

Floristic Diversity of Bukit Bauk (Terengganu), Peninsular Malaysia

S.M. TAM

Department of Plant Sciences, University of Cambridge,
Cambridge CB2 3EA, United Kingdom

Abstract

Bukit Bauk is a small, isolated, coastal hill range that is part of the Terengganu Hills situated at the southern end of the East Range in Peninsular Malaysia. Four vegetation types were distinguished on Bukit Bauk, namely, lowland dipterocarp forest, peat swamp forest, hill dipterocarp forest and vegetation of disturbed areas. Its floristic diversity was investigated leading to a checklist of plants. Its flora comprises at least 638 species (7.7% of the total flora of the Peninsular Malaysia) belonging to 285 genera and 103 families. The most speciose families are the Euphorbiaceae (59 species), Dipterocarpaceae (43 species), Rubiaceae (36 species), Palmae and Guttiferae (each with 31 species). Of these, 91 taxa are endemic (87 species, 1 subspecies and 1 variety), about 3.6% of the total number of endemic taxa in the Peninsula. This includes 17.6% of the total number of tree species and 8.0% of endemic tree species. This study confirms that Bukit Bauk Forest Reserve with a relatively small area of 7,596 ha is a species-rich area with a high degree of endemism and is an important component of the flora in Peninsular Malaysia that should be conserved by being totally protected.

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Introduction

Bukit Bauk is a small, isolated coastal hill range of granite rock overlain with deep loamy soil (Anon, 1954) located on the east coast of Terengganu ($4^{\circ} 42' \text{ N}$ and $103^{\circ} 25' \text{ E}$), approximately 11 km south of Kuala Dungun. Bukit Bauk proper covers an estimated area of 33.75 km² with the highest peak attaining 472.4 m altitude. It is part of the Terengganu Hills (Ulu Kemaman), which are situated at the southern end of the East Range on the east coast of Peninsular Malaysia. These hills are extremely interesting botanically because they are known to possess a large number of species within a relatively small area, of which a large number are endemic. Holttum (1936, cited by Kiew, 1991a) first drew attention to its flora, which he described as "extraordinarily rich and distinctly different from that of other parts of the Peninsula". Corner (1960) even suggested that this area contained the richest and, maybe, the oldest component of the flora in the Malay Peninsula.

In 1996, the Terengganu Hills were recognized as one of the biodiversity hotspots in Peninsular Malaysia (Kiew, 1996). Its flora was estimated to comprise approximately 1500 vascular plant species. Exact figures were then not available as the Terengganu Hills had not been the subject of any detailed botanical investigation since Corner mounted two expeditions to Ulu Kemaman in 1932 and 1935 (Kiew, 1996). These forests still remain undercollected and poorly known botanically.

Literature survey revealed that no botanical collecting had been carried out on Bukit Bauk and its surrounding forest prior to 1927 (Burkill, 1927). The first detailed botanical investigation on Bukit Bauk was carried out in 1955 in a one-acre ecological plot in Compartment 8B (Bukit Bauk Virgin Jungle Reserve) by officers of the Forest Research Institute (Wyatt-Smith, 1963). Kapur trees (*Dryobalanops sumatrensis*, Dipterocarpaceae) were enumerated and subsequently re-measured in 1957 and 1959. This one-acre plot yielded a comparatively high figure of 123 tree species (gbh ≥ 12 in) from 31 families.

Putz (1978) reported that the Forest Research Institute Malaysia (FRIM) maintained the ecological plot in the Virgin Jungle Reserve (VJR); and that in 1973 a Big Tree Plot had been set up in the lowland forest situated beside the main road adjacent to Bukit Bauk. He also noted that University of Malaya had visited the area as a study site.

Examination of herbarium records showed that since then a small number of collections were made from Bukit Bauk but no complete floristic checklist nor results of ecological studies concerning Bukit Bauk were ever published. A systematic and comprehensive floristic study of the forest Bukit Bauk was therefore compiled from existing information and as well as field studies to verify its status as a biodiversity hotspot.

Flora of Peninsular Malaysia

Peninsular Malaysia is recognized as one of the world's biodiversity hotspots (Aiken and Leigh, 1992). Its geographic position as the southernmost land limit of the Asian mainland makes it a meeting place for several regional floras (Wyatt-Smith, 1963). The lowland floristic province of Peninsular Malaysia is generally recognized to be divided into four regions (Wyatt-Smith, 1963; and Ashton, 1990) - that of the extreme northwest above the Kangar-Pattani line (which is similar to that of peninsular Thailand), the Perak subprovince, the generalised inland flora on udult ultisol soils on the west coast and Main Range (which is similar to those of Sumatra and Kalimantan), and the Riau Pocket beginning from the south east of Peninsular Malaysia and extending as a belt up to 32–48 km wide as far north as the Kelantan-Terengganu border (its flora is strongly influenced by elements from Sarawak and the Riau province). Bukit Bauk falls within this last region.

The tropical rain forests of Peninsular Malaysia harbour a great wealth of species. Turner (1995) listed 8,239 vascular plant species belonging to 1,656 genera and 237 families, of which 632 species (34 families) are ferns and fern allies, and 27 species (4 families) are gymnosperms. A checklist of endemic trees for Peninsular Malaysia compiled by Ng *et al.* (1990) included a total of 2,830 tree species in 532 genera and 100 families, of which 746 species representing 26.4% of the total are endemic. Kiew (1988) estimated there are about 2600 species of herbs in Peninsular Malaysia belonging to 551 genera and 94 families. The level of endemism in herbaceous species is considerably higher than for trees (Kiew, 1991b) as seen by several genera with more than 40 species where 87% of *Sonerila* (Melastomataceae) species are endemic, 88% for *Argostemma* (Rubiaceae), 94% for *Didymocarpus* (Gesneriaceae), 96% for *Begonia* (Begoniaceae) and 100% for *Didissandra* (Gesneriaceae).

Hill Forests

Mountains run parallel to the axis of Peninsular Malaysia with the Main Range lying to the west of a central axis and the East Coast Mountains to the east. The latter consist essentially of three major and several minor granite couliisses in Terengganu, including Bukit Bauk, which is also formed of granite material (Anon., 1954). Mountains in the Peninsula are comparatively young with emplacement of the granite having occurred in Permian times. However, Burgess (1975) reported that the east coast granite may be older, dating at least from the Triassic period.

An abrupt change in slope is a conspicuous and consistent topographical feature of the Peninsula. This zone of change has been called steep land boundary (Leamy and Panton, 1966, cited by Burgess, 1975)

and is defined as the line separating land with average slopes less than 20° from those with average slopes in excess of that figure dividing potential agricultural land from land suited to protective and productive forest. By this criterion, approximately 60% of land in Peninsular Malaysia falls within the lowland zone (Lim, 1991).

Early floristic studies of hill forests in Peninsular Malaysia were conducted as part of silvicultural research of economic resources. Timber extraction in hilly terrain became increasingly important post-World War II (Wyatt-Smith, 1963) due to increased demand and technological changes in logging, which introduced heavier and more mechanized equipment that enabled logging operators to log extensively in both lowland forest and on slope land (Aiken and Leigh, 1992).

Wyatt-Smith (1963) provided detailed and comprehensive forestry data on the economic hill forests of Peninsular Malaysia, which, apart from coastal hills, centred mainly between elevations of 150–600 m. The altitudinal range of hill forest begins from sea level along the coast to about 1200 m in the Main Range.

Putz (1978) in his survey of all VJRs in Peninsular Malaysia gave brief descriptions on their ecology, floristics and conservation importance. Out of a total of 86 VJRs surveyed, 31 areas involved hill forests of which one was the Bukit Bauk VJR covering 65 acres.

Kiew (1992), in listing the state of knowledge of mountain peak flora, noted that only 16 floristic surveys were available for individual peaks, out of which only 5 were post war, and most were based on short periods of fieldwork.

Bukit Bauk

The only published botanical account of Bukit Bauk is that by Wyatt-Smith (1963) who described kapur forest. Kapur trees are predominant and characterize the lowland forest in the Bukit Bauk Forest Reserve (FR). Kapur produces a medium-heavy hardwood timber. Its distribution is restricted to two large blocks along the east coast of Peninsular Malaysia, where it is fast disappearing due to logging activities. There is a smaller block in Selangor, on the west coast. The 1955 enumeration recorded all trees greater than 12 in (30 cm) gbh growing on a one-acre (0.4 ha) plot, which numbered 222 individuals in 123 species, 81 genera and 31 families (Wyatt-Smith, 1963). The commonest species was kapur with 24 individuals followed by *Cleistanthus sumatranus* (Euphorbiaceae; 8 individuals), *Nauclea officinalis* (Rubiaceae; 7 individuals), *Knema hookeriana* (Myristicaceae; 6 individuals) and *Scaphium macropodum* (Sterculiaceae; 5 individuals). The majority of species (82 species) were represented by a single tree. It was also noted that, compared with species of *Shorea*, kapur

was well represented in the smaller size classes, an indication of its shade tolerant characteristics.

Family representation in the VJR Plot recorded the Dipterocarpaceae as the commonest family for all size classes, except the small size classes (minimum girth to 12 inches, 30 cm). In this range, the family Euphorbiaceae was represented by the most genera with the Annonaceae, Guttiferae, Myristicaceae, Myrtaceae and Rubiaceae also well represented.

In 1957 and 1959, the Bukit Bauk Jungle Plot was remeasured and recruitment of trees that had reached a minimum 12 in (30 cm) gbh and individual mortality was recorded. Sixteen new trees were enumerated, of which six species had not previously been recorded in the 1955 survey. Wyatt-Smith considered this an indication of the richness of the flora of Bukit Bauk.

In addition, a full enumeration of all sapling growth greater than 5 ft (1.5m) tall and less than 12 in (30 cm) gbh was undertaken in 1955 on a quarter chain wide transect. Subsequently the saplings were re-enumerated in 1959. Kapur saplings were found to be the commonest in both enumerations. Results of the Big Tree Plot Study set up by FRIM at Bukit Bauk (Anon., 1973) also recorded kapur as the commonest tree.

Putz (1976) commented that Bukit Bauk was interesting ecologically because it contained at least three distinct forest types: the most prominent being the kapur forest, the well developed "palm break" above 150 m altitude dominated by *Livistona endauensis* with the undergrowth dominated by its juveniles, while a third was forest common on the hill ridges made up of seraya (*Shorea curtisii*), balau (*S. foxworthyi*) and associated species of *Calophyllum*.

Methodology

Readily available information about species, their habitats and conservation status is needed before management strategies can be developed to prevent decline in plant diversity, resources and habitats. A preliminary checklist was compiled from records in the literature, e.g., from *Tree Flora of Malaya* (Whitmore 1972, 1973; Ng 1978, 1989) and from previous collections from Bukit Bauk based on herbarium records at KEP, obtained from their accession books and database, and the index catalogue developed by Ruth Kiew.

To complete and update the checklist, five field trips were made to Bukit Bauk between September 1997 and May 1998 to collect and identify plant specimens of all plant groups except bryophytes and climbers (the latter because of their inaccessibility). Sterile material was collected as ecological specimens, while fertile material is deposited at KEP.

Methods employed in collecting specimens are as follows:

1. general survey of existing flora near to a path, road or forest track,
2. listing of plants occurring from the edge of the road to 20 m into the forest at 50 m altitude intervals, and
3. circular plots ($r = 5$ m) at least 20 m from a road/path in visually undisturbed forest at 35 m altitude intervals.

In the general survey and plant listings, all trees, shrubs and herbs were recorded and collected where possible. For the circular plots, all species present were identified and trees with 30 cm gbh and above were enumerated. These three methods were conducted at three main sites:

1. Microwave Station Road (Compartment 11A, GPS Reading: $4^{\circ} 42.251'N$ and $103^{\circ} 23.553'E$) leads up to the nearest peak where the summit has been cleared for a microwave station – general survey of plants along the road from 50 m up to the summit at 350 m a.s.l., plant listing at 50 m altitude intervals, and circular plots;
2. Kampung Trail (GPS Reading: $4^{\circ} 42.413'N$ and $103^{\circ} 25.114'E$) – general survey of plants on a self cleared trail 0 m a.s.l. to first summit at 210 m a.s.l., plant listing, and circular plots; and
3. Quarry Trail (Compartment 2) – general survey of plants from 50 m a.s.l. to 150 m altitude.

The nearest climatological station to Bukit Bauk is at Dungun Hospital ($4^{\circ} 46'N$ and $103^{\circ} 25'E$ at 3.1 m a.s.l.). For 1995, the mean annual temperature was $27.5^{\circ}C$ with an annual mean relative humidity at 0800 MST of 93% and at 1400 MST of 70%. The total rainfall for 1995 was 2640 mm with the wettest months from September to January with the maximum in November and December, the North-East monsoon period. There were short dry periods between February and March and between June and August with the driest month in June (Malaysian Metereological Service, 1997).

Bukit Bauk FR covers a total area of 7,596 ha and consists of 46 compartments of various sizes (1–10, 11A, 11B, 11C, 12 to 36, 37A, 37B, 38–43). Compartment 8 is classified as Virgin Jungle Reserve (128 ha). Bukit Bauk FR includes lowland forest that was logged prior to 1960 and which has recovered to become regenerated forest. Other areas were logged as recently as 1986 to 1990. Following foresters' classification, there are small areas of primary "poor" forest and primary "good" forest on undulating terrain reaching 300 m a.s.l. where the predominant plant species include *medang* (Lauraceae), *kedondong* (Burseraceae), *nyatoh* (Sapotaceae) and *kelat* (*Syzygium* sp.) in the "poor" forest and *meranti merah muda* (*Shorea* spp.), *kempas* (*Koompassia malaccensis*), *medang* (Lauraceae) and *kelat* (*Syzygium* spp.) in the "good" forest (Chin *et al.*, 1997). There is also a small area of peat swamp forest with some parts

logged before 1980, others as recently as 1990. The forest surrounding the summit area is in Compartment 11A and is classified as regenerated forest.

Results and Discussion

Vegetation Types on Bukit Bauk

Several vegetation types on Bukit Bauk and the adjacent lowland forest can be recognised based on habitat, altitudinal zonation and floristic composition. These include lowland dipterocarp forest, peat swamp forest, hill dipterocarp forest and secondary (disturbed) forest.

i. *Lowland Dipterocarp Forest*

Lowland dipterocarp forest at about 50–150 m altitude includes vegetation on flatland, gentle undulating slopes and in valleys. On the inland face of the hill (Bukit Bauk Microwave Station Road and Kampung Trail), the forest has three distinct tree layers. The emergent storey (30–45 m tall) is discontinuous and consists of gregarious trees mainly of kapur *Dryobalanops sumatrensis* and other dipterocarps, such as *Shorea parvifolia* ssp. *parvifolia*, *S. acuminata*, *S. foxworthyi*, *S. macroptera*, *S. maxwelliana*, *S. pauciflora*, *Dipterocarpus rigidus* (which normally grows on coastal hills), *Hopea mengarawan*, as well as non-dipterocarps *Endospermum diadenum*, *Sapium beccatum*, *Santiria griffithii*, *Lithocarpus cantleyanus*, *Cratoxylum formosum*, *Calophyllum teysmanii* var. *teysmanii*, *Irvingia malayana*, *Litsea castanea*, *Dialium platysepalum*, *Adenanthera malayana*, *Parkia speciosa*, *Artocarpus elasticus*, *A. scortechinii*, *Parartocarpus bracteatus*, *Streblus taxoides*, *Bouea oppositifolia*, *Dracontomelon dao*, *Gluta wallichii*, *Swintonia floribunda*, *Atuna racemosa* ssp. *excelsa*, *Scorodocarpus borneensis*, *Nephelium maingayi*, *Palaquium hexandrum*, *Pouteria maingayi*, *Heritiera javanica*, *Scaphium macropodum*, *Pentace triptera*, *Aquilaria malaccensis*, *Parinari oblongifolia* and *Syzygium glaucum*.

The continuous second layer at about 20–30 m tall includes large-sized trees of *Gymnacranthera forbesii*, *Myristica cinnamomea*, *Castanopsis rhamnifolia*, *C. schefferana*, *C. tungurrut*, *Lithocarpus cantleyanus*, *L. leptogyne*, *L. maingayi*, *Shorea glauca* (a coastal hill species), *Dipterocarpus verrucosus*, *D. sublamellatus*, *Hopea myrtifolia*, *H. sulcata*, *Vatica scortechinii*, *Litsea costalis*, *Gluta wallichii*, *G. elegans*, *Calophyllum teysmanii* var. *teysmanii*, *C. ferrugineum* var. *oblongifolium*, *Garcinia malaccensis*, *G. parvifolia*, *G. wallichianum* var. *wallichianum*, *Mesua ferrea*, *M. grandis* var. *grandis*, *M. racemosa*, *Beilsmeddia palembanica*, *Cinnamomum iners*, *Barringtonia pendula*, *Adenanthera pavonina*, *Cynometra ramiflora*, *Fordia albiflora*, *Parkia singularis*, *Memecylon*

minutiflorum, *Madhuca utilis*, *Elaeocarpus pedunculatus*, *E. nitidus* var. *nitidus*, *E. stipularis*, *Artocarpus fulvicortex*, *A. nitidus*, *A. integer* var. *silvestris*, *Streblus elongatus*, *Ficus microcarpa*, *Pimelodendron griffithianum*, *Baccaurea reticulata*, *B. motleyana*, *Irvingia malayana*, *Anisophyllea corneri*, *Diospyros clavigera*, *D. rufa*, *D. sumatrana*, *Parishia paucijuga*, *Buchanania arborescens*, *Melanochyla angustifolia*, *M. fulvinervis*, *Cyathocalyx pruniferus*, *Ilex cymosa*, *Canarium littorale*, *Santiria griffithii*, *S. rubiginosa* var. *rubiginosa*, *Lophopetalum floribundum*, *Blumeodendron tokbrai*, *Drypetes laevis*, *Horsfieldia superba*, *Syzygium chloranthum*, *S. griffithii*, *Strombosia javanica*, *Xanthophyllum affine*, *Gynotroches axillaris*, *Prunus javanica*, *Maclurodendron porteri*, *Xerospermum noronhianum*, *Gordonia singaporeana*, *Pentace strychnoidea*, *Schoutenia accrescens* ssp. *accrescens* and var. *borneensis*, *Brackenridgea hookeri* and *Maranthes corymbosa*.

The third and lowest layer comprises smaller trees less than 20 m tall and is represented by *Gironniera hirta*, *G. parvifolia*, *Alangium ebenaceum* var. *ebenaceum*, *Sarcotheca laxa* var. *laxa* and var. *sericea*, *Aporosa aurea*, *A. lunata*, *A. nigricans*, *A. maingayi*, *Abdulmajidia chaniana*, *Barringtonia macrostachya*, *Diospyros apiculata*, *D. lanceifolia*, *D. pauciflora*, *D. rigida*, *Symplocos adenophylla* var. *adenophylla*, *S. rubiginosa*, *Canarium patentinervium*, *Agrostistachys longifolia* var. *leptostachya*, *Calophyllum ferrugineum* var. *ferrugineum*, *C. gracillimum*, *Garcinia eugeniifolia*, *G. nervosa*, *G. malaccensis*, *G. rostrata*, *G. scortechinii*, *G. subhorizontale*, *Mesua lepidota* var. *lepidota*, *Cinnamomum mollissimum*, *Cryptocarya griffithiana*, *Litsea magnifica*, *Strombosia ceylanica*, *Knema malayana*, *K. furfuracea*, *K. patentinervia*, *K. scortechinii*, *Baccaurea motleyana*, *B. parviflora*, *B. racemosa*, *Croton laevifolius*, *Xylopia ferruginea* var. *ferruginea*, *Blumeodendron tokbrai*, *Gynotroches axillaris*, *Vitex gamosepala*, *Polyalthia macrophylla* var. *macrophylla*, *Xylopia caudata*, *X. ferruginea* var. *ferruginea* and var. *oxyantha*, *X. malayana*, *Ilex macrophylla*, *Euonymus javanicus*, *Elaeocarpus palembanicus*, *E. petiolatus*, *Antidesma coriaceum*, *Cleistanthus sumatranus*, *Drypetes longifolia*, *D. pendula*, *Glochidion wallichianum*, *Neoscortechinia kingii*, *Paracroton pendulus*, *Trigonostemon laevigatus*, *Ryparosa hullettii*, *Leea indica*, *Archidendron bubalinum*, *A. ellipticum*, *Saraca declinata*, *S. cauliflora*, *Pternandra coerulescens*, *Horsfieldia sucosa*, *Maesa ramentacea*, *Syzygium attenuatum* ssp. *attenuatum*, *S. gratum*, *S. sp. 57*, *S. sp. 59*, *Tristaniaopsis merguensis*, *Strombosia ceylanica*, *Galearia fulva*, *Paropsia vareciformis*, *Aidia densiflora*, *Gardenia tubifera* var. *tubifera*, *Porterandia anisophylla*, *Timonius flavescens*, *Guioa pleuropteris*, *Lepisanthes tetraphylla*, *Leptonychia caudata*, *Rinorea anguifera*, *Symplocos rubiginosa* var. *rubiginosa* and the palms *Oncosperma horridum*, *Arenga hookeriana* and *A. westerhoutii*,

Beneath is a sparse understorey of treelets, shrubs, and tree saplings, which is dominated by populations of the small to medium sized palms, *Licuala ahlidurii* and *L. terengganuensis* together with smaller populations of *L. khoonmengii* and *L. glabra*. Other palms include *Arenga* seedlings spp., *Plectocomia elongata*, *Calamus* spp. and *Daemonorops monticola*. Treelets include *Anisophyllea disticha*, *Pentace strychnoidea*, *Thottea* sp., *Ixora congesta*, *Ficus parietalis*, *F. deltoidea* var. *deltoidea*, *Eurycoma longifolia*, *Lasianthus densifolius*, *Phaeanthus optalamicus*; shrubs such as *Chroesthes longifolia*, *Dracaena maingayi*, *Polyalthia bullata*, *Chloranthus erectus*, *Kibara coriacea*, *Ficus deltoidea* var. *deltoidea*, *Glycosmis chlorosperma* var. *chlorosperm* and *Sterculia coccinea*, with saplings of *Mesua grandis*, *M. ferrea*, *Ardisia mystica*, *A. perakensis*, *Payena* sp. A, *Durio wyatt-smithii*, *Ilex cymosa*, *Mallotus paniculatus*, *Calophyllum* sp., *Hopea sulcata* and *Shorea macroptera*. Species of shrubs and herbs are poorly represented with the shrubs *Triuphetta grandidens* and *Premna serratifolia*, *Pandanus* sp. and the herbs *Hedyotis philippinensis*, *Mapania cuspidata* var. *cuspidata*, *Scaphochlamys rubromaculata*, *Molineria latifolia*, *Alpinia javanica*, *Amischotolype griffithii*, *Chroesthes longifolia* and climbers, *Claderia viridiflora*, *Rhapidophora lobbii*, *Grenacheria amentacea*, and *Uncaria cordata* var. *cordata*.

Valley bottoms are richer in treelets, shrubs and herbaceous plants. It is here that populations of four *Henckelia* species, *H. puncticulata*, *H. miniata*, *H. rugosa*, *H. heterophylla* are found. Other herbs include *Globba unifolia* var. *sessiflora*, *Sauvagesia serrata*, *Hanguana malayana*, *Zingiber* spp., *Alpinia javanica* and *Alpinia* sp.. The shrub *Tarenna fragrans* and trees, such as *Cynometra ramiflora* and *Fordia albiflora*, were also found in this habitat.

At about 150 m a.s.l., where the slopes become steeper the emergent layer becomes less well defined and is dominated by species, such as *Alstonia angustiloba*, *Cryptocarya rugulosa*, *Shorea curtisii* (a large tree usually growing on hill ridges), *S. maxwelliana*, *Hopea mengarawan* and mature individuals of the fan palm *Livistona endauensis*. The second canopy layer is more continuous with species, such as *Durio wyatt-smithii*, *Litsea magnifica*, *Cynometra malaccensis*, *Memecylon excelsum*, *M. megacarpum*, *Artocarpus lowii*, *A. lanceifolius*, *Knema hookeriana*, *Myristica cinnamomea*, *Xanthophyllum affine*, *Sandoricum koetjape*, *Shorea multiflora*, *S. teysmanniana*, *S. falcifera* (a coastal hill species), *Gluta wallichii* (very common on Bukit Bauk), *Lithocarpus wallichianus* and *Palaquium maingayi*.

The third tree layer is made up of *Rhodamnia cinerea*, *Garcinia pyrifera*, *Actinodaphne pruinosa*, *Diospyros scortechinii*, *Castanopsis lucida*, *Lithocarpus maingayi*, *Abdulmajidia chania* (very common on Bukit

Bauk), *Mesua grandis* var. *cordata*, *Archidendron bubalinum*, *Acmena acuminatissima*, *Lepisanthes fruticosa* and *Actinodaphne pruinosa*. The shrub layer is dominated by the clustering palm *Licuala ahlidurii*, *Prismatomeris glabra* and *Urophyllum glabrum*; treelets such as *Eurycoma longifolia*, *Lasianthus densifolius* and saplings of *Arenga*, *Diospyros rufa*, *Garcinia nervosa*, *Hopea myrtifolia*, *Shorea* sp. and *Vatica scortechinii*. The ground layer is sparse with clusters of *Pandanus* sp., *Dracaena conferta*, *Alpinia javanica*, *Scaphochlamys rubromaculata*, the climber *Piper porphyrophyllum*, the palms *Daemonorops monticola*, *Calamus* sp. and seedlings of *Livistona endauensis* and the fern *Lygodium circinnatum*.

Forest on the eastern side of Bukit Bauk directly facing the sea grows on sandy and rocky (granitic) soil. At the base of the hill, lowland forest has been cleared for quarrying activities. At about 50–150 m a.s.l., where the terrain is steep, the emergent layer is rather discontinuous and is characterized by the presence of *Shorea glauca* (a coastal hill species), *Palaequium hexandrum*, *Swintonia floribunda* and *Sindora echinocalyx* (a hill forest species). Individuals of kapur and *Livistona endauensis* are conspicuously absent.

The second canopy layer is dense and continuous (despite the disturbance at the base of the hill) and consists of trees, such as *Erythroxylum cuneatum* (a species normally found near the sea), *Sapium beccatum*, *Scaphium macropodum*, *Lophopetalum floribundum*, *Artocarpus lanceifolius*, *A. elasticus*, *Xerospermum noronhianum*, *Mesua racemosa*, *Litchi chinensis* (a hill forest species) and the palm *Arenga westerhoutii*.

The third storey species are *Barringtonia macrostachya*, *Cleistanthus sumatranus*, *Paracroton pendulus*, *Baccaurea parviflora*, *Garcinia scortechinii*, *Buchanania sessifolia*, *Knema furfuracea* and *Streblus taxoides*. Saplings, shrubs and seedlings occur in small numbers, namely *Eurycoma longifolia*, *Saraca declinata* and *Donax grandis*. The vegetation on this part of the hill reflects past disturbance because species usually found growing in disturbed or open sites are encountered here, such as *Vitex pubescens*, *Callerya artopurpurea*, *Commersonia bartramia* and *Melastoma malabathricum*.

ii. Peat Swamp Forest

In Peninsular Malaysia, peat swamp forests occur just behind the coastline (Wyatt-Smith, 1963). On Bukit Bauk, peat swamp forest is separated by the main road from the west of the hill. The peat swamp forest here has three canopy layers. The emergent layer is represented by scattered individuals of *Shorea acuminata*, *S. macroptera*, *Dryobalanops sumatrensis*, *Mangifera quadrifida*, *Dialium platysepalum*, *Sarcotheca griffithii*, *Heritiera javanica*, *H. simplicifolia*, *Scaphium macropodum* and *Intsia palembanica*.

The second canopy layer is fairly continuous with trees of *Canarium rufum*, *Dacryodes costata*, *D. rostrata*, *Santiria laevigata*, *S. rubiginosa*, *S. tomentosa*, *Durio wyatt-smithii*, *D. griffithii*, *Heritiera javanica*, *H. simplicifolia*, *Euonymus javanicus*, *Gynotroches axillaris*, *Atuna racemosa* ssp. *excelsa*, *Parinari elmeri*, *Dillenia reticulata* var. *psilocarpa*, *Dipterocarpus costulatus*, *D. lowii*, *D. verrucosus*, *Shorea multiflora*, *S. singkawang* ssp. *singkawang*, *Vatica pauciflora*, *Aquilaria malaccensis*, *Gironniera subequalis*, *Castanopsis lucida*, *C. megacarpa*, *C. schefferana*, *Lithocarpus lucidus*, *Litsea costalis*, *Actinodaphne macrophylla*, *Xerospermum noronhianum*, *Madhuca utilis*, *Brackenridgea hookeri*, *Xanthophyllum affine*, *Ochanostachys amentacea*, *Sarcotheca griffithii*, *Melanochyla angustifolia*, *Elaeocarpus nitidus* var. *nitidus*, *Pimelodendron griffithianum*, *Garcinia griffithii*, *G. parvifolia*, *Mesua ferrea*, *M. racemosa*, *Actinodaphne macrophylla*, *Memecylon minutiflorum* and *Anisophyllea corneri*.

The third layer is dense, consisting of many species of smaller trees, such as *Tabernaemontana corymbosa*, *Monocarpia marginalis*, *Polyalthia lateriflora*, *Gironniera parvifolia*, *Pternandra coerulescens*, *Memecylon megacarpum*, *Archidendron bubalinum*, *Barringtonia scortechinii*, *Cryptocarya griffithiana*, *Cinnamomum mollissimum*, *Stemonurus malaccensis*, *Ryparosa hullettii*, *Blumeodendron kurzii*, *Kopsia singapurensis*, *Pseuduvaria macrophylla*, *Xylopia caudata*, *X. ferruginea* var. *oxyantha*, *Diospyros adenophora*, *D. apiculata*, *D. argentea*, *Microcos fibrocarpa*, *M. lanceolata*, *Agrostistachys longifolia* var. *leptostachya*, *Rinorea anguifera*, *Aporosa aurea*, *A. bracteosa*, *A. falcifera*, *A. maingayi*, *Knema curtisii*, *K. furfuracea*, *K. hookeriana*, *K. patentinervia*, *Baccaurea brevipes*, *B. minor*, *B. parviflora*, *Lepisanthes tetraphylla*, *Blumeodendron kurzii* (a swamp forest species), *Nephelium costatum*, *N. cuspidatum* var. *ophiodes*, *Ryparosa hullettii* (a swamp forest species), *Mallotus griffithianus*, *Quassia indica* (a tidal swamp species), *Stemonurus malaccensis*, *Leptonychia caudata*, *Adenanthera clypearia*, *Ixora lobbii*, *Urophyllum glabrum* and *Timonius flavescens* (a peat soil species).

The shrub layer is dominated by clumps of four *Licuala* species, *L. ahlidurii*, *L. ferruginea*, *L. terengganuensis* and *L. spinosa*, which grow on dry land on the fringe of swamp land, as well as *Tabernaemontana corymbosa*, *Archidendron clypearia* var. *clypearia*, *Ixora lobbii* and *Sterculia coccinea*. The ground flora is sparse but *Orchidantha ?fimbriata* is common.

iii. Hill Dipterocarp Forest

Hill forest on Bukit Bauk begins above 150 m a.s.l. on much steeper slopes (more than 45°), which ascend to ridges before reaching the summit area, which is an exposed plateau. The emergent layer is dominated by large tree species, such as *Shorea curtisii* (particularly common), *S. foxworthyi*,

S. maxwelliana, *Anisoptera curtisii*, *Dryobalanops sumatrensis* (which is not as common as it is in lowland forest), *Sindora echinocalyx*, *Gluta wallichii*, *Swintonia floribunda*, *Alstonia angustiloba*, *Sapium beccatum*, *Litsea castanea*, and mature individuals of the fan palm *Livistona endauensis*.

The second canopy layer is discontinuous with small gaps where natural landslides have occurred. This layer is rich in species including *Dacryodes rostrata*, *Scaphium macropodum*, *Castanopsis rhamnifolia*, *Elaeocarpus nitidus*, *E. palembanicus*, *E. pedunculatus*, *Gluta wallichii*, *Baccaurea maingayi*, *B. motleyana*, *Diospyros rufa*, *D. sumatrana*, *Cleistanthus glaucus*, *Neoscortechinia nicobarica*, *Callerya artopurpurea*, *Cratoxylum formosum*, *Shorea bracteolata* and *S. falcifera* (the last two both coastal hill species), *S. multiflora*, *Dipterocarpus rigidus*, *Pentace floribunda*, *Lithocarpus cantleyanus*, *L. rassa*, *Garcinia wallichianum* var. *wallichianum*, *Parishia paucijuga* (frequently encountered), *Melanochyla fulvinervis*, *Parinari elmeri*, *Litsea tomentosa*, *Fagraea elliptica*, *Memecylon minutiflorum*, *Syzygium chloranthum*, *S. claviflorum* var. *claviflorum*, *S. griffithii*, *Xanthophyllum affine*, *X. griffithii* ssp. *erectum*, *Litchi chinensis*, *Palaquium maingayi*, *Pouteria maingayi*, *Pentace floribunda*, *P. strychnoidea*, *Dillenia grandiflora*, *Horsfieldia ridleyana* and *Schoutenia accreascens* ssp. *borneensis*.

The third storey is denser with species, such as *Gironniera hirta*, *G. parvifolia*, *Aporosa maingayi*, *A. frutescens*, *A. nigricans*, *A. prainiana*, *Polyalthia macrophylla* var. *macrophylla*, *Euonymus javanicus*, *Diospyros apiculata*, *D. pauciflora*, *D. scortechinii*, *Agrostistachys longifolia* var. *leptostachya*, *Antidesma coriaceum*, *Mallotus paniculatus*, *Castanopsis lucida*, *Lithocarpus maingayi*, *Calophyllum gracillimum*, *Ardisia mystica*, *Pternandra echinata*, *Cinnamomum mollissimum*, *Tristaniopsis merguensis*, *Galearia fulva*, *Gardenia tubifera* var. *tubifera*, *Porterandia anisophylla*, *Symplocos adenophylla*, *S. rubiginosa*, *Vitex longisepala*, *Rinorea anguifera*, *Cleistanthus glaucus*, *Mesua lepidota*, *Calophyllum ferrugineum* var. *ferrugineum*, *C. subhorizontale*, *Aglaia leucophylla*, *Santiria tomentosa*, *Rhodamnia cinerea* (a coastal species), *Knema scortechinii*, *Memecylon megacarpum*, *Garcinia eugeniifolia*, *G. pyrifera*, and the palms *Arenga westerhoutii* and *Oncosperma horridum*.

The shrub layer includes *Aidia densiflora*, *Ardisia rosea* var. 2, *Maesa ramentacea*, *Palaquium maingayi*, *Ixora pendula* var. *pendula*, *I. umbellata*, *Lasianthus densifolius*, *Chloranthus erectus*, *Ficus deltoidea* var. *deltoidea*, *Aporosa frutescens*, *Eurycoma longifolia*, *Smilax calophylla*, saplings of trees such as *Drypetes longifolia* and *Paracroton pendulus*, and many juveniles of *Livistona endauensis*. At about 170 m a.s.l. on the Kampung Trail the undergrowth layer is completely dominated by juveniles of the fan palm *Livistona endauensis* (seedlings to individuals with short trunks).

Litter on the forest floor is thick consisting of some broken branches and leaves but mostly dried fronds of *Livistona endauensis*. Beneath the topsoil is damp and loose. The ground layer is denser than in the lowland forest with more and larger clusters of *Pandanus* spp., *Licuala terengganuensis* (less dense than in lowland forest and decreasing as altitude increases), juveniles of the palms *Arenga* sp., *Calamus longispathus*, *Calamus* sp. and the herbs *Molineria latifolia* and *Hedyotis philippinensis*.

At about 200 m a.s.l., steep hill forest gives way to hill ridges with exposed areas of dry, thin, nutrient-poor soil, usually of a sandy or rocky nature. The emergent layer is very incomplete with occasional individual large trees of *Anisoptera curtisii*, *Shorea bracteolata*, *S. curtisii*, *S. glauca*, *S. maxwelliana*, *Anisophylla griffithii*, *Alstonia angustiloba* and crowns of *Livistona endauensis*, the last common in this habitat. The second layer is thinner and includes smaller tree species such as *Cleistanthus glaucus*, *Adenanthera malayana*, *Calophyllum wallichianum* var. *wallichianum*, *Elaeocarpus pedunculatus*, *Shorea falcifera* (a coastal hill species), *Fagraea wallichiana* (a hill ridge species), *Horsfieldia ridleyana*, *Pentace grandiflora* with a large number of *Shorea curtisii* adults and saplings.

The third storey is denser with species such as *Santiria rubiginosa*, *Castanopsis schefferana*, *Parishia paucijuga*, *Breynia coronata*, *Abdulmajidia chania*, *Aporosa prainiana*, *Syzygium lineatum*, *Gordonia maingayi*, *Diospyros confertiflora*, *Tristania merguensis*, *Macaranga triloba*, *Fagraea fragrans* and *Greenea corymbosa* (a coastal hill ridge species). Tree saplings and shrubs are poorly represented on these hill ridges. In exposed areas, e.g., forest edge, climbers, such as *Uncaria cordata*, *Smilax setosa*, *Nepenthes gracilis* and *N. ampullaria*, as well as the orchid *Bromheadia finlaysoniana* grow.

The first summit on the southern front of Bukit Bauk at 350 m a.s.l. has been cleared to build a microwave station, telecommunication station and a guardhouse. It is dry and exposed with rocky or sandy soil and is mostly occupied by smaller-sized trees, shrubs and saplings. Canopy trees on the fringe of the clearing include *Blumeodendron tokbrai*, *Shorea maxwelliana*, and *Parishia paucijuga*. Smaller-sized trees include *Rhodamnia cinerea* (a coastal species), *Macaranga heynei*, *M. hypoleuca* and *M. triloba*, *Fagraea fragrans*, *Canarium patentinervium*, *Vitex pubescens*, *Archidendron ellipticum*, *Gardenia tubiflora* var. *tubiflora*, *Syzygium chloranthum*, *Garcinia parvifolia*, *Gordonia maingayi*, *Castanopsis schefferiana* and *Cleistanthus glaucus*.

The shrub layer consists mostly of *Shorea* saplings, *Rubus moluccanus* and *Livistona endauensis* juveniles and seedlings with the ground layer colonized by *Dicranopteris linearis*, *Sticherus truncatus* var. *truncatus*, *Ardisia rosea* var. 2, *Elephantopus mollis*, *Uncaria cordata*, *Stachytarpheta indica*

and *Bromheadia finlaysoniana*.

iv. Vegetation of Disturbed Areas

The disturbed areas are mainly by the sides of the road leading up to the Microwave Station and at the telecommunication towers. Forest edge species include *Mallotus philippensis*, *Melastoma malabathricum*, *Macaranga heynei*, *M. triloba*, *Ficus fulva*, *F. aurata* and *F. deltoidea* (an epiphyte), *Rhodamnia cinerea*, *Diospyros scortechinii*, *Commersonia bartramia*, *Vitex pinnata*, *Croton laevifolius*, *Themeda villosa*, *Molineria latifolia*, *Fagraea racemosa*, *Dissochaeta gracilis*, *Rubus moluccanus*, var. *moluccanus*, *Myrica esculenta*, *Syzygium lineatum*, *Rhodomyrtus tomentosa*, *Sarcotheca laxa* var. *laxa* and var. *sericea*, *Morinda elliptica*, *Porterandia anisophyllea*, *Nepenthes gracillis* and *N. ampullaria*, and the ferns *Dicranopteris linearis* var. *linearis*, *Sticherus truncatus* var. *truncatus*, *Taenitis blechnoides*, *Blechnum orientale* and *Lygodium longifolium*. On hill ridges on shaded, rocky roadside banks, populations of *Henckelia puncticulata* grow together with *Selaginella*.

Floristic Diversity of Bukit Bauk

The preliminary checklist included a total of 322 species from 65 families; field work increased the total number of species to 638 in 285 genera and 103 families (Table 1). A total of 115 plant species from 37 families recorded in the preliminary checklist were re-collected in this study. The complete floristic checklist is given in Appendix 1. In general, the forests of Bukit Bauk are poor in ferns and herbaceous plants.

Table 1. Floristic Composition of Bukit Bauk based on number of taxa.

	Angiosperms		Gymnosperms	Pteridophytes	Total
	Dicotyledons	Monocotyledons			
Family	76	14	2	11	103
Genus	238	32	2	13	285
Species	567	52	2	17	638

Apart from palms, the most speciose families are predominantly trees (Table 2).

Table 2. Ten Most Speciose Families at Bukit Bauk

Family	No. Genera	No. Species	No. Endemics
Euphorbiaceae	24	59	5
Dipterocarpaceae	7	43	5
Rubiaceae	22	36	2
Palmae	13	31	10
Guttiferae	4	31	3
Myrtaceae	6	26	1
Annonaceae	10	23	6
Anacardiaceae	10	20	3
Leguminosae	12	19	2
Lauraceae	8	18	3

The Euphorbiaceae is the most speciose family with 59 species (9.2% of the species recorded from Bukit Bauk). Wyatt-Smith (1963) had already found this to be the case in sample plots at Bukit Bauk (one-acre plot), Mata Ayer (Perlis) and Gunung Raya (Langkawi Island) and similar results were reported for lowland forest at Pasoh FR, Negeri Sembilan (Kochummen *et al.*, 1990) and Sungai Menyala, Negeri Sembilan, and Bukit Lagong, Selangor (Manokaran and Kochummen, 1990). In terms of number of species, the Euphorbiaceae is the second largest family of dicotyledons in Peninsular Malaysia with 70 genera and 364 species of trees, shrubs, herbs and climbers (Turner, 1995).

The second most speciose family on Bukit Bauk is the Dipterocarpaceae with 43 (67%) species, which represent more than a quarter of the Peninsula's 156 species. Wyatt-Smith (1963) reported the Dipterocarpaceae as the third commonest family in the one-acre plot on Bukit Bauk at the minimum size class gbh $\geq$ 30 cm but ranked first both in species and individuals at the minimum size class gbh $\geq$ 60 cm. It is well represented by big trees of the upper canopy and emergent layer. In terms of total tree densities and total basal area, the Dipterocarpaceae was also the most common family in Bukit Lagong and Sungai Menyala (Manokaran and Kochummen, 1990) but in Pasoh FR the Dipterocarpaceae ranked tenth in species diversity (Kochummen *et al.*, 1990).

The Rubiaceae on Bukit Bauk is the third most speciose family with 36 species, whereas at Pasoh FR it ranked fourth with 46 species (Kochummen *et al.*, 1990), and in the Bukit Bauk one-acre plot for minimum size class gbh $\geq$ 30 cm (Wyatt-Smith, 1963) it ranked sixth. The Rubiaceae is the most species rich dicot family in Peninsular Malaysia (Turner, 1995)

but it is better represented by shrubs and herbs (which are sparse on Bukit Bauk) than by trees.

Palms are not usually included in forest enumerations. On Bukit Bauk they rank fourth with 31 species and include the highest number of endemic species of any family (Table 2). They form a conspicuous element of the flora on Bukit Bauk and the Terengganu Hills as a whole, which have been noted to be particularly rich in palm species (Kiew, 1996). Bukit Bauk FR supports nine species of *Licuala*, four endemic to Terengganu (Saw, 1997) and a large population of *Livistona endauensis*. This latter palm is only common on Bukit Bauk, the adjacent Terengganu hills and at Endau Rompin, Johore (Dransfield and Wong, 1987).

The fifth most speciose family, the Guttiferae with 31 species representing more than a quarter of the Peninsula's 120 species, owes its diversity to the large number of *Calophyllum* and *Garcinia* species, each with 11 species. Putz (1976) considered that on ridges at Bukit Bauk *Calophyllum* formed a distinct type of hill forest growing in association with *Shorea curtisii* and *S. foxworthyi*. Guttiferae ranked fourth in the Bukit Bauk one-acre plot (Wyatt-Smith, 1963).

The other five families are each represented by less than thirty species. Notable among them is the Anacardiaceae, which on Bukit Bauk is represented by more than a quarter of the Peninsula's 77 species.

Endemism

The number of endemic taxa occurring on Bukit Bauk is 98 (93 species, 1 subspecies and 4 varieties) representing 14.6% of the total number of species (Table 3). Endemism is higher among monocots (26%), mainly due to the high level of endemicity among palms. Thirteen species are endemic to Terengganu and four are narrow endemics known only from Bukit Bauk/Bukit Bauk FR (Table 4).

Table 3. Species Endemism at Bukit Bauk

Category	Dicots	Monocots	Total
Terengganu only	7	6	13
Terengganu and one other state	15	3	18
Endemic to Penininsular Malaysia	57	5	62
Total No. Endemic	79	14	93 (14.6%)
Total No. Species	567	53	639

Table 4. Species endemic to Terengganu or Bukit Bauk/Bukit Bauk FR

Terengganu only	Bukit Bauk only
<i>Henckelia miniata</i>	
<i>Kochummenia parviflora</i>	<i>Pseudovaria cerina</i>
<i>Pentace grandiflora</i>	<i>Dacroydes breviracemosa</i>
<i>Licuala bayana</i>	<i>Gonocaryum</i> sp. A
<i>Licuala fractiflexa</i>	<i>Licuala ahlidurii</i>
<i>Licuala khoonmengii</i>	
<i>Licuala terengganuensis</i>	
<i>Scaphochalmys rubromaculata</i>	

Comparison of species on Bukit Bauk with the total flora of Peninsular Malaysia shows that Bukit Bauk is home to at least 7.8% of the Peninsula’s species and to 16.5% of the tree species with a very high representation of families (43.9% and 65%) and genera (18.3% and 36.8%) for all and for tree species, respectively (Table 5). In terms of endemism, Bukit Bauk harbours at least 3.7% of the total number of endemic taxa and 8.0% of the total number of endemic tree species in Peninsular Malaysia. These figures are high considering the small area (33.75 km²) that Bukit Bauk covers.

Table 5. Comparison of Floristic Data from Bukit Bauk and Peninsular Malaysia

	Peninsular Malaysia		Bukit Bauk	
	Total (Turner, 1995)	Trees (Ng <i>et al.</i> , 1990)	Total	Trees
No. Families (%)	237	100	103 (43.5)	65 (65)
No. Genera (%)	1565	532	285 (18.2)	196 (36.8)
No. Species (%)	8239	2830	638 (7.7)	467 (16.5)
No. Endemics (%)	2547	746 (26.4)	93 (3.7)	60 (8)

These results confirm that the flora of Bukit Bauk is high in species diversity and endemism, particularly when its small size is taken into consideration, and it certainly deserves to be recognized as a biodiversity hotspot in Peninsular Malaysia, being especially rich in the Dipterocarpaceae (represented by 27% of the Peninsula’s species), the Anacardiaceae and Guttiferae (each by 26%) and the Palmae (18%). In addition, as Putz (1976) has already noted, the presence of the kapur and

fan-palm forests also contribute to Bukit Bauk's conservation importance. These all support its status as a biodiverse area of conservation value for the flora of Peninsular Malaysia (Kiew, 1996). Detailed conservation implications will be discussed in a separate paper.

Conclusions

Bukit Bauk is a small, isolated coastal hill with a high degree of floristic diversity being not only species rich (comprising at least 638 plant species belonging to 285 genera and 103 families) but also in having a high level of endemism (89 species) with four species being known only from this hill.

Within the small area (7,596 ha), several forest types are found – the lowland mixed dipterocarp forest with kapur as the dominant species, peat swamp forest, hill forest where the fan palm *Livistona endauensis* is a conspicuous feature, and secondary forest.

The most species-rich families are the Euphorbiaceae (9.2% of all species recorded from Bukit Bauk), Dipterocarpaceae (6.7%), Rubiaceae (5.6%), Palmae (4.9%), and Guttiferae (4.9%). The ranking of the first three families is comparable with other floristic studies in lowland and hill forests in Peninsular Malaysia. Palms are not usually included in forest enumerations but are an important component of the flora at Bukit Bauk. The Palmae is also the family with the highest number of endemic species (11 out of 31 species). Other families that are well represented on Bukit Bauk by more than a quarter of their Peninsular Malaysian species are the Anacardiaceae, Dipterocarpaceae and the Guttiferae.

The flora of Bukit Bauk includes 89 species endemic to Peninsular Malaysia, 13 of which are endemic to Terengganu and 4 to Bukit Bauk. This study therefore supports the status of Bukit Bauk as a biodiversity hotspot for plants, both on grounds of its species richness and the number of endemic species. It is therefore an area of conservation importance and should be accorded permanent legal protection, particularly as it has been, and still is, threatened by habitat destruction or disturbance from road-building, construction works associated with the microwave station, quarrying, logging and the lack of a clear boundary that allows intrusion.

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Appendix. Floristic Checklist of Bukit Bauk

Species entry begins with * if the species is endemic to Peninsular Malaysia, followed by species name, source of information, and habitat and distribution, which follow Turner (1995).

Abbreviations for sources of information are:

TF - Tree Flora of Malaya, Vol. 1–4

AB - FRIM Assession Book

FR - FRIM Database

RK- Riuth Kiew's index catalogue

98 - Collected and identified in this study

S - Swamp Forest Species identified in this study

Abbreviation for states in Peninsular Malaysia and Singapore follow Turner (1995): Jh – Johor; Kd – Kedah; Kl – Kelantan; Ml – Melaka; NS – Negeri

Sembilan; Ph – Pahang; Pk – Perak; Pn – Penang; Ps – Perlis; Sl – Selangor; Tg – Terengganu, Sp – Singapore; and P. - Pulau.

DICOTYLEDONS

Acanthaceae

Chroesthes longifolia (Wight) B. Hansen. RK, 98. Lowland forest. Widespread,

Actinidaceae

Saurauia nudiflora DC. AB. Lowland and hill forest. Kd, Pk, Ph, Sl, Tg, *S. roxburghii* Wall. FR. Disturbed hill forest to 1250 m. Kl, Tg, Pk, Ph, Sl.

Alangiaceae

Alangium ebenaceum (C.B. Clarke) Harms var. *ebenaceum*. FR, 98. Lowland forest. Tg and Pk southward.

Anacardiaceae

Bouea oppositifolia (Roxb.) Meisn. 98. Lowland forest to 700 m. Widespread.

Buchanania arborescens (Blume) Blume. 98. Common on sandy and rocky coasts and river banks. Widespread.

B. sessifolia Blume. 98, S. Lowland forest to 750 m. Widespread.

Camptosperma auriculatum (Blume) Hook.f. S. Lowland and montane forest to 1600 m, often in swampy places. Widespread.

Dracontomelon dao (Blanco) Merr. & Rolfe. 98. Lowland forest near rivers. Kd, Kl, Tg, Pn, Pk, Ph, Sl, NS. E.

**Gluta capituliflora* Ding Hou. AB. Hill forest 100–1000 m. Kl, Tg.

G. elegans Hook.f. AB, 98. Lowland forest to 300 m. Kd, Kl, Tg, Pk, Pn, Ph, Sl.

G. pubescens (Ridl.) Ding Hou. AB. Lowland forest, swamps to 400 m, Kl, Tg, Ph, NS, Ml, Jh.

G. wallichii (Hook.f.) Ding Hou. AB, 98, S. Lowland and hill forest to 1000 m. Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Mangifera griffithii Hook.f. AB. Wet lowland forest to 360 m. Kd, Kl, Tg, Pk, Ph, Sl, Ml, Jh, Sp.

M. magnifica Kochummen. AB., Lowland and hill forest. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh.

M. quadrifida Jack. S. Lowland forest to 900 m. Kd, Kl, Tg, Pk, Ph, Sl, Ml, Jh, Sp.

Melanochyla angustifolia Hook.f. AB, 98, S. Lowland forest to 600 m. Kd,

Kl, Tg, Pn, Ph, Sl, NS, Ml, Jh.

M. caesia (Blume) Ding Hou. AB. Lowland and hill forest. Kl, Tg, Pk, Ph, Sl, NS, Jh.

M. fulnivervis (Blume) Ding Hou. AB, 98. Lowland forest to hills 1350 m. Kl, Tg, Pk, Ph, Sl, NS, Jh.

Parishia maingayi Hook.f. AB. Lowland and hill forest to 600 m on ridge crests. Tg, Pk, Ph, Sl, Jh, Sp.

P. paucijuga Engl. AB, 98. Lowland to hill forest to 400 m. Tg, Pn, Pk, Ph, Sl, NS, Ml, Jh, Sp.

**Semecarpus trengganuensis* Kochummen. TF, AB. Lowland forest. Tg, Ph.

Swintonia floribunda Griff. 98, S. Lowland forest and hill forest to 1000 m. Kd, Kl, Pn, Ph, Sl, NS, Jh, Tg.

S. schwenkii (Teijsm. & Binn.) Teijsm. & Binn. AB. Lowland and hill forest to 700 m. Kd, Tg, Pn, Ph, Sl, NS, Ml, Jh, Sp.

Anisophylleaceae

Anisophylla corneri Ding Hou. 98, S. Lowland and hill forest to 1000 m. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh.

A. disticha (Jack) Baill. AB, RK, 98, S. Lowland to montane forest. Common and widespread.

A. griffithii Oliv. AB. Hill forest often on ridges. Kd, Kl, Tg, Pn, Pk, Ph, Sl, Ml, Jh, Sp.

A. scortechinii King. AB. Lowland forest. Kd, Tg, Pn, Pk, Ph, Jh.

Annonaceae

Cyathocalyx carinatus (Ridl.) J. Sinclair. AB. Lowland forest. Pk, Sl, Tg.

C. pruniferus (Maingay ex Hook.f. and Thomson) J. Sinclair. AB, 98. Lowland and hill forest, Kl, Tg, Pk, Ph, Sl, Ml, Jh, E.

C. ridleyi (King) J. Sinclair. AB. Damp lowland forest. Ph, Jh, Tg, Sp.

**Enicosanthum fuscum* (King) Airy Shaw. AB. Lowland and hill forest. Pk, Ph.

Fissistigma fulgens (Hook. f. & Thomson) Merr. AB. Lowland forest. Kl, Tg, Pk, Ph, Sl, Ml, Jh, Sp.

**Goniothalamus fulvus* Hook.f. & Thomson. AB. Lowland forest. Tg, Ph, Ml, Jh.

G. macrophyllus (Blume) Hook.f. & Thomson. 98. Common in lowland forest. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

G. tapis Miq. AB. Lowland and hill forest. Pn, Kl, Tg, Pk, Jh, Sp.

Mezzitia parviflora Becc. AB. Lowland forest to 300 m. Kd, Pn, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Monocarpia marginalis (Scheff.) J. Sinclair. AB, S. Lowland forest. Kd,

Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh.

Phaeanthus optalamicus Roxb. ex G. Don. 98. Lowland forest. Kl, Pn, Pk, Sl, NS, Ml, Jh, Tg, Sp.

Polyalthia bullata King. AB, 98. Lowland forest. Pk, Ph, Sl, NS, Ml, Jh, Tg.

P. cauliflora Hook.f. & Thomson var. *beccarii*. AB. Lowland forest. Tg, Ph, NS, Ml, Jh, Sp.

**P. dumosa* King. AB. Montane forest. Tg, Pk.

P. lateriflora (Blume) King. S. Lowland forest to lower montane forest. Pk, Ph, Sl, NS, Ml, Jh, Tg, Sp.

P. rumphii (Blume) Merr. AB. Lowland and hill forest. Kd, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

P. sumatrana (Miq.) Kurz. AB Lowland and hill forest. Kl, Tg, Pk, Ph, Sl, NS, Jh, Sp.

**Pseuduvaria cerina* J. Sinclair. FR. Hill forest. Tg, only Bukit Bauk.

P. macrophylla (Oliv.) Merr. var. *macrophylla*. 98, S. Lowland and hill forest. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml.

Xylopia caudata Hook.f. & Thomson. AB, 98, S. Lowland forest. Pk, Ph, Sl, NS, Ml, Jh, Tg, Sp.

X. ferruginea (Hook.f. & Thomson) Hook.f. & Thomson var. *ferruginea*. AB. Lowland forest. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

X. ferruginea (Hook. f. & Thomson) Hook.f. & Thomson var. *oxyantha* (Hook.f. & Thomson) J. Sinclair. 98, S. Lowland forest, Ph, Sl, NS, Jh, Tg, Sp.

X. malayana Hook.f. & Thomson var. *malayana*. AB, 98. Lowland forest. Tg, Pk, Ph, Sl, Ml, Jh, Sp.

**X. subdehiscens* (King) J. Sinclair. AB. Lowland and hill forest. Pn, Tg, Pk, Ph, Sl, Jh.

Apocynaceae

Alstonia angustiloba Wall. ex A.D.C. 98. Lowland to hills to 700 m. Common and widespread.

Kopsia arborea Bl. RK. Lowland. Pn, Tg.

**K. macrophylla* Hook.f. FR. Kl, Tg, Pk, Ph, NS, Ml, Jh.

K. singaporensis Ridl. 98. Common in lowland swamp forest. Pk, Ph, Sl, NS, Jh, Tg, Sp.

Parameria laevigata (A. L. Juss.) Moldenke. 98. Lowland forest. Pn, Pk, Ph, Sl, NS, Ml, Tg, Sp.

Tabernaemontana corymbosa Roxb. ex Wall. S. Lowland and hill forest to 900 m. Kd, Kl, Tg, Pn, Pk, Ph, Sl, NS, Ml, Jh, Sp.

**Urceola maingayi* D. J. Middleton. FR. Ph, Tg.

U. torulosa Hook.f. AB. Lowland forest. Kl, Tg, Pk, Ph, Sl, Ml, Jh, Sp.

Aquifoliaceae

Ilex cymosa Blume. 98. Lowland forest, swamps and secondary forests. Widespread.

I. macrophylla Hook.f. 98. Lowland, well drained forest. Widespread.

Araliaceae

Schefflera oxyphylla (Miq.) R. Vig. FR. Lowland and hill forest. Kl, Tg, Pn, Pk, Ph, Sl, NS, Ml, Jh.

Aristolochiaceae

Thottea grandiflora Rottb. RK. Lowland and hill forest to 600 m. Tg, PK, Ph, NS, Ml, Jh, Sp.

Thottea sp. 98.

Burseraceae

Canarium caudatum King. AB. Lowland forest. Widespread.

C. littorale Blume. AB, 98, S. Lowland forest, occasionally in highlands. Widespread.

C. patentinervium Miq. 98. Lowland forest and hill forest, understorey. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

**Dacryodes brevircemos* Kalkman. TF. Lowland forest. Tg, only from Bukit Bauk FR.

D. costata (Benn.) H.J. Lam. S. Lowland and hill forest. Kd, Tg, Pn, Pk, Sl, NS, Jh, Sp.

D. rostrata (Blume) H.J. Lam. 98, S. Hill forests to 600 m, swamps. Ps, Kd, Tg, Pn, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Santiria apiculata Benn. var. *rubra* (Ridl.) Kalkman. AB. Lowland and hill forest. Widespread.

S. griffithii (Hook.f.) Engl. AB, 98. Lowland forest to 300 m. Widespread except for far north.

S. laevigata Blume. S. Lowland to montane forest. Kd, Kl, Tg, Pn, Pk, Ph, Ml, Jh, Sp.

S. rubiginosa Blume var. *rubiginosa*. AB, 98, S. Lowland to mountains. Kd, Tg, Pk, Ph, Sl, NS, Jh, Sp.

S. tomentosa Blume. 98, S. Swampy lowland forest to 250 m. Kd, Kl, Tg, Pn, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Bombacaceae

Durio affinis Becc. AB. Lowland forest. Tg, Jh.

D. griffithii (Mast.) Bakh. S. Lowland forest. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

D. oxleyanus Griff. AB. Lowland forest, Kd, Tg, Pk, Ph, Sl, NS, Ml, Jh.

D. wyatt-smithii Kosterm. AB, 98, S. Lowland forest. Kl, Tg.

Celastraceae

Euonymus javanicus Blume. 98, S. Lowland and hill forest to 400 m. Widespread.

Lophopetalum floribundum Wight. 98. Lowland forest to 360 m. Kl, Pn, Pk, Ph, NS, Jh, Tg.

Chrysobalanaceae

Atuna nannodos (Kosterm.) Kosterm. AB. Lowland and hill forest to 750 m. Pn, Tg, Pk, Ph, NS, Jh.

A. racemosa Raf. ssp. *excelsa* (Jack) Prance. AB, 98, S. Lowland and hill forest to 750 m. Kd and Tg southwards.

Maranthes corymbosa Blume. 98. Mostly coastal but also in the mountains. Ps, Kd, Pn, Kl, Pk, Ph, Sl, NS, Ml, Jh, Tg, Sp.

Parinari costata (Kofth.) Blume. AB. Lowland forest. Widespread except for far north.

P. elmeri Merr. 98, S. Lowland and hill forest to 600 m. Sl, Ml, Jh, Tg.

P. oblongifolia Hook.f. 98. Lowland forest. Kd to Jh.

P. rigida Kosterm. AB. Lowland forest, swamps. Kl, Tg, Ph, NS, Jh, Sp.

Compositae

Elephantopus mollis Kunth. 98. Weed from tropical America.

Mikania cordata (Burm.f.) B.L. Rob. 98. Forest margins, waste places. Widespread.

Crypteroniaceae

Crypteronia griffithii C.B. Clarke. AB. Lowland and hill forest to 600 m. Kd, Tg, Pn, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Connaraceae

Connarus semidecandrus Jack. AB. Common in open country. Widespread.

Chloranthaceae

Chloranthus erectus (Buch.-Ham) Verdc. 98. Lowland and hill forest. Pn, Pk, Ph, Sl, NS, Ml, Jh, Tg, Sp.

Combretaceae

Lumnitzera racemosa Willd. AB. Mangroves, all coasts but commoner on the east coast.

Dilleniaceae

Acrotrema costatum Jack.RK. Widespread.

Dillenia grandiflora Wall ex Hook.f. & Thomson. 98. Lowland forest and hill forest to 1000 m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

D. reticulata King var. *psilocarpella* Hoogl. S. Lowland forest. Kl, Pk, Ph, Sl, NS, Ml, Jh, Tg.

Dipterocarpaceae

Anisoptera curtisii Dyer ex King. AB, 98. Lowland and hill forest to 700 m. Widespread.

A. laevis Ridl.. AB, FR. Widespread.

Dipterocarpus caudatus Foxw. ssp. *penangianus* (Foxw.) P. S. Ashton. FR. Coastal hill forest. Pn, Kl, Pk, Ph, Jh, Tg, Sp.

D. concavus Foxw. FR. Lowland forest. Pk, Ph northward.

D. costulatus Slooten. FR, S. Lowland forest. Widespread.

D. eurynchus Miq. FR, AB. Lowland forest. Tg, Ph, NS, Jh.

D. gracilis Blume. FR. Lowland forest. Widespread.

D. lowii Hook.f. S. Lowland forest. Scattered.

D. rigidus Ridl. FR, 98. Coastal hill forest. Tg southwards.

D. sublamellatus Foxw. 98. Lowland forest. Widespread.

D. verrucosus Foxw. ex Slooten. AB, 98, S. Lowland forest. Commoner in the south.

Dryobalanops sumatrensis (J.F. Gmel.) Kosterm. AB, 98, S. Gregarious in sandy lowland forest. Tg, Ph, Sl, NS, Jh.

Hopea dryobalanoides Miq. AB. Lowland forest. Widespread

H. dyeri F. Heim. AB, FR. Lowland and hill forest to 1000 m. Widespread.

H. griffithii Kurz. FR. Lowland forest. Widespread.

H. kerangasensis P.S. Ashton. FR. Lowland forest on sandy soils. Tg, Ph.

H. mengerawan Miq. 98. Swampy lowland forest. Tg, Ph and NS southward.

H. myrtifolia Miq. AB, FR, 98. Lowland forest. Pk and Tg, Ph southward.

H. nutans Ridl. FR. Swampy lowland forest, east coast, Tg southward.

**H. pubescens* Ridl. AB, FR. Lowland forest, Kl, Ph, Tg.

**H. sulcata* Symington. 98. Lowland forest to 400 m. Tg, Pk, Sl, Jh.

Parashorea stellata Kurz. AB. Lowland and hill forest to 650 m. Tg and Pk northward.

Shorea acuminata Dyer. FR, 98, S. Lowland forest. Pk, Tg southward.

**S. bentongensis* Foxw. FR. Lowland forest. Sl, Ph, Jh, Tg.

S. bracteolata Dyer. AB, 98. Coastal hills to 600 m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, MS, Ml, Jh, Sp.

S. curtisii Dyer ex King. AB, 98. Ridges to 850 m. Widespread

S. faguetiana F. Heim. FR. Mostly in hills to 700 m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh.

- S. falcifera* Dyer ex Brandis. AB, 98. Coastal hill. Tg, Ph
S. foxworthyi Symington. 98. Lowland and hill forest to 700 m. Kd, Kl, Tg, Pk, Ph, Sl, Jh.
S. glauca King. FR, 98. Coastal hills to 600 m. Ps, Kd, Pn, Kl, Tg, Pk, Ph, NS, Ml, Jh.
S. hypochra Hance. AB, FR. Lowland forest. Sl and Ph northward.
S. macroptera Dyer. AB, FR, 98. S. Lowland and hill forest to 900 m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.
S. maxwelliana King. AB, 98. Lowland and hill forest to 700 m. Pn and Tg southward.
S. multiflora (Burck) Symington. 98, S. Lowland and hill forest to 700 m. Widespread.
S. parvifolia Dyer ssp. *parvifolia* . FR, 98. Lowland forest. Ph, Jh, Tg.
S. pauciflora King. AB, FR. 98. Lowland and hill forest. Widespread.
S. singkawang (Miq.) Miq. ssp. *singkawang* . AB, S. Lowland forest below 400 m. Kd, Kl to Jh.
S. singkawang (Miq.) Miq. ssp. **scabrosa* P.S. Ashton. AB, FR. Forest near sea. Tg, Ph.
S. teysmanniana Dyer ex Brandis. 98. Peat swamp forest. Sl, Tg.
**Vatica cuspidata* (Ridl.) Symington. AB. Lowland ridge forest, near sea. Widespread.
V. pauciflora (Korth.) Blume. S. Swampy lowland forest. Widespread.
**V. scortechinii* (King) Brandis. 98. Lowland and hill forest to 1800m, Tg, Pk, Ph, Sl.
V. umbonata (Hook.f.) Burck. FR. Lowland and hill forest. Tg, Ph.
V. venulosa Blume. FR. Swampy lowland forest. Pk, Ph, Tg.

Erythroxylaceae

- Erythroxylum cuneatum* (Miq.) Kurz. 98. Lowland and hill forest. Common near sea, throughout.

Ebenaceae

- *Diospyros adenophora* Bakh. S. Lowland forest, also on limestone. Kl, Ph, NS, Tg.
D. apiculata Hiern. AB, FR, 98, S. Lowland and hill forest. Pn, Kl, Tg, Pk, Ph, NS, Ml, Jh.
**D. argentea* Griff. 98, S. Lowland and hill forest to 800 m, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.
**D. clavigera* C.B. Clarke. AB, FR, 98. Lowland forest to 500 m. Pn, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.
D. confertiflora (Hiern) Bakh. 98. Lowland to montane forest at 1250m. Kd, Pn, Kl, Tg, Ph, Sl, Jh.

**D. ismailii* Ng. AB, FR. Lowland and hill forest to 1000 m, Kd, Tg, Ph, Sl, NS, Jh.

D. lanceifolia Roxb. 98. Lowland and hill forest to 700 m. Throughout.

D. pauciflora King & Gamble. 98. Lowland and hill forest to 600m. Tg, Pk, Jh.

D. pendula Hasselt ex Hassk. AB. Lowland and hill forest to 1100 m. Kd, Pn, Tg, Pk, Ph, Sl, Jh.

D. pyrrhocarpa Miq. AB. Lowland and hill forest to 900 m. Kd, Tg, Pk, Sl, NS, MI, Jh.

**D. ridleyi* Bakh. AB. Lowland and hill forest to 1200m. Pn, Tg, Ph, Sl, Jh.

D. rigida Hiern. 98. Lowland forest. Kl, Tg, Pk, Ph, Sl, Jh.

**D. rufa* King & Gamble. 98. Lowland to lower montane forest at 1500m Kd, Tg, Kl, Pk, Ph, NS, MI, Jh.

**D. scortechinii* King & Gamble. 98. Hill and montane forest at 400–1500m, Kl, Tg, Pk, Ph, NS.

**D. singaporensis* Bakh. 98. Lowland forest to 600m. Kd, Pk, Ph, Sl, NS, MI, Jh, Tg.

D. sumatrana Miq. 98. Lowland to montane forest at 1500m. Common.

**D. tristis* King & Gamble. AB. Lowland to lower montane forest at 1200m. Kd, Tg, Pk, Ph, Sl, Jh.

Elaeocarpaceae

Elaeocarpus nitidus Jack var. *nitidus*. 98, S. Lowland to montane forest at 1500m. Common throughout.

E. palembanicus (Miq.) Corner. AB, 98. Lowland and hill forest to 900m. Kd, Pn, Kl, Tg, Ph, Sl, NS, Jh.

E. pedunculatus Wall. ex Mast. 98. Lowland and hill forest to 670m. Common throughout.

E. petiolatus (Jack) Wall. 98. Lowland and hill forest to 500m. Widespread.

**E. polystachyus* Wall. ex Mull. Berol. AB. Lowland and hill forest to 1100m, Kl, Tg, Pk, Ph, Sl, NS, Jh, Sp.

E. stipularis Blume var. *stipularis*. 98. Lowland to lower montane forest at 1250m. Throughout.

Euphorbiaceae

Agrostistachys longifolia (Wight) Benth. var. *leptostachya* (Pax & K. Hoffm.) Whitmore. AB, 98, S. Lowland and hill forest. Kd, Tg, Pk, Ph.

Alchornea rugosa (Lour.) Mull. Arg. var. *rugosa*. AB. Lowland forest. Ph northward.

Antidesma coriaceum Tul. 98. Lowland to lower montane forest at 1500 m. Except for far north.

A. cuspidatum Mull.. Arg. AB. Lowland forest. Common throughout.

- A. leucocladon* Hook.f. AB. Lowland forest. Ps, Kd, Kl, Tg, Pk, Sl, Ml.
- Aporusa aurea* Hook.f. 98, S. Lowland and hill forest. Scattered throughout.
- A. bracteosa* Pax & K. Hoffman. AB, S. Lowland forest. Kl, Ph. Southward.
- A. falcifera* Hook.f. 98, S. Lowland and hill forest to 540 m. Scattered throughout.
- A. frutescens* Blume. AB, 98. Kd, Pn, Kl, Pk, Jh, Tg, Sp.
- A. lunata* (Miq.) Kurz. 98. Lowland to montane forests at 1500m. Pn, Pk, Ph, Jh, Tg, Sp.
- A. microstachya* (Tul.) Mull. Arg. AB. Hillsides in lowland forest to 400 m. Kd, Tg southward.
- A. nigricans* Hook.f. 98. Lowland and hill forest to 600 m. Scattered throughout.
- A. prainiana* King ex Gage. 98. Hillsides in lowland forest. Kd, Pn, Tg, Pk, Ph, Ml, Jh, Sp.
- A. symplocoides* (Hook.f.) Gage. AB. Lowland forest. Common throughout.
- Baccaurea brevipes* Hook.f. S. Damp lowland forest. Throughout.
- B. maingayi* Hook.f. S. Hill forest at 150–780 m. Pk, Tg, NS, Jh.
- B. motleyana* (Mull. Arg.) Mull. Arg. AB, 98. Lowland and hill forest to 900 m. Scattered throughout.
- A. minor* Hook.f. S. Lowland forest. Kl, Pk, Ph, NS, Jh, Tg, Sp.
- B. parviflora* (Mull. Arg.) Mull. Arg. AB, 98, S. Widespread, commoner in the north, lowland and hill forest to 600 m.
- B. racemosa* (Reinw.) Mull. Arg. AB, 98. Lowland forest, throughout, commoner in the south.
- B. reticulata* Hook.f. 98. Lowland forest to 300 m. Tg and Pk southward.
- B. sumatrana* Mull. Arg. AB. Lowland forest. Common throughout.
- Blumeodendron kurzii* (Hook. f.) J.J. Sm. AB, S. Lowland forest. Kd, Kl, Pk, Ph, Jh, Tg.
- B. tokbrai* (Blume) J.J. Sm. AB, 98. Lowland forest to 450 m, often in swamps. Tg, Pk, Ph, Sl, NS, Jh, Sp.
- Breynia coronata* Hook.f. 98. Lowland and mountains to 1200 m. Widespread.
- Cheilosa montana* Blume. AB. Lowland forest. Kl, Tg, Ph, Sl, Sp.
- Cleistanthus decurrens* Hook.f. AB. Lowlands, often near limestone. Pn, Tg, Pk, Ph, NS, Jh.
- **C. glaucus* Jabl. AB, 98. Limestone and rocky outcrops. Pk, Tg.
- C. hirsutulus* Hook. f. AB. Lowland forest, rarely on limestone. Scattered throughout.
- **C. podocarpus* Hook.f. AB. Lowland and hill forest. Tg, Pk, Jh.
- C. sumatranus* (Miq.) Mull. Arg. 98. Lowland forest. Ph, Ml, Jh, Tg, Sp.
- Croton laevifolius* Blume. AB, 98, S. Lowland, forest margins. Common throughout.

- Drypetes laevis* (Miq.) Pax & K. Hoffm. 98. Lowland. Kd, Ph, NS, Jh, Tg.
D. longifolia (Blume) Pax & K. Hoffm. 98. Lowland forest. Widespread.
D. pendula Ridl. AB, 98. Lowland forest. Common throughout.
Endospermum diadenum (Miq.) Airy Shaw. 98, S. Lowland to lower montane forest at 1000 m. Common throughout.
Glochidion superbum Baill. AB. Lowland forest. Common throughout
G. wallichianum Mull. Arg. 98. Lowland forest. Sl, Ph northward.
Hevea brasiliensis (Willd. ex A. Juss.) Mull. Arg. 98. Naturalised from S.America.
**Macaranga amissa* Airy Shaw. AB. Swampy lowland forest. Tg, Pu, Ml, Jh.
M. heynei I.M. Johnst. 98. Lowland forest and secondary forest. Ps, Kd, Pn, Pk, Ph, Sl, NS, Ml, Jh, Tg, Sp.
M. hypoleuca Rchb. f. & Zoll. AB. Secondary forest, throughout.
M. laciniata Whitmore & Airy Shaw. AB. Secondary forest. Kl, Tg, Ph.
M. triloba (Blume) Mull. Arg. 98. Lowland forest and secondary growth. Common throughout.
Mallotus dispar (Blume) Mull. Arg. AB. Usually on limestone. Scattered in the north.
**M. griffithianus* Hook.f. S. Lowland forest. Throughout.
M. paniculatus (Lam.) Mull. Arg. 98. Secondary forest in lowland and hill forest to 900 m. Throughout.
M. philippensis (Lam.) Mull. Arg. 98. Lowland forest margins, sometimes on limestone. Kd, Tg, Pk, Ph, NS.
Neoscortechinia kingii (Hook.f.) Pax & K. Hoffm. AB, 98, S. Lowland forest. Ps, Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Jh, Sp.
N. nicobarica (Hook.f.) Pax & K. Hoffm. 98. Lowland or more frequently on hill forest. Kd, Kl, Ph, Sl, Jh, Tg.
Paracroton pendulus (Hassk.) Miq. 98. Damp or swampy lowland forest. Kd, Pn, Tg, Pk, Ph, NS, Ml, Jh, Sp.
Phyllanthus roseus (Craib & Hutch.) Beille. AB. Lowlands or hills to 750 m. P. Langkawi, Kd, Pn, Tg, Pk.
Pimelodendron griffithianum (Mull. Arg.) Benth. 98, S. Lowland forest. K1, Tg, Pk, Ph, Sl, NS, M1, Jh, Sp.
Ptychopyxis javanica (J.J. Sm.) Croizat. AB. Lowland forest. Kd, Pn, Pk, Tg.
Sapium beccatum Roxb. 98. Lowland and hill forest to 600 m. Throughout.
Suregada multiflora (Juss.) Baill. var *multiflora*. AB. Rocky and sandy shores, inland in rocky places to 750 m. Widespread.
Trigonostemon laevigatus Mull. Arg. 98. Coasts. P. Langkawi, Pn, Tg, Pk, P. Tioman, Jh.
T. longifolius Baill. AB. Lowland and hill forest to 600 m. Throughout.

T. malaccanus Mull. Arg. AB. Lowland forest. Widely scattered.

Fagaceae

Castanopsis lucida (Nees) Soepadmo. 98. Lowland to lower montane forest. Kd, Pn, K1, Pk, Ph, S1, NS, M1, Jh, Tg, Sp.

C. megacarpa Gamble. S. Lowland and hill forest to 600 m. Kd, K1, Tg, Pk, Ph, S1, NS, M1, Jh, Sp.

C. rhamnifolia (Miq.) A. DC. 98. Lowland to montane forest at 1600 m. K1, Pu, Ph, S1, Tg.

C. schefferana Hance. 98. S. Lowland forest. Kd, Tg, Ph, NS, Jh, Sp.

C. tunggurut (Blume) A. DC. 98. Lowland forest. S1, NS, M1, Tg.

Lithocarpus cantleyanus (King ex Hook.f.) Rehder. 98. Lowland and hill forest to 850 m. K1, Pk, Ph, S1, Jh, Tg, Sp.

L. leptogyne (Korth.) Soepadmo. 98. Uncommon, lowlands. Pk, Jh, Tg.

L. lucidus (Roxb.) Rehder. S. Forest to 1600 m. Throughout.

**L. maingayi* (Benth.) Rehder. 98. Hill forest at 600–1000 m. Kd, Pn, K1, Tg, Pk, Ph, S1, NS, M1, Jh.

L. rassa (Miq.) Rehder. 98. Lowlands but commoner in the mountains. Kd, Pn, K1, Tg, Pk, Ph, S1, NS, M1, Jh.

L. wallichianus (Lindl. ex Hance) Rehder. 98. Lowland and hill forest. Throughout.

L. wrayi (King) A. Camus. AB. Lowland to lower montane forest at 1350 m. Kd, K1, Tg, Pk, Ph, NS.

L. urceolaris (Jack) Merr. AB. Lowland to lower montane forest. Tg, Ph, Jh.

Quercus argentata Korth. AB. Lowland to montane forest. Tg, Ph, M1, Jh, Sp.

Flacourtiaceae

Casearia velutinosa Ridl. AB. Lowland forest often near streams. Tg, Pk, S1, Jh.

Homalium dictyoneurum (Hance) Warb. AB. Lowland forest. Kd, Tg, Jh.

Hydnocarpus woodii Merr. AB. Lowland and hill forest to 1000 m. Ps, Tg, Pk, Ph, S1, NS, Jh.

Ryparosa hullettii King. 98. S. Swampy lowland forest. Tg, Pk, Jh, Sp.

Gesneriaceae

Cyrtandra sp. Ridl. RK.

**Henckelia heterophylla* (Ridl.) A. Weber. AB, 98. By streams in lowland and hill forest. Ph, Jh, Tg.

**H. rugosa* (Ridl.) A. Weber. 98. Lower montane forest. Kd, K1, Tg, Pk, Ph, S1.

**H. miniata* (Kiew) A. Weber. RK. Lowland forest on sandstone. Tg (only Bukit Bauk and Bukit Chabang).

H. platypus (C.B. Clarke) A. Weber. RK. 98. Lowland and hill forest to 1000 m. Widespread.

**H. puncticulata* (Ridl.) A. Weber. AB. Lowland forest. Tg, Ph, Jh, Sp.

**H. salicinoides* (Kiew) A. Weber. RK. Lowland forest. K1, Tg.

Guttiferae

Calophyllum calaba L. var. *bracteatum* (Wight) P.F. Stevens. AB, FR. Lowland and hill forest. Throughout.

C. canum Hook.f. AB. Lowland forest. Kd, Pn, K1, Tg, Pk, Ph, S1, NS, M1, Jh.

C. ferrugineum Ridl. var. *ferrugineum*. 98. Lowland forest. Tg, Jh, Sp.

C. ferrugineum Ridl. var. **oblongifolium* (T. Anderson) P.F. Stevens. AB, 98. Lowland and hill forest to 760 m. K1, Tg, Pk, Ph, S1, NS, M1, Jh.

C. flavoramulum M.R. Hend. & Wyatt-Sm. AB. Lowland forest. Tg, Ph, Jh.

**C. gracillimum* M.R. Hend. & Wyatt-Sm. AB, 98. Lowland and hill forest to 1000 m. Tg, Ph, S1.

C. inophylloide King var. *singaporense* Hend. & Wyatt-Sm. TF. Lowland and hill forest, hillsides to montane forest at 1200 m. K1, Jh, Tg, Sp.

C. rufigemmatum M.R. Hend. & Wyatt-Sm. AB. Lowland forest. Tg, Ph, Jh, Sp.

C. sclerophyllum Vesque. AB. Swamp forest. Kd, K1, Tg, Pk, Ph, Jh.

C. teysmanii Miq. var *teysmanii* AB, 98. Lowland to lower montane forest at 1200m. K1, Tg, Ph, Jh, Sp.

C. teysmanii Miq. var *inophylloide* (King) P.F. Stevens. AB, FR. Lowland to lower montane forest. Kd, Pn, Tg, Pk, Ph, S1, NS, Jh.

**C. subhorizontale* M.R. Hend. & Wyatt-Sm. 98. Lowland forest. Ph, S1, NS, Tg.

C. wallichianum Planch. & Triana var. **wallichianum*. AB, 98. Lowland and hill forest. Kd, Pn, K1, Pk, NS, Tg.

C. wallichianum Planch & Triana var. *incrassatum* (M.R. Hend. & Wyatt-Sm.) P.F. Stevens. AB. Lowland forest. K1, Tg, Ph, S1, M1, Jh, Sp.

Cratoxylum arborescens (Vahl) Blume. AB. Common in lowland, swamp forest and hills. Pn, K1, Tg, Pk, Ph, S1, NS, ML, Jh, Sp.

C. formosum (Jack) Dyer. 98. Lowland forest to 600 m. Throughout.

Garcinia eugeniiifolia Wall. ex T. Anderson. AB, 98. Lowland to lower montane forest. P. Langkawi, Kd, Pn, Tg, Pk, Ph, Jh, Sp.

G. griffithii. AB, S. Lowland and hill forest to 900 m Scattered throughout.

G. malaccensis Hook.f. AB, 98. Lowland forest to 540 m. K1, Tg, Ph, S1, NS, Jh.

- G. merguensis* Wight. AB. Lowland forest. P. Langkawi, Kd, Pk, Ph, Tg.
G. murdochii Ridl. AB. Lowland forest, also on limestone. Kd, Tg, Pk, Jh.
G. nervosa Miq. var. *nervosa*. 98, S. Lowland forest. Scattered widely.
G. parvifolia (Miq.) Miq. AB, 98, S. Lowland forest to 600 m. Throughout.
G. penangiana Pierre. AB. Lowland forest to 300 m. Pn, Tg, Pk, Ph.
**G. pyrifera* Ridl. 98. Lowland and hill forest, Pn, Kl, Tg, Pk, Sl, Jh, Sp.
G. rostrata (Hassk.) Miq. 98. Lowland and hill forest. Scattered throughout.
G. scortechinii King. 98, S. Lowland and hill forest to 700 m. Common throughout.
Mesua assamica (King & Prain) Kosterm. AB. Lowland forest. Kd, Kl, Tg, Ph, NS, Jh.
M. ferrea L. AB, 98, S. Lowland forest to 480 m. Throughout but commoner in the north.
M. grandis (King) Kosterm. 98, S. Lowland and hill forest to 1200 m. Tg, Pk southward.
M. lepidota T. Anderson var. *lepidota*. 98. Lowland forest. Tg, Pk, Ph, Sl, NS, Ml, Jh.
M. racemosa (Planch. & Triana) Kosterm. 98, S. Lowland forest. Kd, Kl, Tg, Pk, Ph, Sl, Ml.
**M. sp.C.* TF. Lowland forest. Ph, Tg. (Bukit Bauk and Gunung Tapis).
**M. sp. E.* TF. Lowland forest, Tg, Ph.

Icacinaceae

- Gomphandra quadrifida* (Blume) Sleumer var. *ovalifolia* (Ridl.) Sleumer. AB Lowland to lower montane forest to 1200 m. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.
Gonocaryum sp. A. TF. Tg (Bukit Bauk only).
Stemonurus malaccensis (Mast.) Sleumer. S. Lowland and hill forest to 1300 m. Throughout.

Irvingiaceae

- Irvingia malayana*. 98. Lowland forest. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Ixonanthaceae

- Allantospermum borneense* Forman. AB, TF. Hill to lower montane forest. Kd, Tg, Pk.
Ixonanthes reticulata Jack. AB. Lowland and hill forest. Throughout.

Junglandaceae

- Engelhartia serrata* Blume. AB. Lowland to montane forest at 2000 m. Kd, Pn, Pk, Ph, Ml, Jh, Tg, Sp.

Lauraceae

Actinodaphne macrophylla (Blume) Nees. S. Lowland to montane forest. Kl, Tg, Pk, Ph, Sl, Ml, Jh.

**A. pruinosa* Nees. 98. Lowland and hill forest. Kd, Pn, Sl, NS, Ml, Tg, Sp.

Alseodaphne insignis Gamble. AB. Lowland forest. Tg, Pk, Ph, Sl.

A. pendulifolia Gamble. AB. Lowland forest. Tg, Pk, Ph, Sl, Jh.

Beilsmeddia palembanica (Miq.) Kosterm. 98. Lowland to montane forest. Pk, Ph, Sl, Ml, Jh, Tg.

B. perakensis Gamble. AB. Lowland and hill forest. Kl, Tg, Pk, Ph, Sl, NS.

Cinnamomum iners Reinw. AB, 98. Primary and secondary forest in lowland and hills. Common throughout.

**C. mollissimum* Hook.f. 98, S. Lowland and hill forest. Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh.

Cryptocarya griffithiana Wight. 98, S. Lowland forest. Pk, Ph, Sl, NS, Ml, Jh, Tg, Sp.

C. rugulosa Hook.f. 98. Lowland and hill forest. Kd, Pn, Pk, Tg, Ml, Jh, Sp.

**Endiandra maingayi* Hook.f. AB. Lowland to montane forest at 1200 m. Kl, Pk, Ph, Sl, NS, Jh, Tg.

Litsea castanea Hook.f. AB, 98, S. Lowland to montane forest. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh.

L. costalis (Nees) Kosterm. 98, S. Lowland and hill forest to 500 m. Pk, Ph, Tg, Sl, Ml, Sp.

L. johorensis Gamble. AB. Lowland to lower montane forest at 1200 m. Kl, Tg, Pk, Ph, NS, Jh.

L. magnifica (Miq.) Villar. 98, S. Lowland and hill forest. Pn, Kl, Ph, Ml, Tg, Jh.

L. sessiliflora Hook.f. AB. Lowland and montane forest to 1500 m. Kd, Kl, Tg, Pk, Ph, Sl, NS, Jh.

L. tomentosa Blume. 98. Lowland and hill forest to 750 m. Pn, Pk, Ph, Sl, Tg.

Nothaphobe coriacea (Kosterm.) Kosterm. AB. Peat swamp forest, Tg, Ph, Sl.

Lecythidaceae

**Abdulmajidia chaniana* Whitmore. 98. Lowland forest to 570 m. Ph, Tg, Jh.

**Barringtonia fusiformis* King. AB. Lowland forest, often near rivers. Pk to Jh.

B. macrostachya (Jack) Kurz. AB, 98. Lowland forest, rarely in mountains. Throughout.

B. pendula (Griff.) Kurz. AB, 98. Lowland forest to 500 m. Throughout.

B. scortechinii King. AB, S. Lowland and hill forest to 1200 m. Throughout.

Leeaceae

Leea indica. 98. Lowland forest, particularly secondary regrowth. Throughout.

Leguminosae

Adenanthera malayana Kosterm. 98. Lowland and hill forest to 900 m. Widespread but scattered.

A. pavonina L. 98. Lowland forest usually near the sea. East coast and offshore islands.

Archidendron bubalinum (Jack) I.C. Nielsen. AB, 98, S. Lowland forest, often in secondary forest. Widespread.

A. clypearia (Jack) I.C. Nielsen ssp. *clypearia* var. *clypearia*. S. Lowland forest to 1200 m. Widespread.

A. contortum (Martelli) I.C. Nielsen. AB. Common in secondary forest, usually near the sea. Widespread.

A. ellipticum (Blume) I.C. Nielsen. 98. Lowland forest including secondary forest. Widespread.

Callerya artopurpurea (Wall.) Schot. 98. Open country. Widespread.

Crudia curtisii Prain. AB, TF. Lowland and hill forest. Tg, Pk, Pn, Ph, Sl, Ml. E.

Cynometra malaccensis Meeuwen. 98, S. Lowland and hill forest to 600 m. Pk, Ph, Sl, Ml, Tg.

C. ramiflora L. 98. Riverbanks and swamps especially near coast. Widespread.

Dialium platysepalum Baker. 98, S. Lowland forest, Scattered throughout.

**Fordia albiflora* (Prain) Dasuki & Schot. AB, 98. Lowland forest often near rivers. Tg, Pk, Ph, Sl, Jh.

Intsia palembanica Miq. S. Lowland forest. Common throughout.

Ormosia venosa Baker. TF. Hill forest. Tg, Sl, Ml.

Parkia singularis Miq. AB, 98. Lowland and hill forest to 500 m. Tg, Pk, Ph, Sl, Jh.

P. speciosa Hassk. 98, S. lowland and hill forest to 900 m. Widespread.

Saraca cauliflora Baker. 98, S. Lowland and hill forest, often riverine, Ml and Ph northward.

Saraca declinata (Jack) Miq. 98, S. Lowland and hill forest, often riverine. Widespread.

Sindora echinocalyx (Benth.) Prain. 98, S. Hill forest to 700 m. Widespread.

Loganiaceae

Fagraea elliptica Roxb. 98. Montane forest. Kd, Ph, Tg.

F. racemosa Jack ex Wall. 98, S. Secondary forests. Widespread.

**F. wallichiana* Benth. 98. Hill ridge forest. Kd, Pn, Kl, Tg, Jh.

Magnoliaceae

Magnolia candolii (Blume) H. Keng var. *obovata* (Kort.) Noot. AB. Lowland and hill forest. Kd, Kl, Tg, Pk, Jh.

Meliaceae

Aglaia exstipulata (Griff.) W. Theob. AB. Lowland and hill forest to 1400 m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

A. lawii (Wight) Saldanha ex Ramamoorthy. FR. Lowland forest. Kl, Pk, Sl, Tg.

A. leucophylla King. 98. Lowland and hill forest to 700 m. Kd, Kl, Tg, Pk, Sl, NS, Jh.

A. macrocarpa (Miq.) Dannel. AB. Lowland to montane forest at 1750 m. Kd, Pn, Kl, Tg, Ph, Pk, Sl, NS, Jh, Sp.

A. odoratissima Blume. AB. Lowland and hill forest to 1370 m. Throughout.

A. spectabilis (Miq.) S.S. Jain & Bennet. AB. Lowland forest to 300 m. Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Chisocheton sp. AB.

Dysoxylum cauliflorum Hiern. AB, FR. Lowland and hill forest. Throughout.

D. dumosum King. AB. Lowland and hill forest to 1000 m. Tg, Pk, Ph, Sl, Jh.

Sandoricum koetjape (Burm.f.) Merr. 98, S. Lowland and hill forest. Widespread.

Melastomataceae

Dissochaeta gracilis (Jack) Blume. 98. Forest margins. Common throughout.

Melastoma malabathricum L. 98. Secondary growth in lowlands and hills. Throughout.

Memecylon dichotomum (C.B. Clarke) King var. *dichotomum*. AB. Pk, Tg.

M. excelsum Blume. 98. Lowland and hill forest to 1200 m. Kd, Kl, Tg, Pk, Ph, NS, Ml, Jh.

M. garcinoides Blume. AB. Lowland and hill forest to 1200 m. Kl, Pk, Ph, Sl, NS, Ml, Jh, Tg, Sp.

M. megacarpum Furtado. 98, S. Lowland to montane forest at 1800 m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, Ml, NS, Jh, Sp.

M. minutiflorum Miq. 98, S. Lowland to montane forest at 1800 m. Kd, Pn, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

M. oleifolium Blume. AB. Lowland and hill forest to 1200 m. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

M. pubescens (C.B. Clarke) King. AB. Lowland and hill forest to 1200 m. Kd, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Pternandra coerulescens Jack. AB, 98. S. Lowland and hill forest. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

P. echinata Jack. 98. Lowland and hill forest to 1200 m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Sonerila integrifolia Stapf. RK. Lowland to montane forest. Common on the Main Range.

Monimiaceae

Kibara coriacea (Blume) Tul. AB, 98. Lowland and hill forest to 1000 m. Pn, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Moraceae

Artocarpus elasticus Reinw. ex Blume. 98., lowland forest and open country. Common throughout.

A. fulvicortex F.M. Jarrett. 98. Lowland forest. Pk, Ph, NS, Ml, Tg, Sp.

**A. hispidus* F.M. Jarrett. AB. Lowland forest. Pn, Tg, Pk, Ph, Sl, Ml, Sp.

A. integer (Thunb.) Merr. var. *silvestris* Corner. AB, 98. S. Lowland to montane forest. Widespread.

A. lanceifolius Roxb. 98. Lowland and hill forest. Widespread.

A. lowii King. 98. Lowland forest. Widespread but uncommon.

A. nitidus Trecul ssp. *griffithii* King. 98. Lowland forest. Throughout.

A. scortechinii King. 98. Lowland forest. Widespread.

Ficus aurata Miq. var. *aurata*. FR, 98. Secondary forest. Kl, Tg, Pk, Ph, Sl, Ml, Jh, Sp.

F. deltoidea Jack var. *deltoidea*. 98. Seashores to mountain tops.

F. fulva Reinw. ex Blume. 98. Secondary forests in lowlands and hills. Ml northwards.

F. microcarpa L.f. 98. Swampy places. Common and widespread.

F. parietalis Blume. 98. Lowland forest. Widespread.

Paratocarpus bracteatus (King) Becc. 98. Lowland forest to 600 m. Pn, Sl, NS, Ml, Jh, Tg, Sp.

Streblus elongatus (Miq.) Corner. 98. Lowland forest. Kd, Pn, Tg, Pk, Ph, Sl, NS, Jh, Sp.

S. taxoides (K. Heyne) Kurz. 98. Lowland, hills also on limestone. Widespread.

Myricaceae

Myrica esculenta Buch.-Ham. 98. Lowland forest, particularly secondary forest on poor soil, mountain tops. Widespread, commoner in the south.

Myristicaceae

Gymnacranthera farquhariana (Hook.f. & Thomson) Ward var. *eugeniifolia*

(A.DC.) R.T.A. Scouten. AB. Lowland and hill forest to 1300 m. P. Langkawi, Kd, Pn, Tg, Pk, Ph, Sl, Ml, Jh, Sp.

G. forbesii (King) Warb. 98. Lowland forest. Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Horsfieldia ridleyana (King) Warb. 98. Lowland forest on poor soils. Kl, Tg, Pk, Ph, Sl, Ml.

H. sucosa (King) Warb. AB, 98. Lowland forest. Kl, Tg, Pk, Ph, Sl, Ml, Jh, Tg, Sp.

H. superba (Hook.f. & Thomson) Warb. 98. Lowland forest. Common throughout.

Knema conferta (King) Warb. AB. Swampy lowland forest. Pk, Ph, Ml, Jh, Sp.

K. curtisii (King) Warb. S. Lowland forest. Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh.

K. furfuracea (Hook.f. & Thomson) Warb. AB, 98, S. Lowland forest. P. Langkawi, Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

K. hookeriana (Wall. ex Hook.f. & Thomson) Warb. AB, 98. Lowland and hill forest, Pn, Kl, Tg, Pk, Ph, NS, Ml, Jh, Sp.

K. kunstleri (King) Warb. AB. Lowland and hill forest on poor soils. Kl, Tg, Pk, Ph, Sl, NS, Jh.

K. laurina (Blume) Warb. var. *laurina*. AB. Lowland forest. P. Langkawi, Kd, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

K. malayana Warb. AB, 98. Lowland forest. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

K. patentinervia (J. Sinclair) W.J. de Wilde. 98, S. Lowland forest. Kl, Tg, Pk, Ph, Ml, Jh.

**K. plumulosa* J. Sinclair. AB. Swampy lowland forest. Pn, Tg, Pk, Sl, Jh.

K. scortechinii (King) J. Sinclair. 98. Lowland forest. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh.

Myristica cinnamomea King. 98. lowland and hill forest, throughout.

M. elliptica Hook.f. & Thomson. AB. Swampy lowland forest. Throughout.

M. maxima Warb. AB. Lowland forest. Commonest in the south.

M. maingayi Hook.f. AB. lowland forest. Common throughout.

Myrsinaceae

**Ardisia mystica* B.C. Stone. FR, 98. Montane forest. Ph (Genting Highlands), Tg.

**A. perakensis* King & Gamble. 98. Lowland forest. Pk, Tg.

**A. rosea* King & Gamble var 2. 98. Hill and montane forest above 800 m. Pk, Ph, Sl, Tg.

**A. solida* B.C. Stone. AB, FR. Lower montane forest at 1000 m. Jh (Gunung Besar), Tg.

A. villosa Roxb. var. *villosa*. AB, FR. Lowland forest. Kd, Pn, Pk, Ph, Tg.
Grenacheria amentacea (G.B. Clarke) Mez. 98. Lowland forest. Widespread.
Labisia pumila (Blume) Fern.-Vill var. *pumila*. RK. Lowland and hill forest. Widespread.

Maesa ramentacea Wall. ex Roxb. 98. Lowland and hill forest to 1200 m. Throughout.

Rapanea porteriana Wall ex A.DC. AB. Coasts, lowland, hill and montane forests to 1700 m. Throughout.

Myrtaceae

Acmena acuminatissima (Blume) Merr. & L.M. Perry. 98. Lowland to montane forest. Widespread.

Cleistocalyx nervosum (DC.) Kosterm. AB. Lowland forest, often near streams. Kd, Pn, Tg, Pk, Ph, Sl, Jh.

Rhodamnia cinerea Jack. AB, 98. lowland secondary forest, often near the sea. Common throughout.

Rhodomertus tomentosa (Aiton) Hussk. 98. Open sandy ground. Common throughout, particularly on the east coast.

Syzygium attenuatum (Miq.) Merr. & L.M. Perry ssp. *attenuatum* var. *attenuatum*. 98. Lowland to lower montane forest. Kd, Pn, Ph, Sl, Ml, Jh, Tg, Sp.

S. cerasiforme (Blume) Merr. & L.M. Perry. AB. Lowland forest. P. Langkawi to Ml.

S. chloranthum (Duthie) Merr. & L.M. Perry. 98. Lowland and hill forest. Kd to Sp.

S. claviflorum (Roxb.) Wall ex A.M. Cowan & Cowan var. *claviflorum*. 98. Lowland and hill forest. Ps, P. Langkawi, Kd, Tg, Pn, Pk, Ph, Sp.

S. cinereum (Kurz) P. Chantaranothai & J. Parn. AB. Lowland forest, sometimes in mountains. Widespread.

S. dyerianum (King) P. Chantaranothai & J. Parn. AB. Lowland to lower montane forest at 1300 m. Common throughout.

S. flosculiferum (M.R. Hend.) Sreek. AB. Lowland and hill forest. Kd, Pk, Ph, Sl, Ml, Jh, Tg, Sp.

S. glaucum (King) P. Chantaranothai & J. Parn. AB, 98. Lowland forest. Kd, Pn, Pk, Ph, Sl, NS, Ml, Jh, Tg, Sp.

S. gratum (Wight) S.N. Mitra. AB, 98., mostly on rocky and sandy shore. Widespread.

S. griffithii (Duthie) Merr. & L.M. Perry. AB, 98. Lowland and hill forest. Kd to Sp.

**S. goodenovii* (King) Masam. AB. Lowland forest. Pk, NS, Ml, Tg.

S. kiahii (M.R. Hend.) I.M. Turner var. *kiahii*. AB. Lowland forest including swamps. Tg, Ph, Sl, Jh.

S. lineatum (DC.) Merr. & L.M. Perry. 98. Secondary forests and open country in lowlands. Common throughout.

S. nigicans (King) Merr. & L.M. Perry. AB. Lowland and hill forest. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

S. polyanthum (Wight) Walp. var. *polyanthum*. AB. Lowland forest. P. Langkawi and Kl to Sp.

S. rugosum Korth. var. *rugosum* AB. Lowland and hill forest. Ps, Kd, Tg, Pk, Ph, Sl, Ml, Jh, Sp.

S. syzygioides (Miq.) Merr. L.M. Perry. AB. Lowland, often near sandy coasts. Common throughout.

S. valdevenosum (Duthie) Merr. & L.M. Perry. AB. Lowland and hill forest. Pn to Jh.

**S. sp.* 22 . AB. Lowland forest. Tg, Jh,

**S. sp.* 57. 98 . Lowland forest. Sl (once from Sg. Lallang FR), Tg.

**S. sp.* 59. 98. Tree to 18m tall, once from Tg,

S. sp. 98.

Tristaniopsis merguensis (Griff.) Peter G. Wilson & J. T. Westerh. AB, 98. Rocky coasts and mountains. Widespread.

Nepenthaceae

Nepenthes ampullaria Jack. 98. Secondary forest, forest margins. Pn, Pk, Ml, Jh, Tg, Sp.

N. gracilis Korth. FR, 98. Secondary forest, forest margins in the lowlands. Kd, Pn, Tg, Pk, Ph, NS, Ml, Jh, Sp.

Ochnaceae

Brackenridgea hookeri (Planch.) A. Gray. 98, S. Lowland and hill forest to 1000 m. Throughout.

Sauvagesia serrata (Korth.) Sastre. 98. Damp shady places in lowland and hill forests. Tg, Ph, Jh.

Olacaceae

Ochanostachys amentacea Mast. S. Lowland and hill forest to 900 m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Scorodocarpus borneensis (Baill.) Becc. AB, 98. Lowland forest. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Strombosia ceylanica Gardn. 98. Widespread.

S. javanica Blume. 98. Lowland forest. Kd, Pn, Kl, Pk, Ph, Sl, NS, Jh, Tg, Sp.

Opiliaceae

Champereia manillana (Blume) Merr. AB. Lowland forest. Widespread.

Oxalidaceae

- *Sarcotheca glomerula* Veldkamp. AB. Lowland forest. Kd, Pk, Ph, Tg.
S. griffithii (Planch ex Hook.f.) Hallier f. S. Lowland forest. Ps, Kd, Pn, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.
S. laxa (Ridl.) Knuth var. **laxa*. 98. Swamps or forest margins. Ps, Kd, Kl, Tg, Pk.
S. laxa (Ridl.) Knuth var. **sericea* (Ridl.) Veldkamp. AB, 98. Swamps and forest margins. Tg, Ph, Jh, Sp.

Pandacaceae

- Galearia fulva* (Tul.) Miq. 98, S. Lowland and hill forest to 690 m. Throughout.

Passifloraceae

- Paropsia vareciformis* (Griff.) Mast. AB, 98. Lowland and hill forest to 500 m. Tg, Ph, Pk, Sl, NS, Ml.

Pentaphragmataceae

- Pentaphragma horsfieldii* (Miq.) Airy Shaw. RK. Lowland and montane forest to 2000 m. Pk, Ph, Sl, Ml, Tg.

Piperaceae

- Piper porphyrophyllum* N.E. Br. 98. Lowland forest. Widespread.

Polygalaceae

- Xanthophyllum affine* Korth. ex Miq. AB, 98, S. Lowland and mountains. Widespread.
X. griffithii Hook.f. ex A.W. Benn. ssp. *erectum* Meijden. 98. Lower montane forest to 1400 m. Pk, Sl, NS, Ml, Tg.
X. ngii Meijden. AB. Lowland forest. Tg, NS, Ml.
X. obscurum A. W. Bennett. AB. Lowland forest. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Rhamnaceae

- Ventilago malaccensis* Ridl. AB. Lowland forest. Widespread.

Rhizophoraceae

- Gynotroches axillaris* Blume. 98, S. Lowland including swamps to mountains at 1400 m. Throughout.

Rosaceae

- Prunus arborea* (Blume) Kalkman var. *arborea*. AB. Lowland to lower

montane forest at 1300 m. Pk, Sl, NS, Ml, Tg, Sp.

P. grisea (Blume) Kalkman var. *tomentosa* (Koord. & Valeton) Kalkman.

98. Lowland forest to 600 m. Widespread.

P. javanica (Teij S.M. & Binn.) Miq. 98. Lowland forest. Kd, Pk, Ph, Tg.

Rubus moluccanus L. var. *moluccanus*. 98. Forest margins in lowlands and hills. P. Langkawi, Pn, Tg, Pk, Ph, Sl, NS, Sp.

Rubiaceae

Aidia densiflora (Wall.) Masam. AB, 98. Lowland to montane forest. Throughout.

**Canthium* sp. 1. AB. Lowland forest. Pk, Ph, Sl, Tg.

C. strychnoides Craib. AB, FR. Lowland to lower montane forest. Tg, Kl.

Gaertnera vaginans (DC.) Merr ssp. *junghuhniana* (Miq.) Beusekom. FR. Lowland to montane forest. Throughout.

Gardenia tubifera Wall. var. *tubifera*. AB, 98, S. Lowland and hill forest. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

G. tubifera Wall. var. *subcarinata* Corner. AB. Lowland and hill forest. Kd, Kl, Tg, Pn, Pk, Ph, Sl, Ml, Jh, Sp.

Greenea corymbosa (Jack) K. Schum. 98. Rocky coasts to hill ridges to 700 m. Widespread.

Hedyotis philippinensis Willd. ex Spreng. 98. Lowland and hill forests. Widespread.

**Hypobathrum venulosum* (Hook.f.) K.M. Wong. AB. Lowland and hill forest. Widespread.

Ixora congesta Roxb. FR, 98, S. Lowland and hill forest to 1000 m. Throughout.

I. grandifolia Zoll. & Moritzi var. *grandifolia*. FR. Lowland and hill forest. Throughout.

I. javanica (Blume) D.C. var. *javanica*. FR. Lowland and hill forest. Widespread.

I. lobbii King & Gamble. S. Lowland to montane forest at 1200 m. Throughout.

I. pendula Jack var. *pendula*. 98. Lowland and hill forest to 600 m. Throughout.

I. umbellata Koord. & Valeton var. *umbellata*. 98. Lowland and hill forest, also on limestone. Throughout.

**Kochummenia parviflora* K.M. Wong. FR. Collected twice from Tg.

Lasianthus densifolius Miq. 98. Lowland and hill forest. Kd, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

L. griffithii Wight. AB, FR. Lowland and hill forest. Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Lasianthus sp. RK.

Morinda elliptica (Hook.f.) Ridl. AB, FR, 98. Lowland secondary forest and forest margins. Widespread, common.

Nauclea officinalis (Pierre ex Pit.) Merr. & Chun. AB. Lowland and hill forest. Throughout.

Neonauclea pallida (Reinw. ex Havil) Bakh.f. ssp. *malaccensis* (Gand.) Ridsdale. AB. Lowland to montane forest, often rheophyte. Widespread.

Ochreinauclea maingayi (Hook.f.) Ridsdale. AB. Tg, Pn, Pk, Ph, Sl, NS, Kl, Jh, Sp.

Porterandia anisophylla (Jack ex Roxb.) Ridl. AB, FR, 98. Lowland and hill forest. Kd, Pn, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Prismatomeris glabra (Korth.) Valetton. FR, 98. Lowland to montane forest. Throughout.

Psychotria malayana Jack. AB, FR. Lowland to montane forest at 1600 m. All states except Ps and Kd.

**P. penangiana* Hook.f. FR. Lowland forest, common. Widespread,

P. viridiflora Reinw. ex Blume. AB, FR. Lowland forest also on limestone. Throughout.

Rothmannia macrophylla (R.Br. ex Hook.f.) Bremek. AB. Lowland and hill forest. Kd, Kl, Tg, Pn, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Tarennia fragrans (Nees) Koord. & Valetton. 98. Lowland forest, often on river banks. Kd, Pn, Pk, Ph, Sl, NS, Ml, Jh, Tg, Sp.

Timonius flavescens (Jack) Baker. 98, S. Peaty soils in the lowlands and mountains. Throughout.

**T. wrayi* King & Gamble. AB, FR. Lowland and hill forest. Tg, Pk, Ph, Jh.

Uncaria cordata (Lour.) Merr var. *cordata*. AB, 98. Lowland forest. Widespread.

Urophyllum glabrum Wall. FR, 98, S. Lowland to lower montane forest at 1400 m. Throughout.

U. griffithianum (Wight) Hook.f. FR. Lowland and hill forest. Pn, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

U. streptopodium Wall. ex Hook.f. FR. lowland to lower montane forest at 1200 m. Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Rutaceae

Glycosmis chlorosperma Spreng. var. *chlorosperma*. 98. Lowland to montane forest. Widespread.

G. decipiens B.C. Stone. AB. Lowland to lower montane forest. Tg, Ph, P.Tioman, NS, Jh.

Maclurodendron porteri (Hook.f.) T.G. Hartley. AB, 98. Lowland to lower montane forest. Throughout.

Sapindaceae

**Glenniea penangensis* (Ridl.) Leenh. AB. Lowland and hill forest to 1000 m. Widespread.

Guioa pleuropteris (Blume) Ridl. 98. Coastal and riverine forest. Widespread.

Lepisanthes fruticosa (Roxb.) Leenh. AB, 98. Lowland forest, usually on slopes. Kd, Pn, Kl, Pk, Ph, Tg, Sl, Ml.

L. senegalensis (Poir.) Leenh. AB. Lowland and hill forest to 1000 m. Widespread.

L. tetraphylla (Vahl.) Radlk. AB, 98, S. Lowland forest. Widespread.

Litchi chinensis Sonn. 98. Hill forest. Kd, Tg, Pk, Sl, NS.

**Nephelium costatum* Hiern. S. lowland forest, Pk, Ph, Tg, Sl, NS, Ml.

N. cuspidatum Blume var. *ophiodes* (Radlk.) Leenh. S. Lowland and hill forest. Ph, NS, Jh, Tg.

N. maingayi Hiern. 98. Swampy lowland forest. Kl, Tg, Pk to Jh.

Xerospermum noronhianum (Blume) Blume. AB, 98, S. Lowland forest to 500 m. Widespread.

Sapotaceae

Ganua sp. AB.

Isonandra sp. AB.

**Madhuca. tomentosa* H.J. Lam. AB, FR.. Swampy lowland forest. Ph, Tg, Jh.

**M. tubulosa* H.J. Lam. AB, TF, FR. Lowland forest. Tg, Jh.

M. utilis (Ridl.) H.J. Lam. AB, FR, 98, S. Lowland forest. Tg, Pk, Ph, Sl, Jh.

Palaquium clarkeanum King & Gamble. AB, FR. Lowland forest, Kd, Kl, Tg, Pk, Ph, Sl, NS, Jh.

P. hexandrum (Griff.) Baill. AB, FR, 98. Mostly lowland forest. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

P. leiocarpum Boerl. AB, FR. Lowland freshwater swamp forest. Kl, Tg.

**P. maingayi* (C.B. Clarke) King & Gamble. 98. Lowland and hill crest. Kd, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh.

P. obovatum (Griff.) Engl. AB, FR. Lowland forest. Kd, Pn, Kl, Tg, Ph, Sl, NS, Ml, Jh, Sp.

P. rostratum (Miq.) Burck. AB, FR. Lowland to montane forest. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

P. semaram H.J. Lam. AB, FR. Lowland forest. Kl, Tg, Ph, Jh.

P. sukoei C.E.C. Fisch. FR. Lowland and hill forest. Tg, Pk, Jh.

P. xanthochymum (de Vriese) Pierre ex Burck. AB, FR. Swampy lowland forest. Tg, Pk, Ph, Sl, Jh, Sp.

**Payena maingayi* C.B. Clarke. AB, FR. Lowland forest. Kd, Pn, Tg, Pk,

Ph, Sl, NS, Ml, Jh, Sp.

Payena sp. A. TF, FR. Lowland forest. Tg (twice from Bukit Bauk).

Pouteria maingayi (C.B. Clarke) Baehni. AB, 98. Lowland and hill forest. Throughout.

Schisandraceae

Kadsura scandens Blume. AB. lowland forest, widespread.

Simaroubaceae

Eurycoma longifolia Jack. 98. Lowland and hills. Throughout.

Quassia indica (Gaert.) Noot. S. Tidal swamps. Tg, Jh, Sp.

Sterculiaceae

Commersonia bartramia (L.) Merr. 98. Lowland disturbed sites. Widespread.

Heritiera javanica (Blume) Kosterm. 98, S. Lowland forest to 600 m. Kd, Kl, Tg, Pk, Ph, Sl, NS, Jh.

H. simplicifolia (Mast.) Kosterm. S. Lowland forest. Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Leptonychia caudata (wall. ex G. Don) Burret. 98, S. Lowland to lower montane forest. Ps, Kd, Pn, Tg, Pk, Ph, Sl, Ml, Jh, Sp.

Scaphium macropodum (Miq.) Beumee ex Heyne. 98, S. Lowland and hill forest to 1200 m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Sterculia coccinea Jack. 98, S. Lowland forest. Common throughout.

S. cuspidata R.Br. AB. Lowland and hill forest. Kd, Pn, Tg, Pk, Ph, NS, Ml, Jh.

Styracaceae

Styrax benzoin Dryand. var. *hiliferum* Steenis. AB. Lowland forest. Ph, Tg.

Symplococaceae

Symplocos adenophylla Wall ex G. Don var. *adenophylla*. AB, 98. Sea coasts to montane forest at 1500 m. Widespread.

S. barringtoniifolia Brand. AB. Lowland and hill forest to 750 m. Tg, Pk, Ph, Sl, Ml, Jh.

S. crassipes C.B. Clarke var. *curtisii* (Oliv.) Noot. AB. Lowland to montane forest 300–1200 m. Tg, Pk, Ph, Sl.

S. rubiginosa Wall. ex DC. 98. Lowland to montane forest. Kd, Pn, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Theaceae

**Gordonia maingayi* Dyer. AB, 98. Lowland to montane forest at 1600 m. Kl, Tg, Pk, Ph, Sl, NS, Ml.

**G. multinervis* King. AB. Lowland forest below 800 m. Pn, Kl, Tg, Pk, Ph, Ml, Jh, Sp.

**G. singaporeana* Wall. ex Ridl. 98. Lowland forest. Pn, Pk, NS, Ph, NS, Ml, Jh, Tg, Sp.

Pyrenaria acuminata Planch. AB. Lowland forest. Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Tiliaceae

Microcos blattifolia Corner. AB. Lowland and hill forest to 1000 m. Widespread.

**M. erythrocarpa* (Ridl.) Airy Shaw. AB. Lowland forest to 600 m. Widespread.

M. fibrocarpa (Mast.) Burret. S. Scattered widely.

M. lanceolata (Miq.) Burret. S. Lowland forest. Mostly west coast states.

**Pentace acuta* Ridl. AB. Lowland forest. Tg, Pk.

P. floribunda King. 98. Hill forest. Kl, Pk, Ph, Sl, Tg.

**P. grandiflora* Kochummen. AB, 98. Ridge top forest. Tg only.

P. macrophylla King. AB. Lowland and hill forest. Tg, Pk, Sl, Jh.

**P. strychnoidea* King. AB, 98. Lowland and hill forest. Kd, Kl, Tg, Pk, Ph, Sl, NS.

P. triptera Mast. AB, 98. Lowland forest. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Schoutenia accrescens (Mast.) C.H. Curtis ssp. *accrescens*. AB, 98. lowland to montane forest. Common and widespread.

S. accrescens (Mast.) C.H. Curtis ssp. *borneensis* Roekmowati. 98. Lowland forest. Tg, Jh.

Triumphetta grandidens Hance. 98. Sandy shores. East coast.

Thymelacaceae

Aquilaria hirta Ridl. AB. Lowland forest. Tg, Ph, Jh, Sp.

A. malaccensis Lam. 98, S. Lowland and hill forest to 750m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Gonystylus brunnescens Airy Shaw. AB. Lowland forest, often near sea. Pn, Tg, Pk, Ph.

Ulmaceae

Gironniera hirta Ridl. 98. Lowland forest. Kl, Ph, Jh, Tg, Sp.

G. parvifolia Planch. AB, 98, S. Lowland and hill forest to 900 m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

G. subaequalis Planch. S. Lowland and hill forest to 1100 m. Kd, Pn, Kl, Tg, Pk, Ph, Sl, NS, Ml, Jh, Sp.

Verbenaceae

Clerodendron deflexum Wall. AB. Lowland to lower montane forest at 1300 m. Throughout.

Gmelina elliptica Sm. AB. Open country near the sea. Widespread.

Premna serratifolia L. 98. Sea shore. Common on all coasts.

Stachytarpheta indica (L.) Vahl. 98. Sandy places near the sea. Widespread weed.

Teijsmanniodendron simplicifolium Merr. TF. Lowland forest. Tg, Ph, Pk.

Vitex gamosepala Griff. 98. Lowland and hill forest to 1200 m. Throughout.

V. pinnata L. 98. Disturbed forest. Throughout.

**V. longisepala* King & Gamble. 98. Mainly montane forest. Pn to Ml.

Violaceae

Rinorea anguifera (Lour.) Kuntze. 98, S. Lowland and hill forest to 600 m. Throughout.

R. lanceolata (Wall.) Kuntze var. *lanceolata*. AB. Lowland forest below 750 m. Widespread mostly in the south.

Vitaceae

Ampelocissus sp. AB.

MONOCOTYLEDONAE

Araceae

Aglaonema nitidum (Jack) Kunth. RK. Damp lowland forest. Widespread.

Alocasia denudata Endl. var. *denudata*. RK. Forest margins. Widespread.

Homalomena aromatica (Roxburgh) Schott. 98. Widespread.

Rapidophora lobbii Schott. 98. Lowland forest. Pn, Sl, Ml, Tg, Sp.

Commelinaceae

Amischotolype griffithii (C.B. Clarke) I.M. Turner. 98. Lowland forest. Widespread.

Cyperaceae

Mapania cuspidata (Miq.) Uittien var. *cuspidata*. 98. Primary lowland forest. Kl, Pk, Ph, Sl, Jh, Tg.

Dracaenaceae

Dracaena conferta Ridl. 98. Lowland and hill forest. Widespread.

**D. maingayi* Hook.f. 98. Lowlands near the sea. Mostly in the south.

Gramineae

Themeda villosa (Poir) A. Camus. 98. Sandy waste places, river banks, seashores. Ps, Kd, Kl, Pn, Pk, Ph, Sl, NS, Ml, Jh, Tg, Sp.

Hanguanaceae

Hanguana malayana (Jack) Merr. 98. Lowland and hill forest to 1500m, or in lowland ponds and rivers. Widespread.

Hypoxidaceae

Molineria latifolia (Dryand.) Herb. ex Kurz var. *latifolia*. 98. Forest and forest margins, lowland to mountain tops. Throughout.

Palmae

**Areca ridleyana* Furtado. AB, FR. Hill forest. Tg, Ph, Jh.

Arenga hastata (Becc.) Whitmore. AB, FR. Lowland forest sometimes on limestone. Tg, Pk, Ph, Sl, Jh.

A. westerhoutii Griff. 98. Locally gregarious in hillside forest including limestone. Widespread.

A. hookeriana (Becc.) Whitmore. 98. Lowland forest including limestone. Widespread.

Calamus blumei Becc. FR. Swampy or wet forest to 800 m. Pk, Ph, Sl, NS, Tg, Jh.

C. diepenhorstii Miq. 98. Lowland and hill forest to 700 m. Kl, Tg, Pn, Pk, Ph, Sl, NS, Ml, Jh, Sp.

**C. holttumii* Furtado. FR. Hill forest. Tg (Bukit Bauk), Jh.

C. longispathus Ridl. FR, 98. Ridge tops in hill forests. Tg, Pk, Ph, Sl, NS, Ml, Jh.

C. polystachys Becc. 98. Ph (Mentakab), P. Tioman, Tg.

C. scabridulus Becc. FR. Peat swamp forest. Tg, Sl, Jh.

Daemonorops longipes (Griff.) Martelli. FR. Damp spots in lowland forest. Ph, NS, Ml, Jh, Tg, Sp.

**D. monticola* (Griff.) Martelli. 98. Hill forest, Pn, Jh, Tg.

D. sabut Becc. FR. Alluvial or freshwater swamp forest to 250 m. Tg, Pk, Ph, NS, Jh, Sp.

Iguanura wallichiana (Wall. ex Martelli) Hook.f. ssp. *wallichiana* var. *wallichiana*. 98. Lowland and hill forest to 1000 m. North of Fraser's Hill, Ph, and Sg. Dungun, Tg.

Korthalsia sp. 98.

**Licuala ahlidurii* L.G. Saw. 98. Lowland forest, Tg (only Bukit Bauk).

**L. bayana* L.G. Saw. 98. Tg only.

L. ferruginea Becc. AB, 98. Lowland forest. Tg, Ph, NS, Jh, Sp.

**L. fractiflexa* L.G. Saw. 98. Tg only.

L. glabra Griff. var. *glabra*. AB, FR, 98. Lowland and mountains. Kl, Pk, Ph, Sl, Tg, Ml.

**L. khoonmengii* L.G. Saw. AB, 98. Tg only.

**L. malajana* Becc. 98. Lowland and hill forest. Kl, Tg, Ph, Sl, Jh.

L. spinosa Wurm. AB, 98. Damp open sites. Throughout.

L. terengganuensis L.G. Saw. AB, 98 Tg only.

**Livistona endauensis* J. Dransf. & K.M. Wong. FR, 98. Gregarious in hill forest to 660 m. Tg, Jh.

Johannesteijmannia altifrons (Rechb.f. & Zoll) H.E. Moore. 98. Lowland forest. Kl, Ph, Sl, Tg, Jh.

Oncosperma horridum. (Griff.) Scheff. 98. Lowland and hill forest to 500 m. Throughout.

Pinanga disticha (Roxb.) Blume ex H. Wendl. 98, S. Lowland and montane forest to 1200 m. Widespread and common.

P. simplicifrons. AB, FR. Wet lowland forest. East of Main Range.

Plectocomia elongata Mart. ex Blume. 98. Lowland and montane forest to 2000 m. Kd, Kl, Tg, Ph, Pn, Pk, Sl, NS, Ml, Jh, Sp.

Pholidocarpus macrocarpus Becc. 98. Swampy lowland forest. Widespread.

Lowiaceae

**Orchidantha* ? *fimbriata* Holttum. 98, S. Lowland and hill forest. Tg, Pk, Ph, Sl, Jh.

Marantaceae

Donax grandis (Miq.) Ridl. 98. Lowland forest. Widespread.

Orchidaceae

Bromheadia finlaysoniana (Lindl.) Miq. 98. Lowland secondary forest and scrub. Common throughout.

Claderia viridiflora Hook.f. 98. Lowland and hill forest. Widespread.

Smilacaceae

Smilax setosa Miq. 98. Lowland forest margins. Widespread.

S. calophylla Wall. ex A. DC. 98. Lowland and hill forest. Widespread.

Taccaceae

Tacca integrifolia Ker Gawl. 98. Lowland and hill forest. Widespread.

Zingiberaceae

Alpinia javanica Blume var. *javanica*. AB, 98. Open places in lowland forest. Widespread.

**Globba unifolia* Ridl var. *sessifolia*. 98. Lowland and montane forest. Kl, Tg.

**Scaphochlamys rubromaculata* Holttum. 98. Lowland forest at 200 m. Tg (Ulu Bendong and Bukit Bauk).

GYMNOSPERMS**Cycadaceae**

Cycas rumphii Miq. 98. Mostly rocky shores. Widespread.

Gnetaceae

Gnetum gnemon L. var. *gnemon*. 98, S. Rocky coasts and islands. Mostly east coast.

PTERIDOPHYTA**Adiantaceae**

Taenitis blechnoides (Willd.) Sw. 98. Common at forest edges. Widespread.

Aspleniaceae

Asplenium nidus L. 98. Lowland and mountains. Throughout.

Blechnaceae

Blechnum finslaysonianum Wall. ex Hook.f. & Grew. 98. Forests to 500 m. Widespread.

B. orientale L. 98. Common in open sites, lowland and mountains. Widespread.

Dipteridaceae

Dipteris lobbina (Hook. & Grew.) Copel. 98. Rheophyte, lowland and hills to 1000 m.

Dryopteridaceae

Tectaria semipinnata (Roxb.) C.V. Morton. 98. Lowland forest.

T. singaporeana (Hook. & Grew.) Copel. 98. Lowland forest.

Gleicheniaceae

Dicranopteris linearis (Burm.f.) Underw. var. *linearis*. 98. Lowland and mountains to 1400 m. Throughout.

Sticherus truncatus (Willd.) Nakai var. *truncatus*. 98. Forest margins to 1600 m. Widespread.

Lycopodiaceae

Lycopodium sp. 98.

Polypodiaceae

Platyserium coronarium (D. Koenig ex O.F. Mull) Desv. 98. Lowland forest and plantations. Widespread.

Schizaeaceae

Lygodium circinnatum (Burm.f) Sw. 98. Lowland to montane forest at 1500 m.

L. longifolium (Willd.) Sw. 98. Lowland forest margins.

Lygodium sp. 98.

Schizaea dichotoma (L.) J. Sm. 98. Lightly shaded sandy soils to 1000 m.

Selaginellaceae

Selaginella sp. 98.

Thelypteridaceae

Pronephrium repandrum (Fee) Holttum. 98. Shady lowland and hill forest.