clerodendrum villosum*		Lamiaceae		ML
63	*Cratoxylum cochinchinense*	Geronggang	Hypericaceae	Lower risk/least concern	ML
64	*Cratoxylum formosum*	Geronggang derum	Hypericaceae	Lower risk/least concern	ML
65	*Cratoxylum* sp.	Geronggang	Hypericaceae		ML
66	*Croton argyratus*	Hujan panas	Euphorbiaceae		ML
67	*Croton laevifolius*	Hujan panas	Euphorbiaceae		ML

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
68	*Croton* sp.	Hujan panas	Euphorbiaceae		ML
69	*Crotoxylum formosum*	Geronggang	Hypericaceae	Lower risk/least concern	ML
70	*Cryptocarya ferrea*	Medang	Lauraceae		IC
71	*Cyathocalyx pruniferus*		Annonaceae		ML
72	*Dacrydium beccarii*	Ekor tupai	Podocarpaceae	Least concern	ML
73	*Dacrydium comosum*	Ekor	Podocarpaceae	Endangered	IC
74	*Dacrydium elatum*	Ekor kuda	Podocarpaceae	Lower risk/least concern	ML
75	*Dacryodes rostrata*	Kedondong kerut	Burseraceae	Lower risk/least concern	ML
76	*Dacryodes rubiginosa*	Kedondong	Burseraceae		IC
77	*Desmos chinensis*	Pisang monyet	Annonaceae		IC
78	*Dialium platysepalum*	Keranji kuning besar	Leguminosae		ML
79	*Dillenia borneensis*	Simpoh gajah	Dilleniaceae		IC
80	*Dillenia excelsa*	Simpoh laki	Dilleniaceae		IC
81	*Dillenia reticulata*	Simpoh gajah	Dilleniaceae		ML
82	*Diospyros andamanica*	Kayu arang	Ebenaceae		ML
83	*Diospyros buxifolia*	Meribut	Ebanaceae		ML
84	*Diospyros rigida*	Kayu arang	Ebanaceae		ML
85	*Diospyros* sp.	Kayu arang	Ebanaceae		IC/ML
86	*Diospyros styraformis*	Kayu arang	Ebanaceae		ML
87	*Diospyros wallichii*	Kayu malam	Ebanaceae		IC
88	*Dipterocarpus* sp.	Keruing	Dipterocarpaceae		ML
89	*Dipterocarpus caudiferus*	Keruing putih	Dipterocarpaceae		IC
90	*Dipterocarpus crinitus*	Keruing mempelas	Dipterocarpaceae		ML
91	*Dipterocarpus grandiflorus*	Keruing belimbing	Dipterocarpaceae	Critically endangered	IC

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
92	*Dipterocarpus kerrii*	Keruing gondol	Dipterocarpaceae	Endangered	ML
93	*Dipterocarpus kunstleri*	Keruing rapak	Dipterocarpaceae	Critically endangered/near streams	IC
94	*Dracaena* sp.		Asparagaceae		ML
95	*Dryobalanops lanceolata*	Kapur paji	Dipterocarpaceae	Endangered/Endemic	IC
96	*Duabanga moluccana*	Megas	Sonneratiaceae	Wet area	IC
97	*Durio griffithii*	Durian kuning	Bombacaceae		IC
98	*Durio oxleyanus*	Durian	Bombacaceae		IC
99	*Dyera costulata*	Jelutong/Jelutong bukit	Apocynaceae	Lower risk/least concern	IC/ML
100	*Dysoxylon* sp.	Olop-olop	Meliaceae		IC
101	*Elaeocarpus floribundus*	Mendung	Elaeocarpaceae		ML
102	*Elaeocarpus nitidus var. nitidus*	Mendung	Elaeocarpaceae		ML
103	*Elaeocarpus palembanicus*	Mendung	Elaeocarpaceae		ML
104	*Elaeocarpus* sp.	Mendung	Elaeocarpaceae		ML
105	*Elateriospermum tapos*	Perah	Euphorbiaceae		ML
106	*Endospermum diadenum*	Sesenduk	Euphorbiaceae		ML
107	*Erythroxylum cuneatum*		Erythroxylaceae		ML
108	*Eucalyptus deglupta*	Kayu putih	Myrtaceae		ML
109	*Eurya nitida*	Podo kebal musang	Theaceae		ML
110	*Eurycoma longifolia*	Pahit-pahit	Simaroubaceae		IC
111	*Fagraea crenulata*	Tembusu	Loganiaceae		ML
112	*Falcatifolium falciforme*	Podo	Podocarpaceae	Lower risk/least concern	IC
113	*Ficus* sp.	Ara	Moraceae		IC/ML
114	*Ficus* cf. *sinuata*	Ara	Moraceae		ML
115	*Ficus deltoidea*	Mas cotek	Moraceae		ML

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
116	*Ficus fulva*	Ara	Moraceae		ML
117	*Ficus glossularioides*	Ara	Moraceae		ML
118	*Ficus vasculosa*	Kayu ara	Moraceae		IC
119	*Ficus xylophylla*	Ara	Moraceae		ML
120	*Fordia curtisii*		Leguminosae		IC
121	*Fordia* sp.		Leguminosae		IC
122	*Garcinia malaccensis*	Manggis hutan/Kandis	Guttiferae		IC/ML
123	*Garcinia* sp.	Kandis	Guttiferae		IC/ML
124	*Gardenia tubifera*	Mentiong bukit	Rubiaceae		ML
125	*Gironniera subaequalis*	Ampas tebu/Hampas tebu	Ulmaceae		IC/ML
126	*Glochidion borneensis*	Ubah nasi	Euphorbiaceae		IC
127	*Glochidion superbum*	Gerumong jantan	Euphorbiaceae		IC
128	*Gluta aptera*	Rengas/Rengas kerbau jalang	Anacardiaceae		IC/ML
129	*Gluta elegans*	Rengas	Apocynaceae		ML
130	*Gluta wallichii*	Rengas	Anacardiaceae		ML
131	*Gnetum gnemon*	Meninjau	Gnetaceae	Least concern	ML
132	*Gonocaryum gracile*		Icacinaceae		ML
133	*Gordonia concentricicatrix*	Semak pulut	Theaceae		ML
134	*Gordonia* sp.	Samak pulut	Theaceae		ML
135	*Gymnacranthera forbesii*	Lanau	Myristicaceae		IC
136	*Gynotroches axillaris*		Rhizophoraceae		ML
137	*Helicia* sp.		Proteaceae		IC
138	*Heritiera elata*	Kembang	Sterculiaceae		IC
139	*Heritiera javanica*	Kembang	Sterculiaceae		IC

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
140	*Homalium longifolium*	Telur buaya	Sterculiaceae	Lower risk/least concern	ML
141	*Hopea nervosa*	Selangan jangkang	Dipterocarpaceae		IC
142	*Hopea* sp. 1	Selangan	Dipterocarpaceae		IC
143	*Hopea* sp. 2	Selangan	Dipterocarpaceae		IC
144	*Hopea vesquei*	Selangan bukit karangas	Dipterocarpaceae		IC
145	*Horsfieldia guatteriifolia*	Darah-darah	Myristicaceae		IC
146	*Horsfieldia polyspherula*	Darah-darah	Myristicaceae		IC
147	*Horsfieldia* sp.	Darah-darah	Myristicaceae		IC
148	*Ilex cymosa*	Mensirah	Aquifoliaceae		ML
149	*Ilex macrophylla*	Mensirah	Aquifoliaceae		ML
150	*Ilex* sp.	Mensirah	Aquifoliaceae		ML
151	*Ilex triflora*	Mensirah	Aquifoliaceae		ML
152	*Irvingia malayana*	Pauh kijang	Irvingiaceae	Lower risk/least concern	IC
153	*Ixonanthes icosandra*	Pagar anak	Ixonanthaceae		ML
154	*Ixonanthes reticulata*	Inggir burung	Ixonanthaceae		ML
155	*Ixora* sp.	Kiam/Jejarum	Rubiaceae		IC/ML
156	*Ixora* sp.	Kiam	Rubiaceae		IC
157	*Knema laurina*	Darah-darah	Myristicaceae		IC
158	*Knema malayana*	Darah-darah	Myristicaceae	Lower risk/least concern	IC
159	*Knema patentinervia*	Penarahan	Myristicaceae		ML
160	*Knema scortechinii*	Penarahan	Myristicaceae		ML
161	*Knema stenophylla* subsp. *longipedicellate*	Darah darah	Myristicaceae	Endemic	IC
162	*Koilodepas longifolium*		Euphorbiaceae		ML

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
163	*Kokoona reflexa*	Mata ulat	Celastraceae		ML
164	*Koompasia malaccensis*	Kempas	Leguminosae	Lower risk/conservation dependent	ML
165	*Koompassia excelsa*	Mengaris	Leguminosae	Lower risk/conservation dependent	IC
166	*Lasianthus* sp.		Rubiaceae		IC
167	*Leea indica*	Mali-mali	Leeaceae		IC
168	*Leptospermum flavescens*	Cina maki	Myrtaceae		ML
169	*Leucostegane latistipulata*	Mempisang	Leguminosae	Vulnerable	IC
170	*Lindera montanoides*	Medang pawas	Lauraceae		IC
171	*Lithocarpus curtisii*	Mempening	Fagaceae	Vulnerable	IC
172	*Lithocarpus encleiscarpus*	Mempening	Fagaceae		IC
173	*Lithocarpus ewyckii*	Mempening	Fagaceae		IC
174	*Lithocarpus* sp.	Mempening	Fagaceae		ML
175	*Lithocarpus wallichianus*	Mempening	Fagaceae		ML
176	*Litsea* sp.	Medang	Lauraceae		ML
177	*Lophopetalum sp.*	Mata ulat	Celastraceae		ML
178	*Macaranga gigantea*	Mahang gajah	Euphorbiaceae		ML
179	*Macaranga hypoleuca*	Sedaman putih/Mahang kapur	Euphorbiaceae		IC/ML
180	*Macaranga laciniata*	Mahang	Euphorbiaceae		ML
181	*Macaranga triloba*	Sedaman/Mahang merah	Euphorbiaceae		ML
182	*Maclurodendron porteri*		Rutaceae		ML
183	*Maesa fraseriana*		Maesaceae	New record for Mount Ledang	ML
184	*Magnolia montana*		Magnoliaceae		ML

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
185	*Magnolia* sp. 2	Cempaka	Magnoliaceae		IC
186	*Mallotus griffithianus*	Balik angin	Euphorbiaceae		ML
187	*Mallotus macrostachyus*	Balik angin	Euphorbiaceae		ML
188	*Mallotus oblongifolius*	Balik angin	Euphorbiaceae		ML
189	*Mallotus* sp.	Balik angin	Euphorbiaceae		ML
190	*Mallotus stipularis*	Mallotus	Euphorbiaceae		IC
191	*Mangifera griffthii*	Rawa	Anacardiaceae		ML
192	*Maranthes corymbosa*	Merbatu	Chrysobalanaceae		ML
193	*Mastixia pentandra*	Tetebu	Cornaceae		ML
194	*Melastoma malabatricum*	Senduduk	Melastomataceae		ML
195	*Memecylon amplexicaule*	Nipis kulit	Melastomataceae		ML
196	*Memecylon cantleyi*	Nipis kulit	Melastomataceae		ML
197	*Memecylon minutiflorum*	Nipis kulit	Melastomataceae		ML
198	*Memecylon pubescens*	Nipis kulit	Melastomataceae		ML
199	*Memecylon* sp.	Nipis kulit	Melastomataceae		ML
200	*Mesua kochummeniana*	Penaga bayan	Guttiferae		ML
201	*Mesua racemosa*	Penaga	Guttiferae		ML
202	*Mesua* sp.	Penaga	Guttiferae		ML
203	*Mezzettia leptopoda*	Mempisang	Annonaceae		IC/ML
204	*Microcos antidesmifolia*	Kerodong	Tiliaceae		IC
205	*Microcos latifolia*	Chenderai	Tiliacea		ML
206	*Microcos* sp.		Tiliacea		ML
207	*Monocarpia marginalis*	Mempisang	Annonaceae		ML
208	*Myrica esculenta*		Myricaceae		ML

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
209	*Nauclea albicinales*		Rubiaceae		ML
210	*Nauclea* sp.		Rubiaceae		ML
211	*Nauclea subdita*	Bangkal kuning	Rubiaceae		IC
212	*Neesia* sp.	Durian monyet	Bombacaceae		IC
213	*Norrisia malaccensis*		Loganiaceae		ML
214	*Ochanostachys amentacea*	Tanggal/Petaling	Olacaceae		IC/ML
215	*Octomeles sumatrana*	Benuang	Datiscaceae	Lower risk/least concern	IC
216	*Oxyspora* sp.		Melastomaceae		IC
217	*Palaquium maingayi*	Nyatoh durian	Sapotaceae		ML
218	*Palaquium obovatum*	Nyatoh	Sapotaceae		ML
219	*Pangium edule*	Kepayang	Salicaceae		ML
220	*Parashorea melaanonan*	Urat mata daun licin	Dipterocarpaceae	Critically endangered	IC
221	*Parashorea tomentella*	Urat mata beludu	Dipterocarpaceae		IC
222	*Parinari elmeri*	Merbatu	Chrysobalanaceae		ML
223	*Parinari oblongifolia*	Merbatu	Chrysobalanaceae		IC
224	*Parkia javanica*	Kupang/Petai kerayong	Leguminosae		IC/ML
225	*Parkia speciosa*	Petai kerayong	Leguminosae		ML
226	*Payena lucida*	Nyatoh	Sapotaceae		ML
227	*Payena maingayi*	Nyatoh	Sapotaceae	Lower risk/least concern	IC
228	*Pentace laxiflora*	Takalis daun halus	Tiliaceae		IC
229	*Phyllocladus* sp.		Podocarpaceae		IC
230	*Pimelodendron griffithianum*	Perah ikan	Euphorbiaceae		ML
231	*Pinus carribea*	Pine	Pinaceae		ML
232	*Pittosporum ferrugineum*		Pitosporaceae		ML

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
233	*Ploiarium alternifolium*	Riang riang	Bonnetiaceae		ML
234	*Ploiarium* sp.	Riang riang	Bonnetiaceae		ML
235	*Podocarpus neriifolius*	Podo bukit	Podocarpaceae	Least concern	ML
236	*Podocarpus neriifolius*	Kayu china	Podocarpaceae	Lower risk/least concern	IC
237	*Polyalthia clauliflora*	Kerai larak	Annonaceae		IC
238	*Polyalthia rumphii*	Mempisang	Anonaceae		ML
239	*Polyalthia sumatrana*	Mempisang	Anonaceae		ML
240	*Popowia pisocarpa*	Mempisang	Annonaceae		ML
241	*Porterandia anisophylla*	Tinjau belukar	Rubiaceae		ML
242	*Pouteria malaccensis*	Nyatoh nangka kuning	Sapotaceae		ML
243	*Premna corymbosa*	Leban	Verbenaceae		ML
244	*Prunus* sp.1	Pepijat	Rosaceae		ML
245	*Prunus* sp.2	Stone fruits	Rosaceae		ML
246	*Pternandra coerulescens*	Sial menahun	Melastomataceae		ML
247	*Pternandra echinata*	Sial menahun	Melastomataceae		ML
248	*Pterospermum javanicum*	Bayur bukit	Malvaceae		ML
249	*Pterospermum* sp.	Bayur	Malvaceae		IC
250	*Randia scortechinii*	Tinjau belukar	Rubiaceae		ML
251	*Rapanea porteriana*		Myrcinaceae		ML
252	*Rennellia elliptica*	Tepejat	Rubiaceae		ML
253	*Rennellia speciosa*		Rubiaceae		IC
254	*Rhodamnia cinerea*	Mempoyan/poyan	Myrtaceae		ML
255	*Rinorea anguifera*	Sentil tembakau	Violaceae		ML
256	*Santiria griffithii*	Kedondong	Burseraceae		ML

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
257	*Santiria laevigata*	Kerantai/Kedondong kerantai lichin	Burseraceae	Lower risk/least concern	IC/ML
258	*Santiria tomentosa*	Kerantai bulu	Burseraceae	Lower risk/least concern	IC
259	*Sapium baccatum*	Ludai	Euphorbiaceae		ML
260	*Saprosma* sp.		Rubiaceae		ML
261	*Saraca cauliflora*	Gapis	Leguminosae		ML
262	*Sarcotheca griffithii*	Belimbing pipi	Oxalidaceae		ML
263	*Scaphium linearicarpum*	Kembang semangkok bulat	Sterculiaceae		ML
264	*Scaphium macropodum*	Kembang semangkok jantung	Sterculiaceae	Lower risk/least concern	IC/ML
265	*Schefflera* sp.		Araliceae		IC
266	*Schima wallichii*	Gegatal	Theaceae		ML
267	*Schoutenia accrescens*	Bayur bukit	Tiliaceae		ML
268	*Scorodocarpus borneensis*	Bawang hutan	Olacaceae		IC
269	*Scutinanthe brunnea*	Kedondong sengkuang	Burseraceae	Lower risk/least concern	ML
270	*Shorea agentifolia*	Seraya daun emas	Dipterocarpaceae	Endangered	IC
271	*Shorea atrinervosa*	Selangan batu hitam	Dipterocarpaceae		IC
272	*Shorea ciliata*		Dipterocarpaceae	Endangered	IC
273	*Shorea curtisii*	Meranti seraya	Dipterocarpaceae	Lower risk/least concern	ML
274	*Shorea excelliptica*	Balau tembaga	Dipterocarpaceae		ML
275	*Shorea fallax*	Seraya daun kasar	Dipterocarpaceae		IC
276	*Shorea flaviflora*	Seraya daun besar	Dipterocarpaceae	Critically endangered	IC
277	*Shorea guiso*	Selangan batu merah	Dipterocarpaceae		IC
278	*Shorea johorensis*	Seraya majau	Dipterocarpaceae	Critically endangered	IC
279	*Shorea laevis*	Selangan batu kumus	Dipterocarpaceae	Lower risk/least concern/ ridges	IC

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
280	*Shorea leprosula*	Seraya tembaga/Meranti tembaga	Dipterocarpaceae	Endangered	IC/ML
281	*Shorea macroptera*	Meranti melantai	Dipterocarpaceae		ML
282	*Shorea Maxwelliana*	Selangan batu asam	Dipterocarpaceae	Endangered	IC
283	*Shorea microphylla*	Kawang jantung	Dipterocarpaceae		IC
284	*Shorea monticola*	Seraya gunung	Dipterocarpaceae	Endemic, mountains	IC
285	*Shorea multiflora*	Damar hitam pipit	Dipterocarpaceae		ML
286	*Shorea obscura*		Dipterocarpaceae	Hills	IC
287	*Shorea ovalis*	Meranti kepong	Dipterocarpaceae		ML
288	*Shorea ovata*	Seraya punai bukit	Dipterocarpaceae	Endangered	IC
289	*Shorea parvifolia*	Meranti sarang punai	Dipterocarpaceae		ML
290	*Shorea parvifolia*	Seraya punai	Dipterocarpaceae		IC
291	*Shorea parvistipulata*	Seraya lupa	Dipterocarpaceae		IC
292	*Shorea patoiensis*	Seraya kuning pinang	Dipterocarpaceae		IC
293	*Shorea pauciflora*	Meranti nemesu	Dipterocarpaceae	Endangered	ML
294	*Shorea platyclados*	Meranti bukit	Dipterocarpaceae	Endangered	ML
295	*Shorea* sp.	Seraya/Meranti	Dipterocarpaceae		IC/ML
296	*Sindora beccariana*	Sepetir	Leguminosae		IC
297	*Sindora coriacea*	Sepetir lichin	Leguminosae		ML
298	*Sindora echinocalyx*	Sepetir daun nipis	Leguminosae		IC
299	*Sloanea javanica*	Mendong	Lauraceae		IC
300	*Stemonurus malaccensis*	Katok	Icacinaceae		IC
301	*Sterculia parvifolia*	Kelumpang	Sterculiaceae		ML
302	*Streblus elongatus*	Tempinis	Moraceae		ML
303	*Swintonia* sp.	Merpauh	Anacardiaceae		ML

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
304	*Symplocos adenophylla*		Symplocaceae		ML
305	*Symplocos* sp.		Symplocaceae		ML
306	*Syzygium filiforme*	Kelat	Myrtaceae		ML
307	*Syzygium griffithii*	Kelat	Myrtaceae		ML
308	*Syzygium politum*	Kelat	Myrtaceae		ML
309	*Syzygium pustulatum*	Kelat	Myrtaceae		ML
310	*Syzygium* sp. 1	Kelat serai	Myrtaceae		ML
311	*Syzygium* sp. 1	Obah	Myrtaceae		IC
312	*Syzygium* sp. 2	Kelat	Myrtaceae		ML
313	*Syzygium* sp. 3	Obah	Myrtaceae		IC
314	*Syzygium* sp. 4	Obah	Myrtaceae		IC
315	*Syzygium* sp. 5	Kelat	Myrtaceae		ML
316	*Syzygium stapfianum*	Obah	Myrtaceae		IC
317	*Syzygium subdesugata*	Kelat	Myrtaceae		ML
318	*Tarenna* sp.		Rubiaceae		ML
319	*Terminalia* sp.	Telisai	Combretaceae		IC
320	*Ternstroemia tectandra*	Langkubak	Theaceae		IC
321	*Timonius wallichianus*	Kaum kopi	Rubiaceae		ML
322	*Trigonostemon malaccanus*		Euphorbiaceae		ML
323	*Tristaniopsis merguensis*	Pelawan	Myrtaceae		ML
324	*Tristaniopsis razakiana*	Pelawan	Myrtaceae		ML
325	*Tristaniopsis whiteana*	Pelawan	Myrtaceae		IC
326	*Urophyllum* sp.		Rubiaceae		ML
327	*Vatica dulitensis*	Resak bukit	Dipterocarpaceae		IC

No.	Scientific name	Local name	Family	IUCN Status/remarks	Location
328	*Vatica maingayi*	Resak daun merah	Dipterocarpaceae	Critically endangered	IC
329	*Vatica* sp.	Resak	Dipterocarpaceae		IC
330	*Vitex longisepala*	Leban	Verbenaceae		ML
331	*Vitex pinnata*	Leban	Verbanaceae		ML
332	*Vitex pubescence*	Leban	Verbanaceae		ML
333	*Vitex* sp. 1	Kulimpapa	Verbenaceae		IC
334	*Vitex* sp. 2	Kulimpapa	Verbenaceae		IC
335	*Weinmannia fraxinea*		Cunoniaceae		ML
336	*Xanthophyllum affine*	Minyak berok	Polygalaceae		IC
337	*Xanthophyllum eurhynchum*	Minyak berok	Polygalaceae		ML
338	*Xanthophyllum* sp.	Minyak berok	Polygalaceae		IC/ML
339	*Xerospermum noronhianum*	Rambutan pacat	Polygalaceae		ML
340	*Xylopia* sp.	Jangkang	Annonaceae		ML

IUCN International Union for Conservation of Nature, *ML* Mount Ledang, *IC* Imbak Canyon

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