Plant Formations in the Philippinean BioProvince

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Philippinean Dipterocarp Forest

Forests dominated by dipterocarps are characteristic of the lowlands and up to an altitude of about 600 m. Prior to man's interventions they represented about 75% of the virgin forest area and contained about 95% of the archipelago's standing timber. The dominant dipterocarps are *Parashorea malaanonan, Pentacme contorta* and *Shorea guisa* and these together with trees such as the endemic *Canarium luzonicum* (Burseraceae) and *Celtis philippensis* (Ulmaceae) form a closed canopy. The tallest of these trees, *Parashorea malaanonan,* can reach heights of 40 m. Two sub-canopy layers can usually be distinguised. In the middle layer, at about 20 m high*, Diospyros ahernii, Diplodiscus paniculatus* and the endemic *Dillenia philippinensis* (Dilleniaceae) *and Strombosia philippinensis* (Olacaceae) represent some of the more prominent trees, but this layer probably contains a greater number of species than the other two stories combined. The third storey reaches about 10 m. Here the main species include *Laportea subclausa, Thea montana* and the endemic *Leea manillensis* (Leeaceae). Other endemic trees include *Dillenia reifferscheidia* (Dilleniaceae), *Dipterocarpus philippinensis, Hopea acuminata, Shorea astlosa, Vatica pachyphylla* (Dipterocarpaceae), *Eugenia luzonensis* (Myrtaceae), *Gloeocarpus patentivalis* (Sapindaceae), Guioa discolor (Sapindaceae), *Hydnocarpus cauliflora* (Flacourtiaceae), *Leea philippinensis* (Leeaceae), *Mastixia tetrapetala* (Mastixiaceae), *Myristica rubrinervis* (Myristicaceae), *Pandanus luzonensis* (Pandanaceae), *Symplocos verticillifolia* (Symplocaceae) and *Terminalia pellucida* (Combretaceae).

At ground level rattans (*Calamus* and *Daemonorops*) in their rosette stage are one of the most prominent elements. Other shrubs comprise various endemic species like *Anaxogorea luzonensis* (Annonaceae) and *Osmoxylon oblongifolium* (Araliaceae). In these more shrubby areas, herbaceous species are scarce, but in the wetter areas, particularly in ravines, they become much more conspicuous. Species of the shallow rooting genus *Elatostema* can be present in large numbers, while endemic species may include *Carex nodiflora* (Cyperaceae), *Plectranthus merrillii* (Lamiaceae), *Sedum ambliflorum* (Crassulaceae), *Tectaridium macleanii* (familiy), and by rivers the generic endemic fern *Podosorus angustatus* (Polypodiaceae). Ferns can be present in large numbers but most are fairly small species, while the spectacular *Angiopteria angustifolia* has fronds up to 5 m in length. Some of the more bizare ground dwelling species include the showy endemic parasite *Rafflesia manillana* (Rafflesiaceae) and the endemic leafless orchid *Taeniophyllum philippinensis* (Orchidaceae). With its photosynthetic roots this latter species is also occasionally found on the trunks of trees. However, epiphytic vegetation in general is quite scare and mostly confined to the large branches of tall trees where they often form a veritable aerial garden. Ferns such as *Asplenium nidus* (bird's-nest fern) and various endemic members of the Polypodiaceae like *Drynaria descensa, Microsorum heterolobum, Platycerium grande* and *Pyrrosia samarensis* are common, while the flowering plants are mainly orchids or species of *Hoya*. *Phalaenopsis amabilis* is a spectacular orchid of these high branches but is rarely seen. Climbers, on the other hand, are very common. The most noticeable of these are the climbing palms (rattans). These start of as self-supporting ground species with spiny, pinnate leaves of up to 3 m until they send out climbing stems which can reach lengths of more than 100 m. Other conspicuous climbers are the climbing bamboos such as *Schizostachyum diffusum* (Poaceae) and other monocots of the genera *Freycinetia* (Panadanaceae) and *Pothos* (Araceae). Frequent among the dicot climbers is the endemic *Symphorema luzonicum*

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(Verbenaceae), but several others endemic dicot species of climbers and lianas may be encountered including *Aristolochia leytensis* (Aristolochiaceae), *Cannarus whitfordii* (Connaraceae), *Cyclea cauliflora* (Menispermaceae), *Erycibe terminaliflora* (Convolvulaceae), *Prenacantha repanda* (Icacinaceae) and *Strychnos lanata* (Loganiaceae).

Philippinean Limestone Forest

These forests are confined to limestone, but are sometimes referred to as molave forest due to the conspicuous presence of this species (*Vitex parviflora*). They also contain large numbers of leguminous species and many of the trees are deciduous. Among other characteristic trees are *Afzelia rhomboides, Heritiera sylvatica, Intsia bijuga, Kingiodendron alternifolium, Lagerstroemia piriformis, Mimusops parviflora, Parinari corymbosa, Pterocarpus indicus, Pterocymbium tinctorium, Toona calanthes, Wrightia pubescens, Ziziphus talanai,* endemic taxa like *Litchi chinensis* subsp. *philippinensis* (Sapindaceae), *Sindora supa* (Fabaceae) and the near endemic *Wallaceodendron celebica* (Fabaceae). Not surprisingly the latter species also occurs in the forests of Sulawesi (Celebes). Other characteristic but less common endemic species include *Heterogonium lobulatum* (Dryopteridaceae), the epiphyte *Microsorum samarense* (Polypodiaceae), *Pneumatopteris lithophila* (Thelypteridaceae), *Sphaerostephanos subcordata* (Thelypteridaceae) and various species of *Tectaria* such as *T. athyriosora, T. calcarea* and *T. tabonensis* (Dryopteridaceae).

Philippinean Ultrabasic Forest

There are substantial areas of ultrabasic rock in the Philippines. Examples include Mount Bloomfield on Palawan and Mount Giting-Giting on Sibuyan. The forests are typically stunted although the reason for this is not absolutely clear. It could be due to a shortage of essential nutrients or to the high levels of magnesium and calcium or high nickel concentrations. On Mt Bloomfield the forest trees mainly comprise various metaliferous species such as *Brackenridgea palustris* var. *foxworthyi, Exocarpus latifolius* and *Scaevola micrantha*, while other trees include *Gymnostoma mesostrobilus* and *Phyllanthus balgooyi*. Several species, such as the endemic shrub *Walsura monophylla* (Meliaceae) are known to be nickel hyperaccumuators. The value of this adaptation is unclear but possibly renders their leaves toxic to certain herbivores. Other endemic species associated with these untrabasic rock forests include trees such as *Myristica colinridsdalei* (Myristicaceae) and shrubs such as *Licania palawanensis* (Chrysobalanaceae) and *Securidaca atro-violacea* (Polygalaceae).

Philippinean Montane Forest

Above the dipterocarp forest from about the 600 m contour the forests are much less dense and the number of tree stories are reduced to two. The canopy height varies with altitude but reaches about 18 m at an elevation of about 700 m, while the lower story varies from between 6-12 m. However, it is difficult to define these forests in terms of dominant species, but fairly prevalent first story species include *Neonauclea calycina, Quercus soleriana,* various species of *Ficus* and the endemic *Palaquium philippense* (Sapotaceae) and *Weinmannia luzoniensis* (Cunoniaceae). The second story is composed of a multitude of species, some of which like the endemic *Sauravia luzoniensis* (Sauraviaceae) rarely reach more than about 6 m in height. Other endemic small trees include *Arthrophyllum pulgarense* (Araliaceae), *Symplocos whitfordii* (Symplocaceae) and *Viburnum cornutidens* (Caprifoliaceae). Palms are much less frequent and mostly represented by scattered specimens of *Pinanya barnesii*. Tree ferns, on the other hand, become far more abundant and include endemic species like *Cyathea caudata, C. heterochlamydea, C. robinsonii* and *C. zamboanyana* (Cyatheaceae). Dicotyledonous

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vines are also less prominent with monocots like climbing palms (rattans) and species of the genus *Freycinetia* (Pandanaceae) making up most of the climbing flora, although the woody, endemic vine *Kadura philippinensis* (Schisandraceae) may be encountered. The most conspicuous change compared to the lowland forests is the increased epiphytic flora, but again these are mostly confined to the crowns of tall trees. For example, there are several species of the fern genus *Aglaomorpha* including the spectacular endemic *Aglaomorpha splendens* (Polypodiaceae) with its large pinnate leaves. The trunks of trees usually only support a sparse covering of mosses and other epiphytic species, and it is the bark of trees that is prominent in giving character to the appearance of these forests, especially at lower altitudes. Other endemic species include *Sphaerostephanos lobatus* (Thelypteridaceae) and *Teratophyllum luzonicum* (Lomariopsidaceae).

Philippinean Mossy Forest

From an altitude of about 1200 m, such as mountain summits like the top of Mount Maguiling, the cloud belt starts shrouding these zones in mist for long periods. The high relative humidity and low evaporation rates is responsible for many of the features of these forests and in many ways they are of more interest than those at lower elevations. One of the most obvious features is the abundance of epiphytic mosses. In places these may be several centimeters thick and can reach 30 cm in length. In addition to mosses there are many filmy ferns and small species of the clubmoss *Selaginella* such as the endemic *Selaginella maquiliense* (Selaginaceae). There is usually a single story of low trees with a canopy height of about 10 m. Many of the trees have a tendency to send out aerial roots often causing them to have fantastic shapes. Species of *Astronia,* particularly *A. lagunensis,* and trees ferns (*Cyathea*) are the dominant tree taxa in terms of numbers of species. Tree ferns are very abundant growing luxuriantly among other trees and giving these forests a primordial appearance, and many of these, like *Cyathea edanoi, C. ferruginea, C. fuliginosa* and *C. philippinensis* (Cyatheaceae), are endemic. Other endemic trees include *Aquilaria apiculata* (Thymelaeaceae), *Clethra tomentella* (Clethraceae), *Diplycosia luzonica* (Ericaceae), *Guioa myriadenia* (Sapindaceae), *Matthaea pubescens* (Monimiaceae), *Microtropis curvanii* (Celastraceae), *Podocarpus lophatus* (Podocarpaceae), *Prunus subglabra* (Rosaceae), *Schuumansia vidalii* (family?) and *Vaccinium barandanum* (Ericaceae). Shrubs are also frequently encountered with many endemic species of the Ericaceae such as *Dimorphanthera mindanaensis, Rhododendron mindanaense* and *Vaccinium halconense*. Other endemic shrubs include *Daphne luzonica* (Thymelaeaceae), *Daphniphyllum parvifolium* (Daphniphyllaceae) and *Gomphandra flavicarpa* (Icacinaceae). In addition to terrestrial shrubs there are also many epiphytic species, which are again dominated by endemic species of the Ericaceae such as *Costera loheri, Diplycosia apoensis, Rhododendron leytense* and *Vaccinium perrigidum*. Vines, both epiphytic and terrestrial, are fairly conspicuous but represented by comparatively few species. Possibly the most frequent are species of *Freycinetia* particularly *Freycinetia williamsii*. Where trees send out large numbers of aerial roots and the crowns are overgrown with vines and epiphytes it can be very dark at ground level and devoid of herbaceous species, but where light penetrates fairly dense herbaceous layers can develop. The most conspicuous large herb is *Strobilanthes pluriformis,* while the smaller ones consist largely of ferns (mainly species of Hymenophyllaceae and Polypodiaceae), together with species of *Elatostema* and *Selaginella*. Among the endemic herbaceous flora are *Plectranthus sparsiflorus* (Lamiaceae), *Pogostemon philippinensis* (Lamiaceae), *Trigonotis philippinensis* (Boraginaceae) and *Viola merrilliana* (Violaceae).

Philippinean Pine Forest

These forests reach their best development on the high plateaus of northern Luzon in the so-called ‘Mountain Province’. They range in altitude from about 900 to 1500 m and are

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characterized mainly by the presence of *Pinus insularis* (*P. kesiya*) and *P. merkusii*. Associated endemic plants include *Pronephrium rubidum* (Thelypteridaceae) and the epiphytic fern *Selliguea elmeri* (Polypodiaceae).

Further information required.

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