Habitats of Philippine Dipterocarps

Edwino S. Fernando

The two-winged fruits of *Dipterocarpus kerrii* King in lowland evergreen rain forest. 200 m alt., Quezon National Park, Luzon Island. Photo by Edwino S. Fernando, 01 August 2008.

Dipterocarps are medium to large, resinous forest trees belonging to the tropical plant family Dipterocarpaceae. The name of the family is based on the two-winged fruits of *Dipterocarpus* (from the Greek *di* - double, *ptero* – wing, *karpos* – fruit). The wings are the sepals of the flower which becomes elongated and may be 2, 3, or 5 in number or sometimes absent.

Dipterocarps comprise the main timber trees of tropical Asia and are ecologically major components of various types of lowland rain forests (Ashton 1982; Whitmore 1984; Newman et al. 1996). In the Philippines, about 45 species in six genera have been recorded of which about 46% are endemic to the archipelago (Ashton 1982; Rojo 1979; Newman et al. 1996; Rojo & Aragones 1997).

Many dipterocarps are big trees that have stem diameters of up to 200 cm or more and often reach the top of the forest canopy, with several being emergents towering to 60 m tall.

Sometimes dipterocarps can form extensive patches in the forest. Whitford (1909) earlier showed that the relative density of dipterocarps among forest trees exceeding 40 cm in diameter varied from 33.1% near Bongabon, Mindoro Island, to 60.9% near Limay, Bataan on Luzon Island, to 89.4% on the lower slopes of Mt Silay on Negros Island.

Two adjacent large individuals of *Shorea polysperma* (Blanco) Merr. in tropical lowland evergreen rain forest. 350 m alt., Silago, Leyte Island. Photo by Edwino S. Fernando, 26 October 2008.

In lowland forests dominated by dipterocarps, timber volume of trees 50 cm in diameter

Hopea malibato Foxw. in tropical lowland evergreen rain forest, *c.* 220 m alt., Quezon National Park, Luzon Island. Photo by Edwino S. Fernando. 01 August 2008.

usually reaches 100-180 m^3/ha, 3-6 times more than is usual for the world's tropical rain forests (Newman et al. 1996). On Negros Island in the early 1900's up to 197 m^3/ha of timber volume (98% of it dipterocarp) have been recorded (Berbano 1938).

Dipterocarps are usually confined mainly to areas with a mean annual rainfall exceeding 1,000 mm and/or dry season of only a short duration, with majority of the species occurring in areas with 2,000 mm mean annual rainfall (Ashton 1982). Most species do not occur at elevations above 1,100 m. However, at least one species in the Philippines, *Vatica odorata* ssp. *mindanensis*, reaches to 1,200 m alt.

Forests in which the dominant trees are species of Dipterocarpaceae are often referred to as 'dipterocarp forests' (Brown & Matthews 1914) and these are usually on deep clay loam soil. But dipterocarp trees may also occur over different substrates with different degrees of water stress and they may not often be the dominant species in the area. Species typical of one habitat can also occur in suitable sites within other habitats. Following Whitmore (1984a, 1990), a forest formation is generally recognized by a particular combination of vegetation structure and physiognomy, regardless of the dominant tree species.

Throughout Southeast Asia, dipterocarps occur in various habitat types or forest formations (Whitmore 1984), although most are in lowland evergreen rain forests. In the Philippines, dipterocarps are known to occur in at least four habitat types or forest formations (Fernando et al. 2009b), *viz*., tropical lowland evergreen rain forest, tropical lower montane rain forest, tropical semi-evergreen rain forest, and forest over limestone. In a peat swamp forest in Agusan del Sur, Mindanao, at least one, still unidentified species of *Vatica*, is said to occur there (Fernando et al. 2009b).

Elsewhere in Southeast Asia, other formations

(*e.g.* peat swamp forest and forest over ultramafic rocks) may also contain dipterocarps. In the peat swamp forests of Borneo, for example, at least 12 dipterocarp species, including *Shorea albida*, *Shorea balangeran*, and *Dryobalanops rappa* are present there, with some being gregarious (Ashton 1982). Also in Borneo,at least five species have been recorded in forest over ultramafic rocks, with only one species (*Shorea tenuiramulosa*) being restricted to the formation (Ashton 1982). Some species have a wider ecological or altitudinal range and can occur in two or more forest formations. *Shorea scabrida* in Borneo and Sumatra, is found in freshwater swamp forest, as well as, in other habitat types, including peat swamp forests, heath forest, and lowland evergreen rain forests (Ashton 1982; Newman et al. 1999). Few species may be restricted to a particular formation.

Immature fruits *Shorea palosapis* (Blanco) Merr. in tropical lowland evergreen rain forest adjacent to a shifting cultivation (*kaingin*) area, *c.* 470 m alt., Silago, Leyte Island. Photo by Nemrod E. Dolotina, 25 October 2008.

The following habitat types or forest formations where Philippine dipterocarps are known to occur follow the scheme of Whitmore (1984) and that of Fernando et al. (2009b).

Tropical lowland evergreen rain forest. This is the typical rain forest formation in the Philippines occurring from coastal flats up to c. 900–1,100 m alt. and is best developed in areas where rainfall is more or less uniform throughout the year or where there is only a short dry season. This is the formation where most of the dipterocarp species are found. It includes the *lauan*, *lauan-hagakhak*, and *yakal-lauan* dipterocarp types described by Whitford (1911); the *lowland*, *lower hill*, and in part, upper hill dipterocarp forests of Weidelt & Banaag (1982); the *lowland dipterocarp* forest of Co & Tan (1992); and the *mixed dipterocarp* forest of Ashton (1997) and Co et al. (2006). The common dipterocarp species present in this formation include *Shorea negrosensis* (red lauan), *Shorea astylosa* (yakal), *Shorea almon* (almon), *Shorea falciferoides* ssp. *falciferoides* (yakal-yamban), *Shorea guiso* (guijo), *Shorea palosapis* (mayapis), *Shorea polysperma*

Shorea negrosensis Foxw. in remnant tropical lowland evergreen rain forest, *c.* 570 m alt., Ayungon, Negros Island. Photo by Edwino S. Fernando, 01 December 2008.

Shorea polysperma (Blanco) Merr. in lower montane rain forest, 1065 m alt., Mt Kitanglad, near Sumilao, Bukidnon Prov., Mindanao Island. Photo by Edwino S. Fernando, 05 July 2007.

Shorea contorta Vidal in tropical semi-evergreen rain forest, 60 m alt., Subic Bay, Luzon Island. Barks of dipterocarp and other trees in a tropical semi-evergreen rain forest tend to be thicker. Photo by Edwino S. Fernando. 02 August 2008.

(tanguile), *Hopea malibato* (yakal-kaliot), *Hopea philippinensis* (guisok-guisok), *Parashorea malaanonan* (bagtikan), *Dipterocarpus validus* (hagakhak), and *Vatica mangachapoi* ssp. *mangachapoi* (narig).

Tropical lower montane rain forest. This formation includes the *tanguile-oak* type of dipterocarp forest escribed by Whitford (1911) which extends from the upper limits of the *lauan* and *lauan-apitong* types to the lower limits of the mossy (upper montane) forest type. The forest is similar to the higher limits of the *upper hill dipterocarp* forest and the *montane dipterocarp* forest of Weidelt & Banaag (1982) and the oak-laurel assemblage referred to by Ashton (2003). It connects the lowland evergreen rain forest with the upper montane rain forest ('mossy' forest), usually between c. 800-1,300 m alt. In this formation, the dipterocarp *Shorea polysperma* (tanguile) is frequently dominant, along with various species of oaks (*Lithocarpus*), oil fruits (*Elaeocarpus*), laurels (*Litsea*, *Neolitsea*), and 'makaasim' (*Syzygium*) (Brown 1919; Ashton 1997).

Other dipterocarps that occur in this formation include *Shorea palosapis* (mayapis), *Shorea almon* (almon), *Shorea contorta* (white lauan), and sometimes *Parashorea malaanonan* (bagtikan) (Weidelt & Banaag 1982), but are not as common as *Shorea polysperma*.

Tropical semi-evergreen rain forest. The *lauan-apitong* type of dipterocarp forest described by Whitford (1911) or the *apitong-lauan* association referred to by Weidelt & Banaag (1982) belongs here. This formation occurs in areas with a very distinct strong dry season. It has both evergreen and deciduous trees in a mixture, but with a tendency towards gregariousness (Whitmore 1984a, 1990). The number of species of dipterocarps in the tropical semi-evergreen rain forest formation is less compared to lowland evergreen rain forest. Some of the species present here include *Shorea contorta* (white lauan), *Dipterocarpus*

grandiflorus (apitong), *Dipterocarpus gracilis* (panaw), *Shorea guiso* (guijo), and *Anisoptera thurifera* (palosapis). *Shorea contorta* and *Anisoptera thurifera* tend to be briefly deciduous in this formation, shedding all their old leaves and quickly putting out new ones.

Forest over limestone. In the non-seasonal areas of the Philippines, some of the forests over limestone are evergreen and include many tall trees such as dipterocarps (Fernando et al. 2009b). The presence of dipterocarps on limestone was earlier noted by Whitford (1911) who recorded three dipterocarp species, *viz*. *Shorea guiso* (guijo), *Shorea contorta* (white lauan), and *Parashorea malaanonan* (bagtikan), on Samal Island in Mindanao. Co et al. (2006) also recorded *Shorea palosapis* (mayapis), *Shorea contorta* (white lauan), and *Shorea falciferoides* (yakal yamban) in forests over limestone in northern Luzon near Palanan, Isabela. More recently, on Bohol Island, Fernando et al. (2009a) recorded 12 dipterocarp species on karst limestone, including *Anisoptera thurifera* ssp. *thurifera* (palosapis), *Dipterocarpus hasseltii* (Hasselt's panaw), *Hopea acuminata* (manggachapui), *Hopea philippinensis* (guisok-guisok), *Hopea plagata* (Yakal saplungan), *Hopea quisumbingiana* (Quisumbing guisok), *Shorea assamica* ssp. *philippinensis* (manggasinoro), *Shorea contorta* (white lauan), *Shorea guiso* (guijo), *Shorea palosapis* (mayapis), *Shorea polita* (malaanonang), and *Vatica mangachapoi* ssp. *mangachapoi* (narig). Yet one more species, *Shorea polysperma* (tanguile), has very recently been added to this list of dipterocarps on karst limestone on Bohol Island. The karst limestone area is in rugged terrain (c. 180 - 700 m alt.) with caves and sinkholes. Some of the dipterocarp trees here reach to 70 cm in stem diameter and up to 35 m tall.

Other forest habitats in the Philippines, such as the freshwater and peat swamp forests in central Mindanao and the forests over ultramafic rocks in Luzon, Palawan, and eastern Mindanao

The Philippine Flying Lemur (*Cyanocephalus volans*) on the trunk of the dipterocarp tree *Shorea assamica* Dyer ssp. *philippinensis* (Brandis) Sym. in forest over limestone in the Rajah Sikatuna Protected Landscape, 300 m alt., Bilar, Bohol Island. Photo by Edwino S. Fernando. 07 December 2006.

Vatica mangachapoi Blanco ssp. *mangachapoi* in forest over limestone in the Rajah Sikatuna Protected Landscape, 480 m alt., Bilar, Bohol Island. Photo by Edwino S. Fernando. 02 August 2008 .

Seedlings of *Hopea acuminata* Merr. in forest over limestone, 700 m alt., near Duero, Bohol Island. Photo by Edwino S. Fernando. 09 August 2007.

(Fernando et al. 2009b), may likely contain dipterocarp species when these are more extensively surveyed.

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Dipterocarps of the Philippines

Species Fact Sheet 01

Edwino S. Fernando

Dagang

Anisoptera aurea Foxw.

Description A large **tree** reaching to 40 m tall and basal trunk up to 160 cm diameter. **Buttresses** present, low and rounded. **Bark** prominently flaky, the flakes often peeling off from below; inner bark light yellowish to brown. **Leaves** oblong, broadly elliptic, or obovate, 7-12.5 x 2.5-6.8 cm; base wedge-shaped or rounded or sometimes obtuse; apex shortly acuminate, often slightly down-curved; nerves 15-20 on each side of the midrib, arching towards the margin; lamina on upper surface glabrous, smooth to the touch, lamina on lower surface of scales, golden brown; petiole 1.5-3.2 cm long. **Flowers** in terminal or axillary panicles to 12 cm long; petals whitish; stamens 35-38. **Fruit** with two prominent long wings, 7-12 x 1-1.5 cm; short wings 0.1-3 x 0.2-0.3 cm; fruit tube sub-globose, 0.6-0.8 cm diameter.

Endemic to the Philippines

Habitat and ecology In lowland evergreen rain forest, especially on ridges, up to 600 m alt.

Conservation Status Endangered.
Although not formally assessed by DENR or IUCN, this species is likely to be Endangered, due to the continuing decline in its extent of occurrence, quality of habitat, and number of mature individuals in the wild.

Top Habit and crown of *A nisoptera aurea;* **Bottom left** Leaf showing golden yellow lower surface, and fruits; **Bottom right** Basal part of trunk showing flaky outer bark and low, rounded buttress. Photos by Edwino S. Fernando

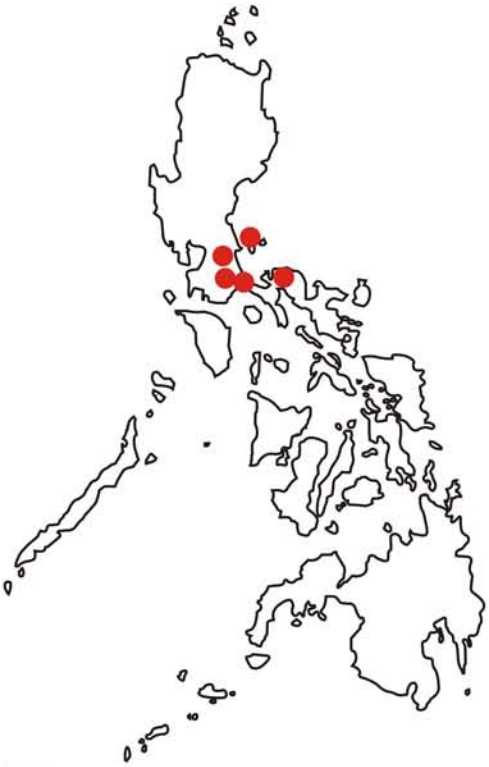
01 Species Fact Sheet

Dipterocarps of the Philippines

Dagang

Anisoptera aurea Foxw.

Geographical distribution Philippines: Luzon (Laguna, Quezon, Camarines), Polillo.



Left Part of the crown of *Anisoptera aurea*; **Bottom left** Trunk showing flaky outer bark; **Bottom right** Fallen leaves showing characteristic golden yellow lower surface. coin scale = 2 cm. Photos by Edwino S. Fernando

Economic uses Timber is suitable for general construction, interior finish, ship planking, wooden tanks, and for veneer and plywood.

Wood properties Light hardwood type with density of 550-790 kg/m^3 at 15% moisture content.

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Palosapis

Anisoptera thurifera (Blanco) Blume ssp. *thurifera*

Synonym: *Anisoptera brunnea* Foxw.

Description A large **tree** reaching to 45 m tall and basal trunk up to 180 cm diameter. **Buttresses** sometimes present, low and rounded, or indistinct. **Bark** prominently scaly; inner bark brownish yellow, resinous. **Leaves**-elliptic, lanceolate, or obovate, 6-15 x 2.5-6.6 cm; base rounded; apex acuminate; nerves 12-20 on each side of the midrib, straight at first, then arching near margin only; lamina on upper surface glabrous, dark green, smooth to the touch, the lower surface pale to light brown; petiole 1.7-3.5 cm long, slender. **Flowers** in terminal or axillary panicles to 20 cm long; petals yellowish; stamens 45-47. **Fruit** with two prominent long wings, 5-15 x 1.0-1.5 cm; short wings 2-3 x 0.2-0.3 cm; fruit tube globose, 1.2-1.7 cm in diameter.

Endemic to the Philippines

Habitat and ecology In lowland evergreen and semi-evergreen rain forest and in forest over limestone, up to 700 m alt.

Conservation Status Vulnerable.

Top Habit of *Anisoptera thurifera* ssp. *thurifera*; **Bottom left** Leaves and immature fruits; **Bottom right** Basal part of trunk showing very low or almost indistinct buttress and scaly outer bark. coin scale = 2 cm. Photos by Edwino S. Fernando

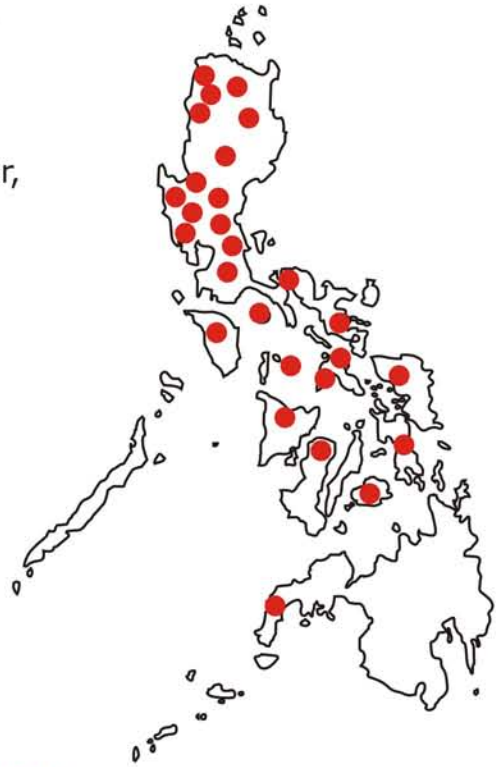
02 Species Fact Sheet

Dipterocarps of the Philippines

Palosapis

Anisoptera thurifera (Blanco) Blume ssp. *thurifera*

Geographical distribution Philippines: Luzon (Ilocos Norte, Ilocos Sur, Abra, Cagayan, Nueva Vizcaya, Nueva Ecija, Zambales, Bataan, Pangasinan, Tarlac, Laguna, Quezon, Camarines Norte, Camarines Sur, Albay), Sibuyan, Ticao, Masbate, Panay, Negros, Samar, Leyte, Bohol, and Mindanao (Zamboanga).



Left Part of the crown of *Anisoptera thurifera* ssp. *thurifera* with young fruits; **Bottom left** Trunk showing scaly outer bark; **Bottom right** Seedling. Photos by Edwino S. Fernando

Economic uses Timber is used for general construction work, interior finish, ship planking, veneer, and plywood.

Wood properties Light hardwood type with density of 580-710 kg/m^3 at 15% moisture content.

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Edwino S. Fernando

Hairy-leaf apitong

Dipterocarpus alatus Roxb. ex G.Don

Synonym: *Dipterocarpus philippinensis* Foxw.

Description A large **tree** reaching to 30 m tall and basal trunk up to 75 cm diameter. **Buttresses** low and rounded when present. **Bark** generally smooth or irregularly mottled-scaly; inner bark pinkinsh to red brown. **Leaves** elliptic, or ovate, 9-25 x 3.5-15 cm, sometimes plicate; base wedge-shaped, rounded, or sub-cordate; apex acute or short acuminate; nerves 11-20 on each side of the midrib, straight to the margin; lamina on upper and lower surfaces smooth to the touch; midrib and nerves below hairy; leaf margin wavy; petiole 1.4-4 cm long, slightly kneed, covered with short yellow-brown hairy. **Flowers** in axillary racemes to 8 cm long; petals white with pink stripe in the middle; stamens 30-32. **Fruit** with two prominent long wings, 10-14 x 2.3-2.8 cm; short wings 0.5-1.2 x 0.5-1.4 cm; fruit tube globose, 1.7-2.5 x 1.7-2.5 cm, with 5 prominent narrow wings continuous from base to apex.

Habitat and ecology In semi-evergreen rain forest; rare.

Conservation Status Endangered (DENR DAO 2007-01).

Top Habit and crown of *Dipterocarpus alatus*; **Bottom left** Fruit; **Bottom middle** leaf, and flowers; **Bottom right** Basal part of trunk showing low, rounded buttresses. coin scale = 2 cm. Photos by Edwino S. Fernando

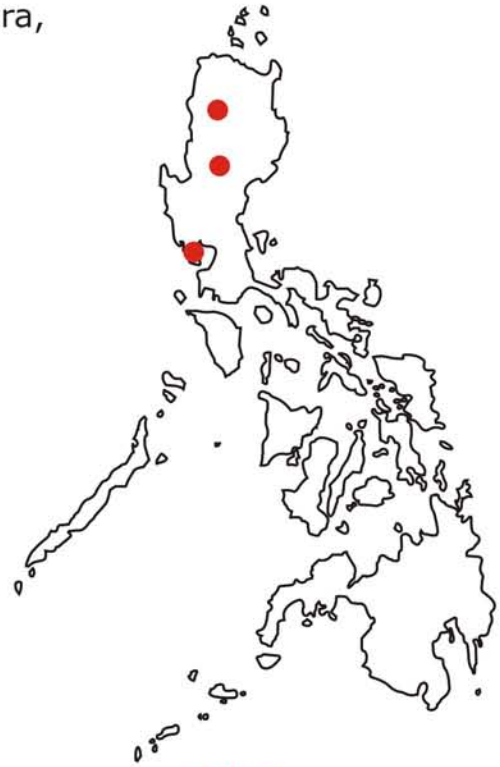
03 Species Fact Sheet

Dipterocarps of the Philippines

Hairy-leaf apitong

Dipterocarpus alatus Roxb. ex G.Don

Geographical distribution Philippines: Luzon (Abra, Nueva Vizcaya, Bataan). Also in Eastern India, Andaman Islands, Bangladesh, Myanmar, Thailand, Cambodia, Laos, and Vietnam.



Top Part of the crown of *Dipterocarpus alatus* with flowers; **Bottom** Trunk showing mottled-scaly outer bark. Photos by Edwino S. Fernando

Other vernacular names *ayamban, apinau*

Economic uses Source of timber for medium construction work. Wood features similar to, and used in the same way as, *apitong* [*Dipterocarpus grandiflorus* (Blanco) Blanco].

Wood properties Medium hardwood type with density of 620-905 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 04

Edwino S. Fernando

Panau

Dipterocarpus gracilis Blume

Synonym: *Dipterocarpus vernicifluus* (Blanco) Blanco

Description A large **tree** reaching to 45 m tall and basal trunk up to 180 cm diameter. **Buttresses** present, low and rounded. **Bark** generally smooth, lenticellate, shedding off in large flakes; inner bark reddish brown. **Leaves** elliptic to ovate, 8-15 x 4-10 cm, base obtuse or wedge-shaped, symmetrical; apex acute to shortly acuminate; nerves 10-20 on each side of the midrib; lamina on upper surface glabrous, lower surface, including nerves, hairy; petiole 1.6-3.3 cm long. **Flowers** in terminal or axillary racemes; petals white with pink stripe in the middle; stamens 28-32. **Fruit** with two prominent long wings, 8-14 x 1.4-2.5 cm; fruit tube globose or round, smooth and glabrous, to 2 cm in diameter.

Habitat and ecology Often gregarious in seasonal semi-evergreen rain forest; usually on well-drained soil, up to 800 m alt.

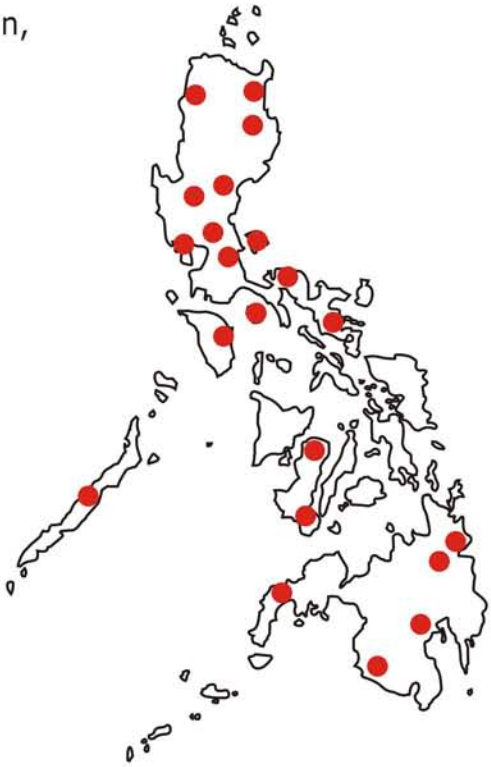
Conservation Status Vulnerable (DENR DAO 2007-01).

Top *Dipterocarpus gracilis* habit; **Bottom left** Fruit and leaf; **Bottom right** Basal part of trunk showing buttresses and bark. coin scale = 2 cm. Photos by Edwino S. Fernando

Panau

Dipterocarpus gracilis Blume

Geographical distribution Philippines: Luzon (Cagayan, Isabela, Ilocos Sur, Nueva Vizcaya, Nueva Ecija, Pangasinan, Zambales, Bataan, Bulacan, Quezon, Camarines, Albay), Polillo, Mindoro, Marinduque, Palawan, Negros, Mindanao (Zamboanga, Cotabato, Davao, Agusan, Surigao). Also in Andaman Is., Chittagong, Myanmar, SE and Peninsular Thailand, Malay Peninsula, Sumatra, Java, and Borneo.



Left Part of the crown of *Dipterocarpus gracilis*; **Right** Young seedling; **Bottom** Fallen flowers. Photos by Edwino S. Fernando

Economic uses An important source of timber for medium and heavy construction. A wood-oil from the stem is extracted and used as a varnish and for illumination.

Wood properties The density of the wood is 580-1,000 kg/m^3 at 15% moisture content. It has similar texture, strength, and durability as *apitong* [*Dipterocarpus grandiflorus* (Blanco) Blanco].

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Foxworthy, F.W. 1911. Philippine Dipterocarpaceae. *Philippine Journal of Science* 6(4): 231-287. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines.* 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5* (1). *Timber trees: Major commercial timber trees.* Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods.* Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 05

Edwino S. Fernando

Apitong

Dipterocarpus grandiflorus (Blanco) Blanco

Synonym: *Mocanera grandiflora* Blanco

Description A large **tree** reaching to 40 m tall and basal trunk up to 180 cm diameter. **Buttresses** present, low, short, and rounded. **Bark** generally smooth and lenticellate in younger, small-diameter trees; flaky in mature, larger trees; newly exposed areas of outer bark comparatively smooth and lenticellate; inner bark reddish, exuding clear sap. **Leaves** ovate, 10-21 x 5-12 cm; base obtuse; apex acute to shortly acuminate; nerves 11-18 on each side of the midrib; lamina leathery, generally glabrous and smooth to the touch; petiole 3-9 cm long; leaf buds usually covered with pinkish, oblong-lanceolate stipules. **Flowers** in axillary racemes; petals white with pink tinge at the base; stamens 30. **Fruit** with two prominent long wings, 12-22 x 2.8-4.2 cm; fruit tube ellipsoid, 4.5-7 x 2.5-3.5 cm, with 5 prominent narrow wings continuous from base to apex.

Habitat and ecology Often common and gregarious in semi-evergreen rain forest; usually on exposed ridges, up to 500 m alt.

Conservation Status
Critically endangered (IUCN 2006)

Top Growth habit of *Dipterocarpus grandiflorus*; **Bottom left** Twig with leaves and fruits; **Bottom right** Basal part of trunk showing low buttresses and flaky outer bark. Photos by Edwino S. Fernando

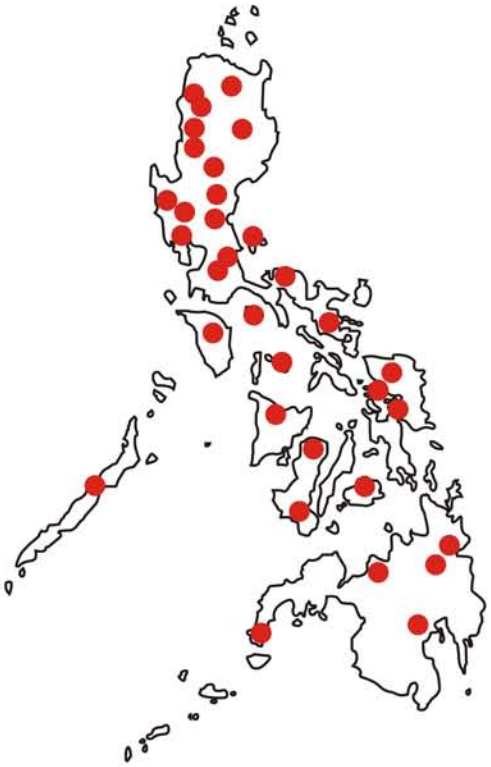
05 Species Fact Sheet

Dipterocarps of the Philippines

Apitong

Dipterocarpus grandiflorus (Blanco) Blanco

Geographical distribution Philippines: Luzon (Cagayan, Isabela, Ilocos Norte, Ilocos Sur, Abra, Benguet, Nueva Vizcaya, Nueva Ecija, Pangasinan, Zambales, Bataan, Bulacan, Pampanga, Rizal, Laguna, Quezon, Camarines, Albay), Polillo, Mindoro, Marinduque, Palawan, Negros, Panay, Samar, Leyte, Bohol, Mindanao (Agusan, Misamis, Davao, Surigao), and Basilan. Also in Andaman Is., Myanmar, Peninsular Thailand, Malay Peninsula,



Left Part of the crown of *Dipterocarpus grandiflorus* with fruits; **Bottom left** Twig showing pink stipules; **Bottom right** Seedling. Photos by Edwino S. Fernando

Economic uses A useful source of timber for medium construction, especially house post and frames. Oleo-resin may be extracted from the stem.

Wood properties Moderately hard and comparatively heavy. The density of the wood is 650-945 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Foxworthy, F.W. 1911. Philippine Dipterocarpaceae. *Philippine Journal of Science* 6(4): 231-287. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // IUCN. 2006 IUCN Red List of Threatened Species. www.iucnredlist.org. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 06

Edwino S. Fernando

Hasselt's panau

Dipterocarpus hasseltii Blume

Synonym: *Dipterocarpus subalpinus* Foxw.

Description A large **tree** reaching to 25 m tall and basal trunk up to 100 cm diameter. **Buttresses** often indistinct or absent, or low and rounded when present. **Bark** lenticellate, irregularly shedding off in large flakes; inner bark pinkish to red brown. **Leaves** broadly elliptic, 7-20 x 5-12 cm, plicate; base wedge-shaped or rounded; apex short acuminate; nerves 11-14 on each side of the midrib, straight to the margin; lamina on upper and lower surfaces smooth to the touch; leaf margin wavy; petiole 2.5-4 cm long. **Flowers** in axillary panicles to 10 cm long, bearing up to 4 secund flowers; petals white; stamens 30. **Fruit** with two prominent long wings, spatulate, 15-22 x 2.5-3 cm; short wings 1-1.5 x 1-1.3 cm; fruit tube subglobose, 2.5-3 x 2.5-3 cm, without angles, wings, or shoulders.

Habitat and ecology In lowland evergreen rain forest and forest over limestone, occasionally up to 1,000 m alt.

Conservation Status
Vulnerable (DENR DAO 2007-01).

Top Habit and crown of *Dipterocarpus hasseltii*; **Bottom left** Leaf and fruit; **Bottom right** Basal part of trunk showing flaky outer bark and absence of prominent buttresses. Photos by Edwino S. Fernando

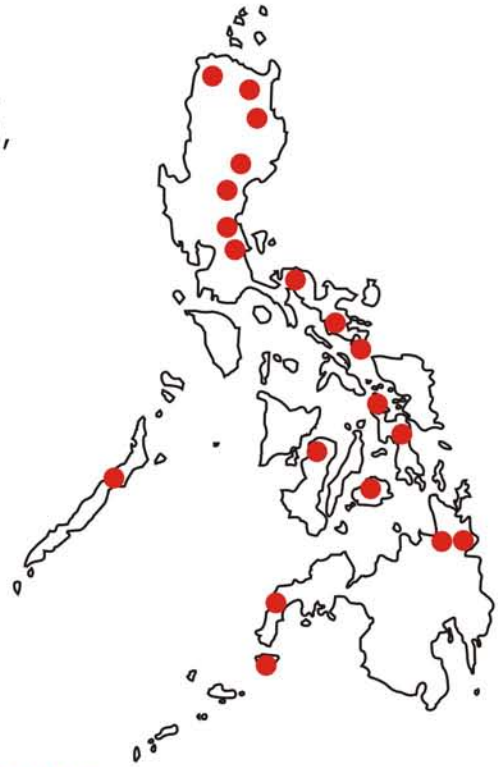
06 Species Fact Sheet

Dipterocarps of the Philippines

Hasselt's panau

Dipterocarpus hasseltii Blume

Geographical distribution Philippines: Luzon (Ilocos Norte, Cagayan, Isabela, Nueva Vizcaya, Nueva Ecija, Quezon, Laguna, Camarines), Palawan, Negros, Biliran, Leyte, Bohol, Mindanao (Zamboanga, Agusan, Surigao), Basilan. Also in Peninsular Thailand, Malay Peninsula, Sumatra, Java, Bali, and Borneo.



Top left Part of the crown of *Dipterocarpus hasseltii* showing young fruits with pinkish wings; **Bottom left** Trunk showing lenticellate and flaky outer bark; **Bottom right** Fruits with two prominent wings, turning lighter pink then brown. Photos by Edwino S. Fernando

Economic uses Source of timber for medium and heavy construction, also of wood oil used for caulking boats, varnish, and illumination.

Wood properties Medium hardwood type with density of 500-980 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Edwino S. Fernando

Malapanau

Dipterocarpus kerrii King

Synonyms: *Dipterocarpus obconicus* Foxw., *Dipterocarpus perturbinatus* Foxw., *Dipterocarpus cuneatus* Foxw.

Description A large **tree** reaching to 30 m tall and basal trunk up to 130 cm diameter. **Buttresses** present, rather tall and plank-like. **Bark** generally smooth, lenticellate, shedding off in large flakes near the base, or often scaly towards the top; inner bark pinkish-brown. **Leaves** broadly elliptic or ovate, 7-13 x 3.3-7.4 cm; base cuneate or wedge-shaped, symmetrical; apex acute or shortly acuminate; nerves 9-11 on each side of the midrib, straight to the margin; lamina on upper and lower surface glabrous, smooth to the touch; leaf margin wavy; petiole 2-3 cm long, slender. **Flowers** in axillary racemes; stamens 28-32. **Fruit** with two prominent long wings, 10-14 x 2-3 cm, tapering apically and abruptly constricted at the base; fruit tube large, globose or subturbinate, smooth and glabrous, to 3-3.5 x 3-3.5 cm.

Habitat and ecology In lowland evergreen and semi-evergreen rain forest; often below 800 m alt.

Conservation Status Vulnerable (IUCN 2006).

Top Habit of *Dipterocarpus kerrii;* **Bottom left** Fruit and leaves; **Bottom right** Basal part of trunk showing buttresses.
coin scale = 2 cm. Photos by Edwino S. Fernando

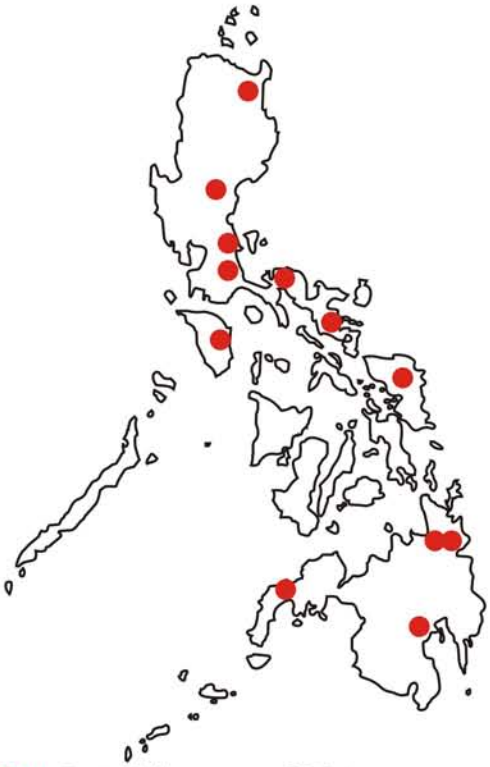
07 Species Fact Sheet

Dipterocarps of the Philippines

Malapanau

Dipterocarpus kerrii King

Geographical distribution Philippines: Luzon (Cagayan, Nueva Ecija, Laguna, Quezon, Camarines, Albay), Mindoro, Samar, Mindanao (Zamboanga, Agusan, Surigao, Davao). Also in Andaman Is., Myanmar, Thailand, Malay Peninsula, Sumatra, and Borneo (Sabah).



Top Part of the crown of *Dipterocarpus kerrii*; **Bottom left** Trunk showing scaly outer bark; **Bottom left** Fruits.
Photos by Edwino S. Fernando

Economic uses An important source of timber for medium and heavy construction; also source of wood oil.

Wood properties The density of the wood is 555-875 kg/m^3 at 15% moisture content. It has wood features similar to, and used in the same way as, *apitong* [*Dipterocarpus grandiflorus* (Blanco) Blanco].

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // Foxworthy, F.W. 1911. Philippine Dipterocarpaceae. *Philippine Journal of Science* 6(4): 231-287. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // IUCN. 2006 IUCN Red List of Threatened Species. www.iucnredlist.org. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 08

Edwino S. Fernando

Broad-winged apitong

Dipterocarpus kunstleri King

Synonym: *Dipterocarpus speciosus* Brandis

Description A medium to large **tree** reaching to 48 m tall and basal trunk up to 140 cm diameter, often only smaller trees are found. **Buttresses** when present often low and rounded. **Bark** generally smooth, lenticellate, shedding off in large flakes; inner bark pinkish-brown. **Leaves** elliptic or broadly lanceolate, 13-27 x 7-18 cm; base cuneate or wedge-shaped, symmetrical; apex acuminate; nerves 15-19 on each side of the midrib, straight to the margin; lamina on upper and lower surface glabrous, smooth to the touch; leaf margin wavy; petiole 2-4.5 cm long. **Flowers** in axillary or terminal racemes; petals yellowish; stamens 28-32. **Fruit** with two prominent long wings, 0.6-11 x 0.5-1.5 cm, tapering apically and abruptly constricted at the base; fruit tube large, at least 1½ times longer than broad, 4-5 x 2-2.5 cm, smooth and glabrous, with 5 angles or ribs.

Habitat and ecology In lowland forest, on undulating lands or flatlands, specially near streams.

Conservation Status Vulnerable (DENR DAO 2007-01).

Top Habit of *Dipterocarpus kunstleri;* **Bottom left** Twig with leaves and immature fruits; **Bottom right** Basal part of trunk showing low buttresses. Photos by Edwino S. Fernando

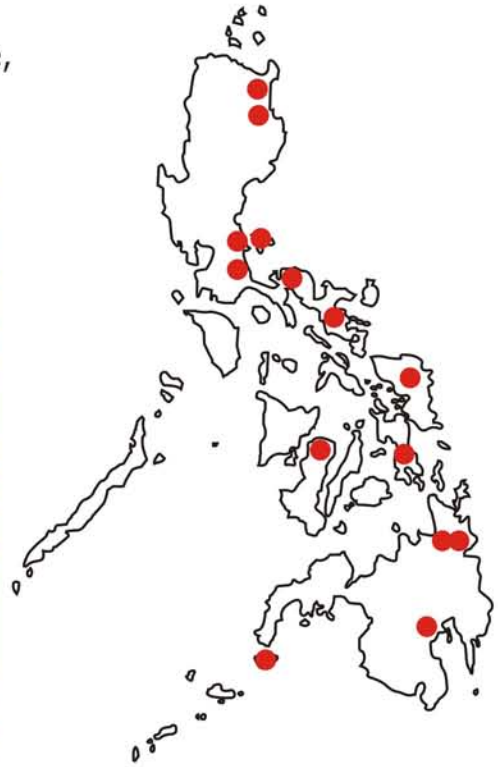
08 Species Fact Sheet

Dipterocarps of the Philippines

Broad-winged apitong

Dipterocarpus kunstleri King

Geographical distribution Philippines: Luzon (Cagayan, Isabela, Laguna, Quezon, Camarines, Albay), Polillo, Leyte, Negros, Samar, Mindanao (Agusan, Surigao, Davao), Basilan. Also in Malay Peninsula, Sumatra, and Borneo.



Top Part of the crown of *Dipterocarpus kunstleri* showing the large leaves with wavy margin, yellow flower, and very young fruits; **Bottom** Trunk showing generally smooth outer bark. Photos by Edwino S. Fernando

Other vernacular names *anahuon, pamalsalan, hagakhak, apitong, balau*

Economic uses An important source of timber for medium and heavy construction. Wood oil is said to be obtainable from the stem.

Wood properties The density of the wood is 510-890 kg/m^3 at 15% moisture content. It has wood features similar to, and used in the same way as *apitong* [*Dipterocarpus grandiflorus* (Blanco) Blanco].

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. Foxworthy, F.W. 1911. Philippine Dipterocarpaceae. *Philippine Journal of Science* 6(4): 231-287. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 09

Edwino S. Fernando

Hagakhak

Dipterocarpus validus Blume

Synonyms: *Dipterocarpus affinis* Brandis, *Dipterocarpus lasiopodus* Perk., *Dipterocarpus warburgii* Brandis, *Dipterocarpus woodii* Merr.

Description A large **tree** reaching to 50 m tall and basal trunk up to 175 cm diameter. **Buttresses** present, especially in mature trees, plank-like. **Bark** generally smooth or irregularly peeling off in small scales; inner bark orangish to red brown. **Leaves** oblong, elliptic, or ovate, 15-26 x 7.5 x 17 cm, plicate; base wedge-shaped or rounded; apex short acuminate; nerves 20-33 on each side of the midrib, straight to the margin; lamina on upper and lower surfaces smooth to the touch; midrib and nerves below brown hairy; leaf margin wavy; petiole 3.5-5 cm long, kneed, sometimes light brown hairy. **Flowers** in axillary or terminal racemes to 15 cm long; petals yellowish; stamens 28-32. **Fruit** with two prominent long wings, 20-25 x 3-3.5 cm; short wings 0.4-0.6 x 0.4-0.6 cm; fruit tube subglobose, 3.5-4 x 3-3.5 cm, without angles, wings, or shoulders.

Habitat and ecology In lowland evergreen rain forest, on lower slopes or plains near streams, or on low hills, up to 300 m alt.

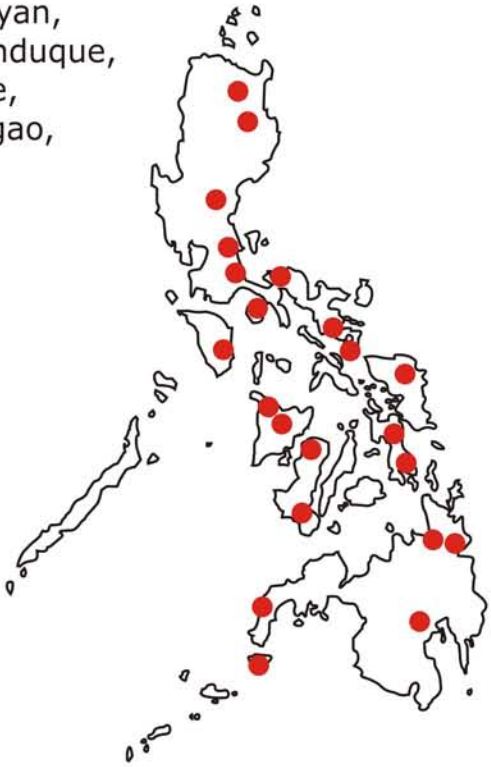
Conservation Status Critically endangered (IUCN 2006).

Top Habit and crown of *Dipterocarpus validus*; **Bottom left** Fruit and leaf; **Bottom right** Basal part of trunk showing prominent plank-like buttresses. coin scale = 2 cm. Photos by Edwino S. Fernando

Hagakhak

Dipterocarpus validus Blume

Geographical distribution Philippines: Luzon (Cagayan, Isabela, Nueva Ecija, Rizal, Quezon, Camarines), Marinduque, Mindoro, Negros, Negros Oriental, Panay, Samar, Leyte, Southern Leyte, Mindanao (Zamboanga, Agusan, Surigao, Davao), Basilan. Also in Borneo (Sabah, Kalimantan).



Top left Trunk of *Dipterocarpus validus* showing generally smooth outer bark or sometimes peeling off in small scales; **Top right** Part of the crown showing large leaves with distinct wavy margin. **Bottom** Young seedling showing first two leaves and hairy epicotyl and shoot bud. Photos by Edwino S. Fernando

Other vernacular names *anahuon, balau, binaguan, kamuyao, lipuut*

Economic uses An important source of timber for medium construction work; wood features similar to, and used in the same way as *apitong*; also source of wood oil used for caulking boats, varnish, and illumination.

Wood properties Medium hardwood type with density of 720-870 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

Text and photos by **Edwino S. Fernando**, University of the Philippines – Los Baños. **January 2009.**

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Dipterocarps of the Philippines

Species Fact Sheet 10

Edwino S. Fernando

Manggachapui

Hopea acuminata Merr.

Synonym: *Hopea maquilingensis* Foxw.

Description A medium-sized to large **tree**, to 35 m tall, with straight, cylindrical stem, and basal trunk to 80-120 cm diameter. **Buttresses** low, thick and rounded. **Bark** prominently fissured; inner bark light yellowish. **Leaves** ovate-elliptic or ovate-lanceolate, 4-12 x 2-4.5 cm; base obtuse, unequal; apex long-acuminate, the acumen to 1 cm long; nerves distinct, 9-12 pairs, arching, sometimes with axillary domatia present near the base; midrib and nerves with sparse, short hairs; petiole 6-10 mm, sparsely short hairy. **Flowers** in terminal or axillary panicles, each branchlet bearing 3-9 flowers; stamens 10. **Fruit** with two prominent long wings (fruit sepals or calyx lobes), the pedicel to 2 mm long; the wings 2-55 x 6-10 mm, spatulate, obtuse, narrowed towards the base, green, turning dark brown when dry; the three other fruit sepals shorter than the nut; nut to 6 x 4 mm, broadly ovoid, apiculate.

Endemic to the Philippines

Habitat and ecology In lowland evergreen and semi-evergreen rain forests and also in forests over limestone, 100-800 m alt.

Conservation Status Critically Endangered (DENR DAO 2007-01).

Top right The crown of *Hopea acuminata*. **Middle right** Trunk showing fissured bark. **Bottom right** Basal part of trunk showing low, rounded buttress. **Bottom left** Twig with fruits. Photos by Edwino S. Fernando

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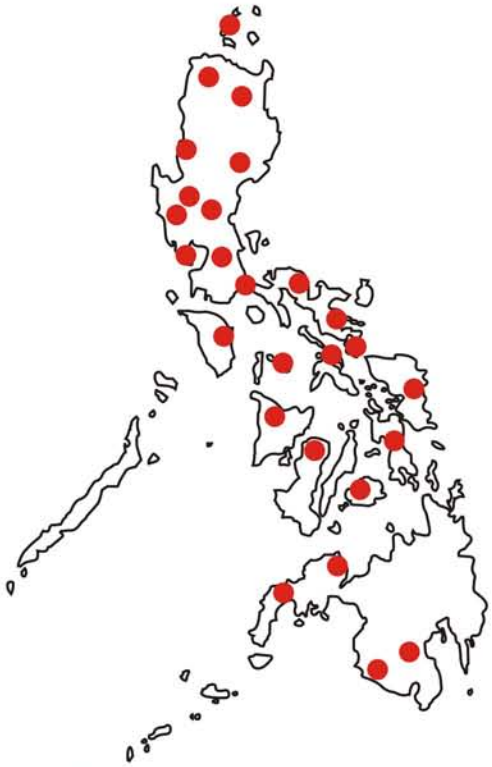
Dipterocarps of the Philippines

Manggachapui

Hopea acuminata Merr.

Geographical distribution Philippines: Babuyan Islands, Luzon (in most provinces, Cagayan to Sorsogon), Mindoro, Ticao, Sibuyan, Negros, Panay, Samar, Leyte, Bohol, Mindanao (Zamboanga, Misamis, Cotabato, Davao).



Top left Twig of *Hopea acuminata* with young flowers and showing characteristic leaf shape. **Bottom left** Seedling. **Bottom right** Fallen leaf fruits, and germinated seed. coin scale = 2 cm. Photos by Edwino S. Fernando

Other vernacular names
dalingdingan, barosingsing

Economic uses The timber is used as medium hardwood especially ideal for doors, sills, and flooring board. The bark contains tannin used in the production of leather and in the manufacture of tannin-formaldehyde adhesives.

Wood properties The density of the wood is about 625-725 kg/m^3 at 15% moisture content; only moderately durable in contact with the ground, but durable for interior work.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Reyes, L.J. 1938. *Philippine Woods*. Tech. Bull. No. 7, Department of Agriculture and Commerce, Manila. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bull. No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 11

Edwino S. Fernando

Narek

Hopea cagayanensis (Foxw.) Sloot.

Description A medium-sized **tree** reaching to 15 m tall and basal trunk up to 35 cm diameter, rarely to 70 cm. **Buttresses** present, low and rather blunt or thin. **Bark** scaly or flaky, grayish to black, the newly exposed surfaces smooth, lenticellate, light brown; inner bark light yellowish. **Leaves** oblong to lanceolate, 7-13 x 2-4 cm, base slightly unequal, broadly cuneate or obtuse on the lower side, faintly subcordate on upper side; apex acuminate, the acumen to 1.5 cm long; nerves prominent beneath, 7-12 on each side of the midrib; domatia present; petiole 5-7 mm long. **Flowers** in axillary panicles to 5 cm long, the branchlets bearing to 3 flowers; stamens 15. **Fruit** without prominent long wings, subsessile, fruit sepals shorter than the fruit, subequal, adpressed to the fruit, the outer ones ovate-acuminate, incrassate, 2-9 x 7 mm, inner ones broadly ovate, obtuse, thin, 3-10 x 10 mm; nut to 15 x 10 mm, ovoid, apiculate.

Endemic to the Philippines

Habitat and ecology
Occurs in lowland rain forests; often gregarious, preferring hill tops, ridges, and slopes, usually on dry and well-drained soil; up to 330 m alt. or more.

Conservation Status
Critically Endangered
(DENR DAO 2007-01).

Top right *Hopea cagayanensis* habit; **Bottom right** Basal part of trunk showing buttresses; **Top left** Twig showing leaf shape; **Bottom left** Fruits.
Photos by Edwino S. Fernando

11 Species Fact Sheet

Dipterocarps of the Philippines

Narek

Hopea cagayanensis (Foxw.) Sloot.

Geographical distribution Philippines: Luzon (Ilocos Norte, Cagayan, Apayao).

Left Trunk of *Hopea cagayanensis* showing scaly bark; **Right** Part of the crown; **Bottom** Habitat of *Hopea cagayanensis* in northwestern Luzon, Philippines. Photos by Edwino S. Fernando

Economic uses The timber is used as heavy hardwood, especially for poles and piles and house construction.

Wood properties The density of the wood is about 920 kg/m^3 at 15% moisture content. A hard, heavy and strong wood comparable to that of *Yakal saplungan* [*Hopea plagata* (Blanco) Vidal] or *yakal* [*Shorea astylosa* Foxw.] in mechanical strength. Very durable even when exposed to weather and in contact with soil.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Reyes, L.J. 1938. *Philippine Woods*. Technical Bulletin No. 7, Department of Agriculture and Commerce, Manila. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Edwino S. Fernando

Yakal-kaliot

Hopea malibato Foxw.

Synonyms: *Hopea woodiana* Gutierrez, *Hopea dalingdingan* Gutierrez

Description A medium-sized **tree**, often 10-20 m tall, sometimes reaching to 30 m, with straight, cylindrical stem, and basal trunk 15-30 cm diameter, occasionally up to 50 cm or more. **Buttresses** generally absent, but the stem base is sometimes stilt-rooted. **Bark** smooth, grayish to dark-brown, the newly exposed surfaces smooth, lenticellate, light brown; inner bark light yellowish. **Leaves** ovate-lanceolate, 5-9 x 1.5-4 cm; base cuneate; apex caudate-acuminate, the acumen to 2 cm long; nervation dryobalanoid (with more or less indistinct nerves), main nerves c. 11 pairs, often with axillary domatia prominent; the midrib equally elevated on both sides of the lamina; petiole 8-16 mm long. **Flowers** in axillary panicles to 2.5 cm long, singly branched to 12 mm long, bearing to 5 flowers; petals light yellow; stamens 15. **Fruit** with two prominent long wings (fruit sepals), the pedicel to 2 mm long; the wings to 35 x 9 mm, spatulate, obtuse, green, turning dark brown when dry; the three other fruit sepals shorter than the nut; nut to 7 x 4 mm, ovoid, apiculate.

Endemic to the Philippines

Habitat and ecology In non-seasonal lowland evergreen rain forests, often in well-drained soil, up to 700 m alt.

Conservation Status
Critically Endangered (DENR DAO 2007-01).

Top right Growth habit of *Hopea malibato*. **Bottom right** Basal part of trunk showing stilt roots. **Left** Twig with fruit and leaves showing leaf shape and lower surface with axillary domatia. Photos by Edwino S. Fernando

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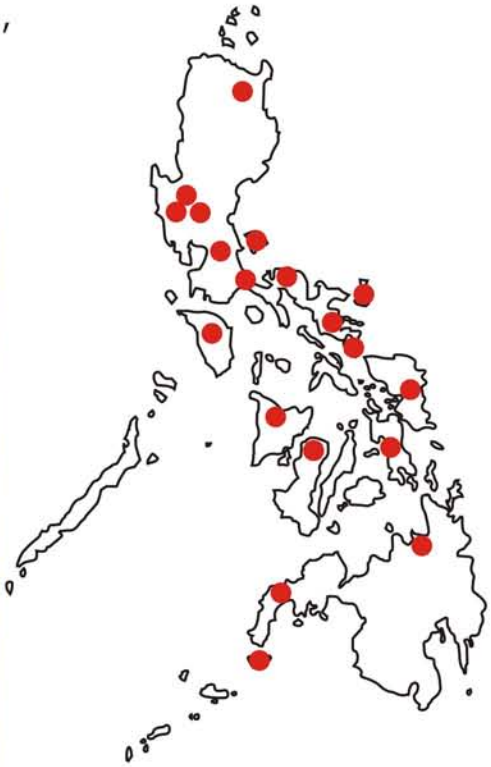
Dipterocarps of the Philippines

Yakal-kaliot

Hopea malibato Foxw.

Geographical distribution Philippines: Luzon (Cagayan, Pangasinan, Nueva Ecija, Zambales, Laguna, Quezon, Leyte, Camarines, Albay, Sorsogon), Polillo, Mindoro, Panay, Negros, Samar, Mindanao (Zamboanga, Agusan del Norte), Basilan.



Top left Trunk of *Hopea malibato* showing smooth bark. **Top right** Part of the crown showing leaves with prominent caudate-acuminate tips. **Bottom** Fallen leaves and fruits of *Hopea malibato* in Atimonan, Quezon Province, Luzon. Coin scale = 2 cm. Photos by Edwino S. Fernando

Other vernacular names *dalingdingan, kaliot, malibato*

Economic uses The timber is used as heavy hardwood for high grade construction work.

Wood properties The density of the wood is about 1,100 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Reyes, L.J. 1938. *Philippine Woods*. Technical Bulletin No. 7, Department of Agriculture and Commerce, Manila. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 13

Edwino S. Fernando

Guisok-guisok

Hopea philippinensis Dyer

Description A small to medium-sized **tree** reaching to 25 m tall and basal trunk up to 40 cm diameter. **Buttresses** present, narrow and plank-like. **Bark** generally smooth, but irregularly flaky or shedding off in large flakes; inner bark pinkish-brown. **Leaves** narrowly elliptic-oblong or lanceolate, 12-25 x 4-7 cm; base unequal, oblique; apex long acuminate; nerves 17-22 on each side of the midrib, arching to the margin; domatia present on axils of nerves and midrib; lamina on upper and lower surface glabrous, smooth to the touch; petiole 5-7 mm long. **Flowers** in axillary racemes to 5 cm long; stamens 15. **Fruit** with two prominent long wings, 10.5-12 x 2.5-3 cm, spatulate, widely arching; the other calyx lobes shorter than the nut; pedicel short, to 2 mm; nut 0.5-0.8 x 0.7-1.2 cm, ovoid, apiculate.

Endemic to the Philippines

Habitat and ecology In lowland evergreen rain forest and in forest over limestone in non-seasonal areas, up to 500 m alt

Conservation Status Critically endangered (DENR DAO 2007-01).

Top Habit of *Hopea philippinensis;* **Bottom left** Twig with leaves showing distinctly unequal and oblique base and mature fruit; **Bottom right** Basal part of trunk showing prominent plank-like buttresses. Top photo by Nemrod E. Dolotina. Bottom photos by Edwino S. Fernando

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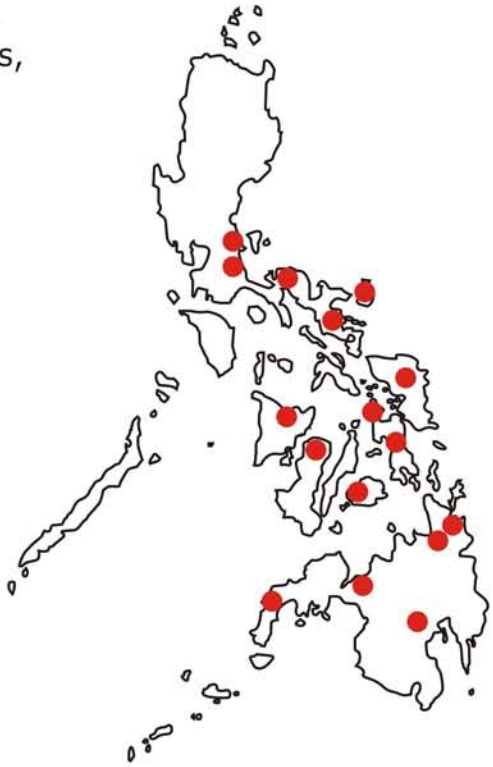
Dipterocarps of the Philippines

Guisok-guisok

Hopea philippinensis Dyer

Geographical distribution Philippines: Luzon (Laguna, Quezon, Camarines, Albay), Catanduanes, Panay, Negros, Samar, Biliran, Leyte, Bohol, Mindanao (Zamboanga, Lanao, Agusan, Surigao, Davao).



Top Mature fruits of *Hopea philippinensis*, one fruit has a third shorter wing developed, an unusual and very rare phenomenon. **Bottom left** Trunk showing flaky outer bark. **Bottom right** Part of the crown showing the leaves. Photos by Edwino S. Fernando

Other vernacular names
bagitarim, baguatsan, bantaya

Economic uses The wood is a heavy hardwood grade; used for house posts or railroad ties.

Wood properties The density of the wood is 705-950 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. Foxworthy, F.W. 1911. Philippine Dipterocarpaceae. *Philippine Journal of Science* 6(4): 231-287. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 14

Edwino S. Fernando

Quisumbing guisok

Hopea quisumbingiana Gutierrez

Description A small to medium-sized **tree** reaching to 20 m tall and basal trunk up to 30 cm diameter. **Buttresses** low and plank-like. **Bark** generally smooth, sometimes with short or broken shallow fissures especially near the base of the trunk. **Leaves** broadly elliptic to suborbicular, 5-7 x 2.5-3.2 cm; base broadly cuneate or obtuse; apex long acuminate to caudate; nerves 9-13 on each side of the midrib, more or less indistinct, arching to the margin; domatia present on axils of nerves and midrib, especially on the basal half of the leaf; lamina on upper and lower surface glabrous, smooth to the touch; petiole 6-8 mm long, slender. **Flowers** in terminal or axillary panicles to 3 cm long; stamens 15. **Fruit** with two prominent long wings, 0.8-1.1 x 4.9-6.2 cm, broadly spatulate; short wings to 0.8 x 0.9 cm, shorter than the nut; nut to 1.1-1.3 x 0.6-0.8 cm, broadly ovoid, tapering to an acute or apiculate apex.

Endemic to the Philippines

Habitat and ecology In forest over limestone in non-seasonal areas, up to 700 m alt.

Conservation Status Critically endangered (DENR DAO 2007-01).

Top Habit of *Hopea quisumbingiana* showing straight cylindrical trunk; **Bottom left** Leaf and fruit; **Bottom right** Basal part of trunk showing prominent, low plank-like buttresses. coin scale = 2 cm. Photos by Edwino S. Fernando

Quisumbing guisok

Hopea quisumbingiana Gutierrez

Geographical distribution Philippines: Samar and Bohol.

Top Leaf and immature and mature fruits of *Hopea quisumbingiana;* lower leaf surface shows domatia along basal half of the midrib; **Bottom left** Trunk showing generally smooth outer bark; **Bottom right** Part of the crown showing twig with young leaves. Photos by Edwino S. Fernando

Economic uses The wood is used as *dalingdingan* for general house construction.

Wood properties Not known.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Gutierrez, H.G. 1968. A revision of the genus *Hopea* Roxb. of the Philippines. *Acta Manillana* Ser. A. 4(2): 3-86, t.1-9. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. //

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Dipterocarps of the Philippines

Species Fact Sheet 15

Edwino S. Fernando

Bagtikan

Parashorea malaanonan (Blanco) Merr.

Synonyms: *Shorea malaanonan* Blume, *Parashorea plicata* Brandis

Description A large **tree** reaching to 60 m tall and basal trunk up to 200 cm diameter. **Buttresses** large and plank-like, tall and spreading. **Bark** fissured, in older trees sometimes cracking horizontally; inner bark reddish brown. **Leaves** elliptic, or ovate, 8-16.5 x 3.5-12 cm; base obtuse to broadly cuneate; apex acuminate; nerves 9-14 on each side of the midrib, steeply ascending, straight at first, then arching near margin only; lamina on upper surface smooth to the touch, the lower surface glaucous or greyish white, smooth to the touch; margin wavy; petiole 1.2-2.2 cm long, kneed. **Flowers** in terminal or axillary panicles to 18 cm long; petals white; stamens 15. **Fruit** with three prominent long wings, 9-16 x 0.7-1.7 cm; short wings 6-10 x 0.5-0.7 cm; base of wings only narrowly imbricate; nut ovoid, 0.9-1.7 x 0.8-1.4 cm, ellipsoid or subglobose, with remnant of style to 0.6 cm long.

Habitat and ecology In lowland evergreen, rain forest, up to 1,300 m alt.

Conservation Status Critically endangered (IUCN 2006).

Top Habit and crown of *Parashorea malaanonan*; **Bottom left** Leaf and fruit; **Bottom right** Basal part of trunk showing prominent tall and large plank-like buttresses. coin scale = 2 cm. Photos by Edwino S. Fernando

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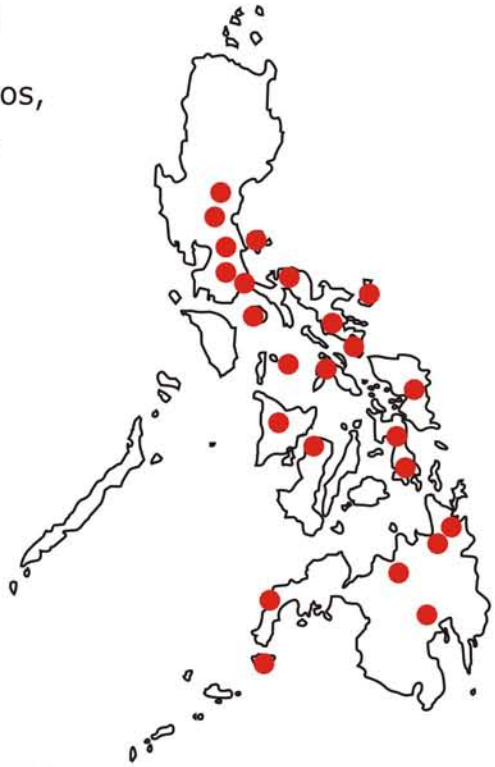
Dipterocarps of the Philippines

Bagtikan

Parashorea malaanonan (Blanco) Merr.

Geographical distribution Philippines: Luzon (Nueva Ecija, Bulacan, Laguna, Quezon, Camarines Albay, Sorsogon), Polillo, Catanduanes, Masbate, Panay, Negros, Samar, Leyte, Southern Leyte, Mindanao (Zamboanga, Bukidnon, Davao, Agusan, Surigao), Basilan. Also in Borneo (Sarawak, Brunei, Sabah, Kalimantan).



Left Part of the crown of *Parashorea malaanonan* with young fruits; **Bottom left** Trunk showing characteristic fissured outer bark; **Bottom right** Seedlings in the nursery. Photos by Edwino S. Fernando

Economic uses Timber is used for furniture, cabinet making, interior finishing, and veneer and plywood.

Wood properties Light hardwood type with density of 420-560 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Foxworthy, F.W. 1911. Philippine Dipterocarpaceae. *Philippine Journal of Science* 6(4): 231-287. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Edwino S. Fernando

Almon

Shorea almon Foxw.

Description A large **tree** reaching to 70 m tall and basal trunk up to 160 cm diameter. **Buttresses** present, large and strong, especially in older trees. **Bark** shallowly-fissured; inner bark reddish yellow, turning reddish brown on exposure. **Leaves** oblong, elliptic, or obovate, 8.7-15.7 x 4.7-8.3 cm; base rounded or obtuse; apex shortly acuminate; nerves 15-19 on each side of the midrib, straight at first, then arching near margin only; lamina on upper surface smooth to the touch, the lower surface, concave or boat-shaped, dull, rough to the touch; petiole 0.8-1.4 cm long. **Flowers** in terminal or axillary panicles to 25 cm long; petals yellowish; stamens 15. **Fruit** with three prominent long wings, 8.8-12.5 x 1.3-2.3 cm; short wings 2.8-6.8 x 0.3-0.5 cm; nut ovoid, 0.80-1.6 x 1.0-1.5 cm, buff pubescent, shortly mucronate.

Habitat and ecology In lowland evergreen and lower montane rain forest, up to 1,060 m alt.

Conservation Status
Vulnerable
(DENR DAO 2007-01).

Top Habit of *Shorea almon*; **Bottom left** Leaf showing boat shaped lower surface and fruit; **Bottom right** Basal part of trunk showing prominent plank buttress. coin scale = 2 cm. Top photo by Nemrod E. Dolotina. Bottom photos by Edwino S. Fernando

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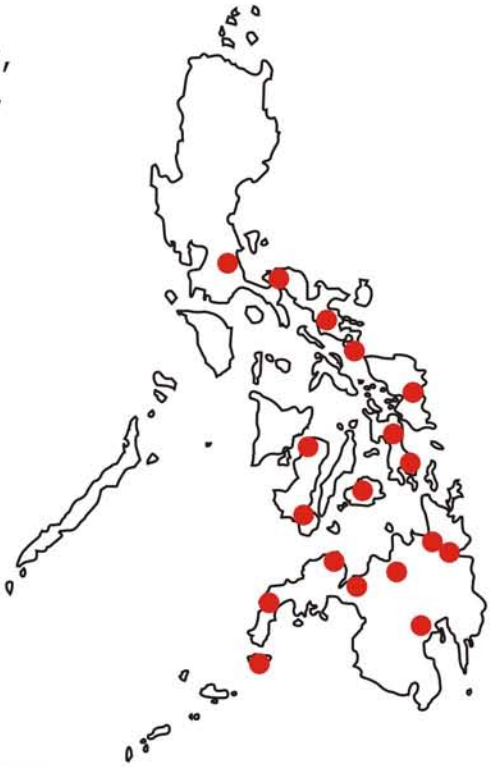
Dipterocarps of the Philippines

Almon

Shorea almon Foxw.

Geographical distribution Philippines: Luzon (Quezon, Camarines, Albay, Sorsogon), Polillo, Negros, Samar, Leyte, Bohol, Mindanao (Zamboanga, Misamis, Lanao, Bukidnon, Davao, Agusan, Surigao), Basilan. Also in Borneo (Sarawak, Sabah).



Left Part of the crown of *Shorea almon* showing characteristic boat-shaped leaves; **Bottom left** Trunk showing shallowly-fissured outer bark; **Bottom right** Seedling. Photos by Edwino S. Fernando

Economic uses Timber is used for light construction work, especially for plywood, furniture and interior work.

Wood properties Light hardwood type with density of 400-580 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 17

Edwino S. Fernando

Manggasinoro

Shorea assamica Dyer ssp. *philippinensis* (Brandis) Sym.

Synonym: *Shorea philipinensis* Brandis

Description A large **tree** reaching to 50 m tall and basal trunk up to 120 cm diameter. **Buttresses** prominent, large and plank-like. **Bark** prominently shallowly fissured; inner bark pale orangish-pink, with white stripes. **Leaves** elliptic or ovate, 4-10 x 2.4-6 cm; base rounded or subcordate; apex acuminate; nerves 10-15 on each side of the midrib, arching towards the margin; lamina on upper surface glossy-green, glabrous, smooth to the touch, the lower surface dull, sparsely hairy; petiole 0.5-1 cm long. **Flowers** in terminal or axillary panicles to 6 cm long; petals white or light yellow; stamens 15. **Fruit** with three prominent long wings, 3-7 x 0.8-1.3 cm; short wings 1.5-5 x 0.4-0.6 cm; nut ovoid, 0.8-1.4 x 0.8-1.1 cm, apiculate.

Habitat and ecology
In lowland evergreen and semi-evergreen rain forest, and in forest over limestone.

Conservation Status
Vulnerable.

Top right Habit and crown of *Shorea assamica* ssp. *philippinensis* in flower; **Bottom right** Basal part of trunk showing prominent plank buttresses; **Top left** Leaves; **Bottom left** Fruits and germinated seeds. Top right and bottom right photos by Edwino S. Fernando. Top left and bottom left photos by Nemrod E. Dolotina

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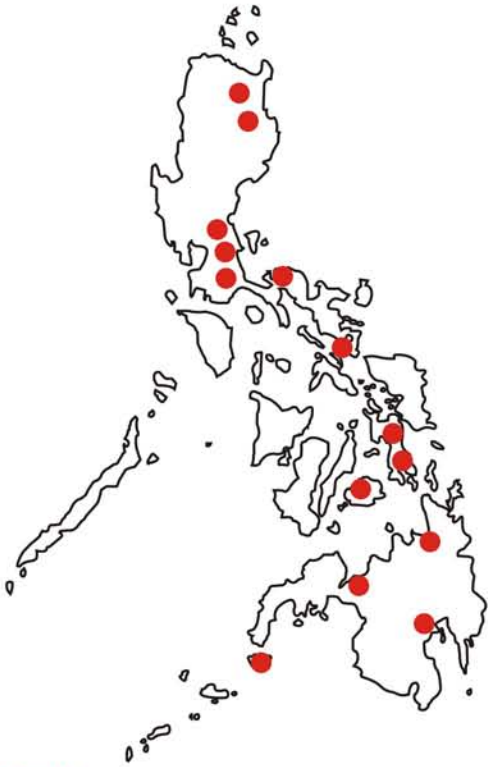
Dipterocarps of the Philippines

Manggasinoro

Shorea assamica Dyer ssp. *philippinensis* (Brandis) Sym.

Geographical distribution Philippines: Luzon (Cagayan, Isabela, Bulacan, Laguna, Quezon, Camarines), Ticao, Leyte, Southern Leyte, Bohol, Mindanao (Lanao, Davao, Agusan), Basilan. Also in Borneo (Kalimantan).



Top left Trunk of *Shorea assamica* ssp. *philippinensis* showing shallowly-fissured outer bark; **Top right** Seedlings in a nursery; **Bottom** Branch from a young tree showing persistent stipules. Photos by Edwino S. Fernando

Economic uses Timber is used as for light construction work; especially used for plywood, furniture, cabinet-making and interior work.

Wood properties Light hardwood type with density of 420-680 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 18

Edwino S. Fernando

White lauan

Shorea contorta Vidal

Synonyms: *Pentacme contorta* (Vidal) Merr. & Rolfe, *Pentacme mindanensis* Foxw.

Description A large **tree** reaching to 50 m tall and basal trunk up to 180 cm diameter. **Buttresses** present, large and strong, especially in older trees. **Bark** shallowly-fissured; inner bark brown to pinkish. **Leaves** elliptic or ovate, 9-29 x 5.5-11 cm; base rounded or truncate; apex long acuminate; nerves 5-9 on each side of the midrib, arching along their length; lamina on upper and lower surfaces smooth to the touch; petiole 1.7-3.5 cm long. **Flowers** in terminal or axillary panicles to 22 cm long; petals whitish; stamens 15. **Fruit** with three prominent long wings, 8-12 x 1.2-3 cm; short wings 3-9 x 0.7-1.5 cm; nut ovoid, 1.5-3.5 x 1.1-1.5 cm, apiculate.

Endemic to the Philippines

Habitat and ecology In lowland evergreen, semi-evergreen, and occasionally in lower montane rain forest, up to 985 m alt., and in forest over limestone up to 650 m alt.

Conservation Status Vulnerable (DENR DAO 2007-01).

Top Habit and crown of *Shorea contorta*; **Bottom right** Fruit and leaf; **Bottom left** Basal part of trunk showing prominent large buttresses. coin scale = 2 cm. Photos by Edwino S. Fernando

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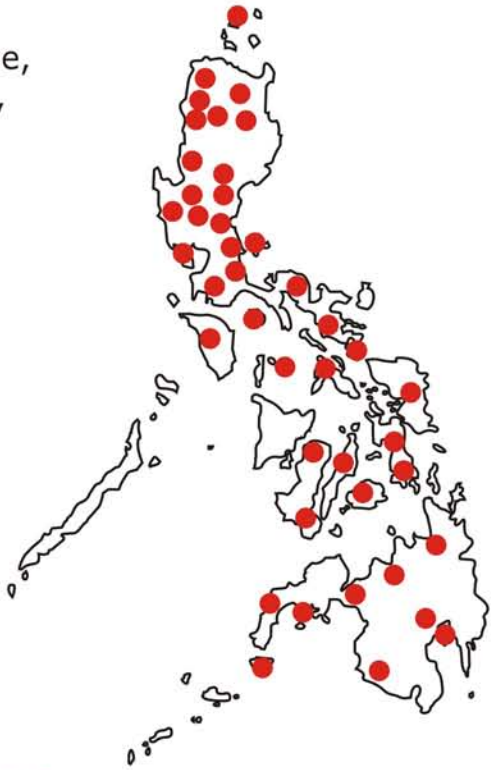
Dipterocarps of the Philippines

White lauan

Shorea contorta Vidal

Geographical distribution Philippines: Babuyan, Luzon (in most provinces), Polillo, Sibuyan, Marinduque, Mindoro, Masbate, Cebu, Negros, Samar, Leyte, Bohol, Mindanao (Zamboanga, Lanao, Bukidnon, Cotabato, Davao, Agusan), Samal, Oluntanga, Basilan.



Left Twig of *Shorea contorta* with mature fruits; **Bottom left** Trunk showing characteristic fissured outer bark; **Bottom right** Young seedlings in the nursery. Photos by Edwino S. Fernando

Economic uses Timber is used for furniture, cabinet making, interior finishing, and veneer and plywood.

Wood properties Light hardwood type with density of 420-560 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 19

Edwino S. Fernando

Yakal-yamban

Shorea falciferoides Foxw. ssp. *falciferoides*

Synonym: *Shorea gisok* Foxw.

Description A large **tree** reaching to 30 m tall and basal trunk up to 180 cm diameter. **Buttresses** present, large and strong, especially in older trees. **Bark** smooth in younger trees, in mature trees peeling off in large flakes; inner bark yellowish, fibrous. **Leaves** elliptic or ovate, 7-18 x 2.5-8 cm; base rounded or wedge-shaped; apex long acuminate; nerves 10-15 on each side of the midrib, arching along their length; lamina on upper surface glossy dark green, smooth to the touch, lower surface light brown to brown, in younger trees creamish or lighter-colored; petiole 1.3-2.8 cm long, slightly kneed. **Flowers** in terminal or axillary panicles, about as long as leaves or shorter; petals whitish; stamens 42-48. **Fruit** with three prominent long wings, 7-9.5 x 1.8-2.2 cm; short wings 6-7 x 0.7-1 cm; nut broadly ovoid, to 1.5 cm diameter.

Endemic to the Philippines

Habitat and ecology In lowland evergreen rain forest, up to 1,000 m alt., often on the upper slopes and ridges.

Conservation Status Vulnerable (DENR DAO 2007-01).

Top Upper trunk of *Shorea falciferoides* ssp. *falciferoides* showing flaky outer bark; **Bottom left** Twig from mature tree showing dark green upper surface and light brown lower surface of leaves, and fruits; **Bottom right** Basal part of trunk showing prominent large rounded buttresses. Photos by Edwino S. Fernando

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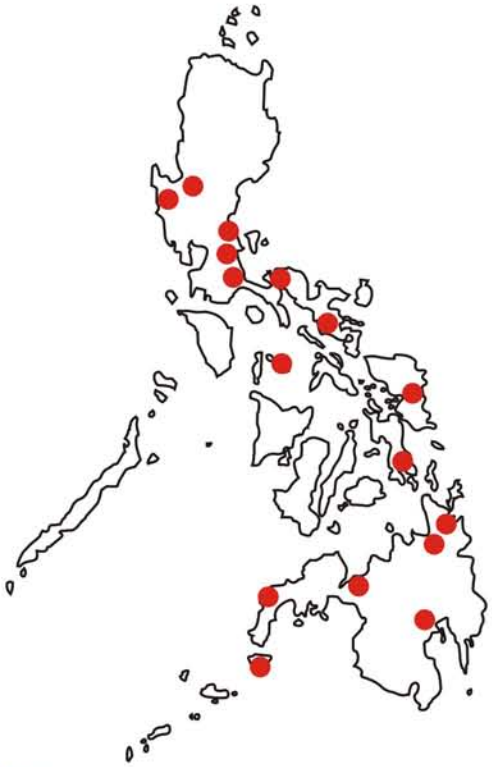
Dipterocarps of the Philippines

Yakal-yamban

Shorea falciferoides Foxw. ssp. *falciferoides*

Geographical distribution Philippines: Luzon (Zambales, Pangasinan, Quezon, Camarines, Albay), Sibuyan, Samar, Southern Leyte, Mindanao (Zamboanga, Davao, Agusan, Surigao), Basilan.



Top Young seedlings of *Shorea falciferoides* ssp. *falciferoides* in various stages of development; **Bottom left** Twig of young sapling; **Bottom right** Fruit and leaf from mature tree showing characteristic light brown lower surface. Photos by Edwino S. Fernando

Economic uses Timber is used for heavy construction as posts and beams.

Wood properties Heavy hardwood type with density of 835-950 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 20

Edwino S. Fernando

Guijo

Shorea guiso (Blanco) Blume

Synonym: *Shorea vidaliana* Brandis

Description A large **tree** reaching to 60 m tall and basal trunk up to 180 cm diameter. **Buttresses** prominent, large, and plank formed. **Bark** irregularly vertically cracked, sometimes scaly, the flakes irregular; inner bark light pink or reddish-brown. **Leaves** elliptic, ovate, or oblong-lanceolate, 5.5-14 x 2.5-6.0 cm; base rounded or obtuse; apex acuminate; nerves 11-19 on each side of the midrib, straight at first, then arching near margin only, or arching along their length; lamina on upper and lower surfaces smooth to the touch; petiole 1-2 cm long. **Flowers** in terminal or axillary panicles to 10 cm long; the branchlet bearing to 5 secund flowers; petals yellow; stamens 15. **Fruit** with three prominent long wings, 4-7 x 0.8-1.5 cm; short wings 2.5-4 x 0.4-0.7 cm; nut ovoid, 1.3-2.7 x 0.5-1.2 cm, apiculate, often hidden by base of calyx lobes or wings.

Habitat and ecology In lowland evergreen and semi-evergreen rain forest, and in forest over limestone.

Conservation Status
Critically endangered (IUCN 2006).

Top Habit of *Shorea guiso*; **Bottom left** Fruits and leaf; **Bottom right** Basal part of trunk showing prominent plank buttresses. coin scale = 2 cm. Photos by Edwino S. Fernando

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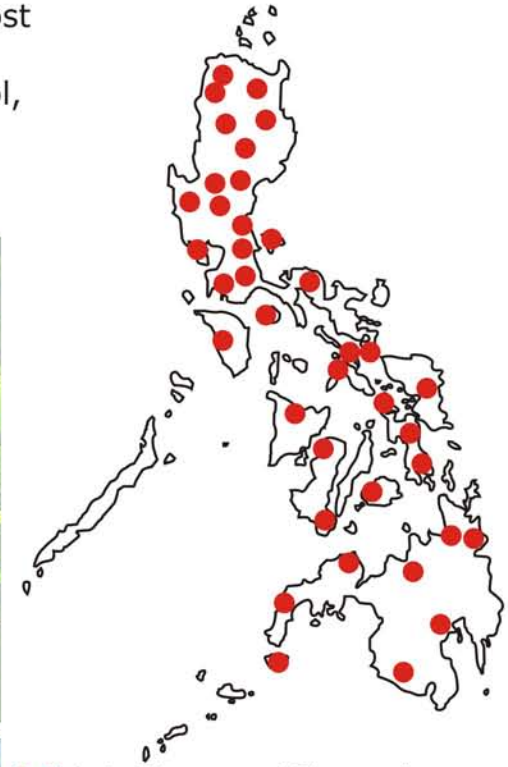
Dipterocarps of the Philippines

Guijo

Shorea guiso (Blanco) Blume

Geographical distribution Philippines: Luzon (in most provinces, Cagayan to Sorsogon), Marinduque, Ticao, Masbate, Mindoro, Panay, Negros, Samar, Leyte, Bohol, Mindanao (Zamboanga, Misamis, Cotabato, Agusan, Surigao, Davao), Basilan. Also in S Vietnam, SE Thailand, Malay Peninsula, Sumatra, and Borneo.



Left Part of the crown of *Shorea guiso*; **Bottom left** Trunk showing irregularly vertically cracked outer bark; **Bottom right** Seedling. Photos by Edwino S. Fernando

Economic uses Timber for light to heavy construction work; also for furniture and cabinet making and other similar uses requiring a hard, strong wood with beautiful grain.

Wood properties Heavy hardwood type with density of 675-1,000kg/m3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Foxworthy, F.W. 1911. Philippine Dipterocarpaceae. *Philippine Journal of Science* 6(4): 231-287. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // IUCN. 2006 IUCN Red List of Threatened Species. www.iucnredlist.org. // Newman, M. F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 21

Edwino S. Fernando

Yakal-malibato

Shorea malibato Foxw.

Description A large **tree** reaching to 30 m tall and basal trunk up to 80 cm diameter. **Buttresses** present, rather low and rounded. **Bark** cracked and scaling off in small patches; inner bark yellowish. **Leaves** ovate-lanceolate, 6-14 x 2-5 cm; base obtuse or broadly cuneate, symmetrical; apex acuminate; nerves 11-15 on each side of the midrib, arching towards the margin; lamina on upper surface glabrous, dark green, the lower surface paler than above, glaucescent light golden brown; petiole 0.9-2 cm long, strongly geniculate. **Flowers** in terminal or axillary panicles; petals yellowish; stamens 35-37. **Fruit** with three prominent long wings, 7 x 1.1 cm; short wings 3.7 x 0.2 cm; nut ovoid, 1.8 x 0.8 cm, shortly buff pubescent, apiculate, tapering into a slender stylopodium.

Endemic to the Philippines

Habitat and ecology In lowland rain forest, often on steep slopes; up to 500m alt.; rather rare.

Conservation Status Critically endangered (DENR DAO 2007-01).

Top Habit of *Shorea malibato*; **Bottom left** Fruit; **Bottom right** Basal part of trunk showing low buttresses and cracked, scaly outer bark. Photos by Edwino S. Fernando

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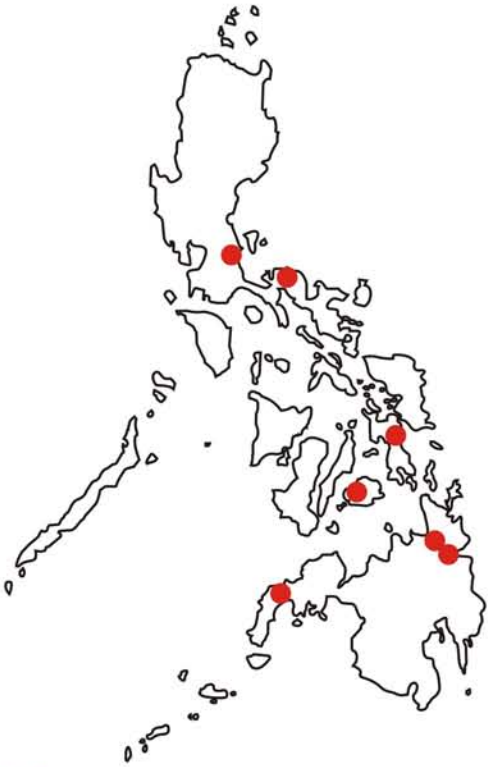
Dipterocarps of the Philippines

Yakal-malibato

Shorea malibato Foxw.

Geographical distribution Philippines: Luzon (Quezon, Camarines), Leyte, Bohol, Mindanao (Zamboanga, Agusan, Surigao del Sur).



Left Part of the crown of *Shorea malibato* showing leaves with light golden brown lower surface; **Bottom left** Flowers; **Bottom right** Germinating seed. Photos by Edwino S. Fernando

Economic uses An important source of timber for heavy construction work requiring strength and durability.

Wood properties Heavy hardwood type with density of about 890 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Foxworthy, F.W. 1913. Dipterocarpaceae from the Agusan Region. *Leaflets of Philippine Botany* 6: 1949-1958. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 22

Edwino S. Fernando

Mayapis

Shorea palosapis (Blanco) Merr.

Synonym: *Shorea squamata* (Turcz.) Benth. & Hook.f.

Description A large **tree** reaching to 50 m tall and basal trunk up to 150 cm diameter. **Buttresses** present, large and strong. **Bark** prominently fissured; inner bark brown to pink. **Leaves** oblong or elliptic, 12-24 x 6-11 cm; leathery; base truncate or subcordate; apex acuminate; nerves 14-20 on each side of the midrib, arching towards the margin; lamina on upper surface glabrous, smooth to the touch, the lower surface rough to the touch, covered with minute stellate hairs; petiole 1.2-2.5 cm long, rather stout. **Flowers** in terminal or axillary panicles; petals creamish or light yellowish; stamens 15. **Fruit** with three prominent long wings, 6.5-12 x 1.2-2.3 cm; short wings 2-5.2 x 0.25-0.4 cm; nut ovoid, 1.5-2.3 x 1.2-1.4 cm.

Endemic to the Philippines

Habitat and ecology In lowland evergreen rain forest on fertile, well-drained sites, and in forest over limestone; up to 1,000 m alt., but more common at lower elevations.

Conservation Status Critically endangered (IUCN 2006).

Top Habit of *Shorea palosapis*; **Bottom left** Twig with leaves and immature fruits; **Bottom right** Basal part of trunk showing large, rounded buttresses.Top and bottom right photos by Edwino S. Fernando. Bottom left photo by Nemrod E. Dolotina

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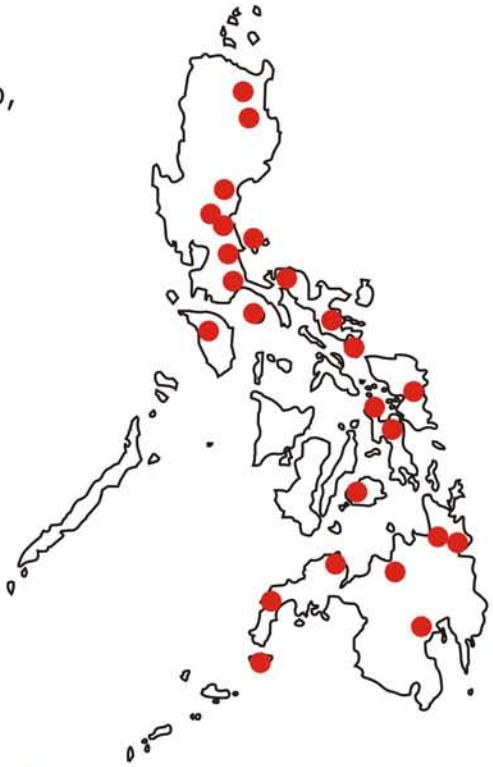
Dipterocarps of the Philippines

Mayapis

Shorea palosapis (Blanco) Merr.

Geographical distribution Philippines: Luzon (Cagayan, Isabela, Nueva Ecija, Bulacan, Rizal, Laguna, Quezon, Camarines, Albay, Sorsogon), Polillo, Marinduque, Mindoro, Samar, Biliran, Leyte, Bohol, Mindanao (Zamboanga, Misamis, Bukidnon, Agusan, Surigao, Davao), Basilan.



Left Part of the crown of *Shorea palosapis* with flowers and young fruits; **Bottom left** Trunk showing fissured outer bark; **Bottom right** Leaf, mature fruit, and seedling. Photos by Edwino S. Fernando

Economic uses Timber is used as *red lauan;* for light construction work, furniture and cabinet making.

Wood properties Light hardwood type with density of 365-680 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Foxworthy, F.W. 1913. Dipterocarpaceae from the Agusan Region. *Leaflets of Philippine Botany* 6: 1949-1958. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // IUCN. 2006 IUCN Red List of Threatened Species. www.iucnredlist.org. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila.

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Dipterocarps of the Philippines

Species Fact Sheet 23

Edwino S. Fernando

Malaanonang

Shorea polita Vidal

Synonyms: *Shorea mindanensis* Foxw.

Description A large **tree** reaching to 30 m tall and basal trunk up to 120 cm diameter. **Buttresses** indistinct, or when present rather very low and rounded. **Bark** fissured; inner bark orange-brown and yellow, laminated. **Leaves** broadly elliptic or ovate 6.5-10 x 3.5-7.5 cm; base rounded; apex shortly acuminate or acute; nerves 11-15 on each side of the midrib, arching towards the margin; lamina on upper surface glabrous, smooth to the touch, and glossy in newly expanded leaves; the lower surface paler than above; the margins sometimes slightly revolute; petiole 1.4-2.5 cm long, sometimes geniculate. **Flowers** in terminal or axillary panicles; petals white, sometimes tinged pink near the base; stamens 21-25. **Fruit** with three prominent long wings, 9-13 x 1.5-2.5 cm; short wings 3-7.5 x 0.3-0.6 cm; nut ovoid, 1.5-2.2 x 1.4-1.6 cm.

Endemic to the Philippines

Habitat and ecology In lowland evergreen and semi-evergreen rain forest, also in forest over limestone; up to 450 m alt.

Conservation Status Vulnerable.

Top Habit of *Shorea polita*; **Bottom left** Leaf and fruits showing three prominent long wings; **Bottom right** Basal part of trunk showing very low rounded or almost indistinct buttress and fissured outer bark. coin scale = 2 cm. Photos by Edwino S. Fernando

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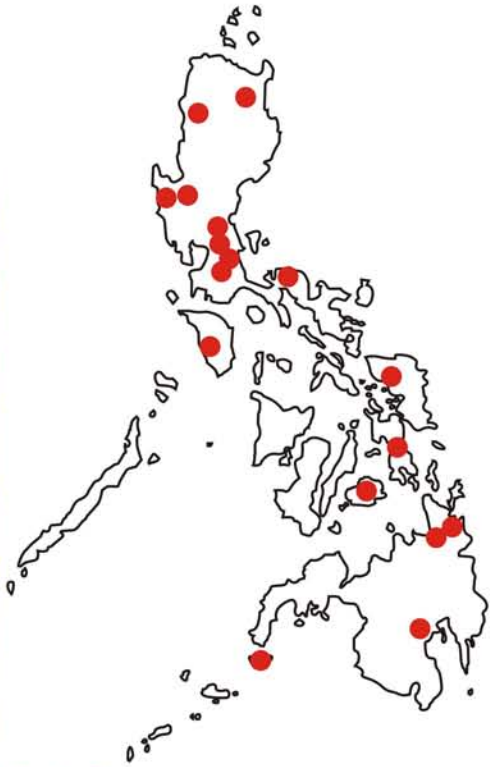
Dipterocarps of the Philippines

Malaanonang

Shorea polita Vidal

Geographical distribution Philippines: Luzon (Cagayan, Ilocos Sur, Pangasinan, Zambales, Nueva Ecija, Rizal, Laguna, Quezon), Mindoro, Samar, Leyte, Bohol, Mindanao (Agusan, Surigao, Davao), Basilan.



Top left Twig of *Shorea polita* showing glossy nature of upper surface of newly expanded leaves; **Top right** Trunk showing fissured outer bark; **Bottom right** Twigs showing light coloration of the lower surface of leaf, and fruits in various stages of maturity. coin scale = 2 cm. Photos by Edwino S. Fernando

Economic uses Timber for light construction work, also for paneling and veneer.

Wood properties Light hardwood type with wood density of about 480-750 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., M.J.M. Bande, R.A. Piollo, D.D. Sopot, N.E. Dolotina, & W.G. Granert. 2009. Dipterocarpaceae of Bohol Island, Philippines. *Asia Life Sciences* 18(1): 121-138. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila. .

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Dipterocarps of the Philippines

Species Fact Sheet 24

Edwino S. Fernando

Tanguile

Shorea polysperma (Blanco) Merr.

Synonym: *Shorea warburgii* Gilg

Description A large **tree** reaching to 50 m tall and basal trunk up to 200 cm diameter. **Buttresses** present, low and plank-like, tending to be slightly larger in trees at lower elevations. **Bark** prominently shallow-fissured, irregularly shedding off in thin, narrow flakes; inner bark light red to pink. **Leaves** elliptic or ovate-lanceolate, 7.5-15 x 2.5-6.5 cm; base rounded; apex acuminate; nerves 9-12 on each side of the midrib, arching towards the margin; lamina on upper surface glossy-green, glabrous, smooth to the touch; petiole 1.5-2.2 cm long. **Flowers** in terminal or axillary panicles to 16 cm long, doubly branching; petals light yellowish; stamens 15. **Fruit** with three prominent long wings, 6-10.8 x 0.9-1.8 cm; short wings 2-5 x 0.3-0.4 cm; nut ovoid, 1.1-1.8 x 1.0-1.4 cm, apiculate.

Endemic to the Philippines

Habitat and ecology In lowland evergreen and lower montane rain forest, up to 1,100 m alt.; also in forest over limestone to 350 m alt.

Conservation Status
Vulnerable (DENR DAO 2007-01).

Top Habit of *Shorea polysperma*; **Bottom left** Fruit and leaf; **Bottom right** Basal part of trunk showing prominent plank buttress. Photos by Edwino S. Fernando

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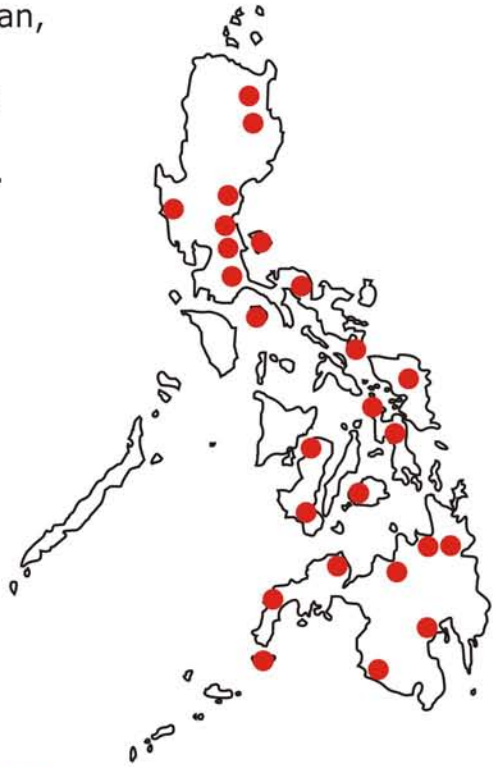
Dipterocarps of the Philippines

Tanguile

Shorea polysperma (Blanco) Merr.

Geographical distribution Philippines: Luzon (Cagayan, Isabela, Nueva Ecija, Bulacan, Zambales, Laguna, Quezon, Camarines, Sorsogon), Polillo, Negros, Samar, Biliran, Leyte, Bohol, Mindanao (Zamboanga, Misamis, Bukidnon, Cotabato, Agusan, Surigao, Davao), Basilan.



Left Part of the crown of *Shorea polysperma* with flowers; **Bottom left** Trunk showing fissured-flaky outer bark; **Bottom right** Twig showing characteristic elliptic or ovate-lanceolate leaves with acuminate apices. Photos by Edwino S. Fernando

Economic uses Timber is used for light construction work; especially used for furniture and cabinet making.

Wood properties Light hardwood type with density of 395-815 kg/m^3 at 15% moisture content.

References Ashton, P.S. 1982. Dipterocarpaceae. *Flora Malesiana* Series I, 9(3): 237-552. // De Guzman, E.D., R.M. Umali, & E.D. Sotalbo. 1981. Philippine Dipterocarps. In: *Guide to Philippine Flora and Fauna*. Vol. 1, 114p., Natural Resources Management Centre and University of the Philippines, Quezon City, Philippines. // Fernando, E.S., L.L. Co, D.A. Lagunzad, W.S. Gruèzo, J.F. Barcelona, D.A. Madulid, A.B. Lapis, G.I. Texon, A.C. Manila, & P.M. Zamora. 2008. Threatened plants of the Philippines: a preliminary assessment. *Asia Life Sciences* Suppl. 3: 1-52. // Foxworthy, F.W. 1911. Philippine Dipterocarpaceae. *Philippine Journal of Science* 6(4): 231-287. // Foxworthy, F.W. 1918. Philippine Dipterocarpaceae, II. *Philippine Journal of Science* 13(3): 163-199. // Foxworthy, F.W. 1938. Philippine Dipterocarpaceae, III. *Philippine Journal of Science* 67(3): 241-333. // Newman, M.F., P.F. Burgess, & T.C. Whitmore. 1996. *Manuals of Dipterocarps for Foresters: Philippines*. 124p. Royal Botanic Garden Edinburgh, U.K. and Centre for International Forestry Research, Jakarta, Indonesia. // Rojo, J.P. 1979. Updated enumeration of Philippine dipterocarps. *Sylvatrop, Philippine Forest Research Journal* 4(3): 123-145. // Rojo, J.P. & E.G. Aragones Jr. 1997. *Botanical Identification Handbook on Philippine Dipterocarps*. 97p. Forest Products Research and Development Institute, Los Baños, Philippines. // Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1994. *Plant Resources of South-east Asia No. 5 (1). Timber trees: Major commercial timber trees*. Prosea Foundation, Bogor, Indonesia. 610p. // Tamesis, F. & L. Aguilar. 1953. *The 'Philippine Mahogany' and Other Dipterocarp Woods*. Popular Bulletin No. 44, Department of Agriculture and Natural Resources, Manila

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Dipterocarps of the Philippines

Species Fact Sheet 25

Edwino S. Fernando

Narig

Vatica mangachapoi Blanco ssp. *mangachapoi*

Synonym: *Vatica whitfordii* Foxw.

Description A large **tree** reaching to 35 m tall and basal trunk up to 70 cm diameter. **Buttresses** low and broadly rounded. **Bark** generally smooth, slightly mottled and irregularly scaly; inner bark light pink to orange. **Leaves** elliptic, 6-11 x 3-5 cm; base cuneate; apex acuminate; nerves 7-9 pairs on each side of the midrib, straight at first, then arching near margin only, or arching along their length; lamina on upper and lower surface glabrous, smooth to the touch; petiole 0.5-1.1 cm long. **Flowers** in terminal or axillary panicles to 14 cm long, singly or doubly branched; petals whitish; stamens 15. **Fruit** with two prominent long wings, to 5.5 x 1.5 cm, arching; short wings to 1.0 x 0.4 cm; nut ovoid, to 0.4 x 0.6 cm.

Habitat and ecology In lowland evergreen rain forest up to 800 m alt. and in forest over limestone up to 600 m alt.

Conservation Status Vulnerable (DENR DAO 2007-01).

Top Habit and crown of *Vatica mangachapoi* ssp. *mangachapoi*; **Bottom left** Twig with leaves and mature fruits; **Bottom right** Basal part of trunk showing low, broadly rounded buttress. Top photo by Nemrod E. Dolotina. Bottom photos by Edwino S. Fernando

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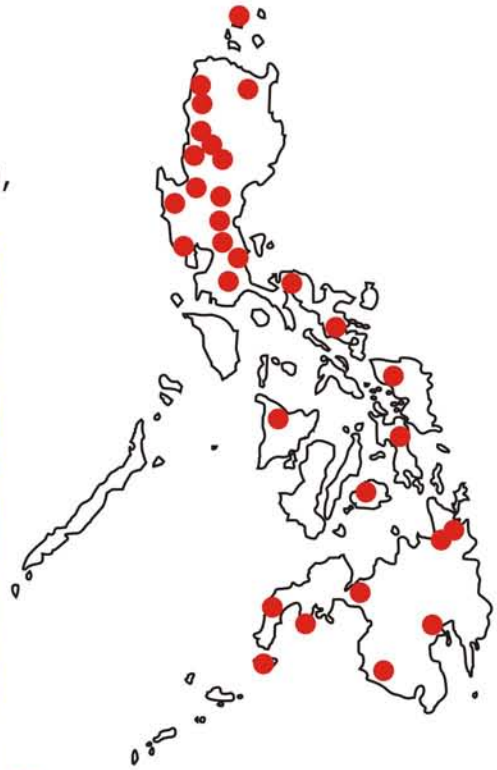
Dipterocarps of the Philippines

Narig

Vatica mangachapoi Blanco ssp. *mangachapoi*

Geographical distribution Philippines: Babuyan Islands, Luzon (in most provinces), Panay, Samar, Leyte, Bohol, Mindanao (Zamboanga, Lanao, Cotabato, Davao, Agusan, Surigao), Oluntanga, Basilan. Also in Peninsular Thailand, Malay Peninsula, and Borneo (Sarawak, Brunei, Sabah).



Left Part of the crown of *Vatica mangachapoi* ssp. *mangachapoi* with mature fruits; **Bottom left** Trunk showing irregularly scaly outer bark; **Bottom right** Fallen leaves, old fruit, and seedling. Photos by Edwino S. Fernando

Economic uses Timber is used as *yakal-saplungan,* for general heavy construction, piles, poles, bridges, wharves, and other uses

Wood properties Heavy hardwood type with density of 690-1,175 kg/m^3 at 15% moisture content.

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Dipterocarps of the Philippines

Species Fact Sheet 26

Edwino S. Fernando

Yakal-saplungan

Hopea plagata (Blanco) Vidal

Description A large **tree** reaching to 55 m tall and basal trunk up to 180 cm diameter, but more commonly only to 60 cm. Buttresses prominent, steep and plank. Bark generally smooth in younger trees, fissured-scaly in mature ones; inner bark light yellowish to reddish-brown. Leaves broadly elliptic-lanceolate or ovate, 6-12 x 2.2-7 cm; base cuneate to obtuse, sometimes markedly unequal; apex acute or short acuminate; nerves 7-12 on each side of the midrib, arching along their length, sometimes with domatia; lamina on upper and lower surfaces glabrous and smooth to the touch; midrib and nerves below glabrous; petiole 0.5-1.6 cm long, glabrous. Flowers in axillary or terminal singly branched panicles to 3 cm long; stamens 32-38. Fruit with two prominent long wings, broadly long-spatulate, 2-4.5 x 1.3-2 cm, sometimes suborbicular; short wings 0.7 x 0.4 cm; nut globose, 0.5-1 cm x 0.4-0.7 cm, narrowly ovoid, more or less pubescent or glabrous, apiculate.

Habitat and ecology In lowland evergreen and semi-evergreen rain forest.

Conservation Status Endangered (DENR DAO 2007-01).

Top Habit and crown of Hopea plagata; **Bottom left** Juvenile and mature fruits, and leaves; **Bottom right** Basal part of trunk showing steep, plank buttresses. Photos by Edwino S. Fernando.

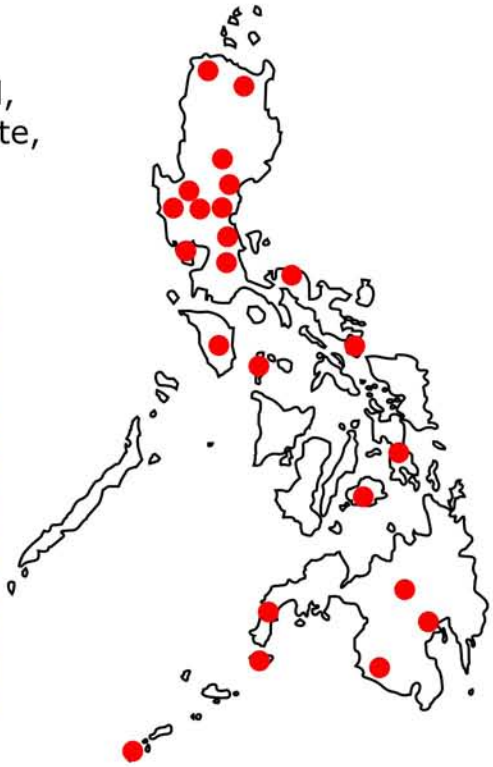
26 Species Fact Sheet

Dipterocarps of the Philippines

Yakal-saplungan

Hopea plagata (Blanco) Vidal

Geographical distribution Philippines: Luzon (Ilocos Norte, Cagayan, Nueva Vizcaya, Nueva Ecija, Pangasinan, Tarlac, Zambales, Bataan, Bulacan, Rizal, Quezon, Camarines, Sorsogon), Mindoro, Tablas, Leyte, Bohol, Mindanao (Zamboanga, Bukidnon, Cotabato, Davao), Basilan, Tawi-tawi. Also in Borneo (N.E. Sarawak, Kalimantan).



Top Part of the crown of *Hopea mailbato*; **Bottom** Trunk of mature tree showing fissured-scaly outer bark. Photos by Edwino S. Fernando

Other vernacular names *gisok-gisok, gyam, haras, malibato, saplungan, yakal*

Economic uses Source of timber for heavy construction work, *e.g.* house construction (especially posts), ship building, for bridges, wharves and railway ties.

Wood properties Heavy hardwood type with density of 1100 kg/m^3 at 15% moisture content.

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ABOUT THE AUTHORS

Marlito Jose M. Bande, *PhD*

Instructor, Institute of Tropical Ecology, College of Forestry and Natural Resources, Visayas State University (VSU), Baybay, Leyte 6521-A, Philippines

He obtained his BSc in Agribusiness from the Visayas State College of Agriculture (now VSU), his MSc in Food Security and Natural Resource Management from the University of Hohenheim, Stuttgart, Germany, and his PhD in Agroecology at the UH, Germany. He was one of the pioneer researchers in the implementation of the Rainforestation technology was personally involved in the community-based production and conservation of dipterocarp species in Leyte since 1993. He has published 6 articles in scientific journals and books. Currently, he is pursuing advocacy on the cultivation and conservation of dipterocarps in the Philippines.

Maria Juliet C. Ceniza, *DSci Agr*

Director, Institute of Tropical Ecology, College of Forestry and Natural Resources, Visayas State University (VSU), Baybay, Leyte 6521-A, Philippines

She obtained her BSc in Agriculture and MSc in Entomology from the Visayas State College of Agriculture (now VSU) and graduated her DSci in Agriculture at the University of Hohenheim in Stuttgart Germany. She also holds a Professor position in the same University teaching and conducting research along the fields of ecology, entomology and plant protection courses for over 25 years now. She has prepared and published over 25 scientific publications in referred in journals and is a contributor of the book on "Ecosystems of Palawan" (2003). She developed, prepared and edited info and instructional materials such as the "RF Trainer's Training manual" (2009). She has conducted and delivered lectures and facilitated orientation trainings and cross visits on Rainforestation.

Nemrod E. Dolotina, *BSc*

Project Coordinator, "Dipterocarp Tree Domestication and Use of Public and Private Lands in Selected Sites to Expand and Conserve Philippine Forest Project", Soil and Water Conservation Foundation Inc., Bilar, Bohol, Philippines

He obtained his Bachelor of Science in Forestry degree at the Central Visayas State College of Agriculture Forestry and Technology (CVSCAFT) in Bilar Bohol in 2001. He has worked as a Field Technician of the Soil and Water Conservation Foundation (SWCF). He co-authored papers on "Ferns and Fern Allies of Bohol Island" and "Dipterocarpaceae of Bohol Island".

Edwino S. Fernando, *PhD*

Professor, Department of Forest Biological Sciences, The University of the Philippines - Los Baños, College, 4031 Laguna, Philippines

He is a Professor and a researcher at UPLB for more than 30 years in the fields of forest botany, dendrology and plant biodiversity studies. He has a BSc and MSc in Forestry from the University of the Philippines – Los Baños, an MSc in Plant Taxonomy from the University of Reading England, and PhD in Botany from the University of New South Wales, Australia. He has written over 60 papers published mostly in peer-reviewed scientific journals. He is lead author of the book "Flowering Plants and Ferns of Mt. Makiling" (2004) and "Forest Formations of the Philippines" (2009).

William G. Granert, *MSc*

Executive Director, Soil and Water Conservation Foundation, Inc., 169-G. Maria Cristina Extension, Cebu City, Philippines

He has worked in the Philippines for over thirty-five years in natural resource management, integrated rural development and environment education. He has a BS in Zoology from the University of Wisconsin and an MS in Botany and Education from the University of Wisconsin-Milwaukee in the United States. He has worked as an agroforestry consultant to the DENR, taught soil and water conservation to upland farmers, and helped develop sustainable projects and programs for local barangays and municipalities. He has published over 40 articles and papers and is one of the principal authors of SWCF's Karst Information Kit for Environmental Management Decision Makers.

Paciencia P. Milan, *PhD*

University Professor, Department of Pest Management, Visayas State University, Visca, Baybay, Leyte 6521-A, Philippines

She has a BSc in Zoology and MSc in Biology from the University of San Carlos, Cebu City. She obtained her PhD in Biology/Vertebrate Ecology and Pest Management from Bowling Green State University, Bowling Green, Ohio, U.S.A. She has co-authored around 15 books, one of which she is one of the principal authors entitled "Ecolog of Southeast Asia – The Indonesian Archipelago". She has also written about 8 papers published in peer-reviewed scientific journals, more than 35 manuals, modules and guides and other extension materials. She is the co-author in the development of the Rainforestation Farming Technology concept in 1991 in VSU and had prepared the original guides and manuals on Rainforestation. She is now actively engaged in the wider promotion, adoption and advocacy of the RF as well as other environment related cause and concerns.

Mitzi T. Pollisco, *PhD*

Forestry Consultant, 9999 Mt Pulog St., Los Baños Subdivision, Los Baños, Laguna 4030, Philippines

She obtained her BSc, MSc, and PhD in forestry from the University of the Philippines - Los Baños. She is a research scientist with extensive work in tree improvement/propagation, including pioneering work in the propagation of dipterocarp species from cuttings. She previously worked for the Ecosystems Research and Development Bureau (ERDB) of the Department of Environment and Natural Resources (DENR) of the Philippines for twenty-five years, reaching the level of Senior Science Research Specialist. She currently works for GHD Pty Ltd, an international consultancy. Dr Pollisco has extensive experience in environmental impact assessment and has published 20 technical papers dealing with her expertise. She also received the International Green Apple Environmental Best Practice Award (Gold) Conservation and Wildlife Category, November 2006, House of Commons, London for her work with propagation of dipterocarps.

Diosdado D. Sopot, *BSc*

Forester, Soil and Water Conservation Foundation Inc., Bilar, Bohol, Philippines

A graduate of the Bachelor of Science in Forestry from the Central Visayas State College of Agriculture, Forestry and Technology (CVSCAFT) in Bilar Bohol in 2001. He is a licensed Forester and now works for the Soil and Water Conservation Foundation (SWCF). He co-authored papers on "Fern and Fern Allies of Bohol Island", "Dipterocarpaceae of Bohol Island" and "Preliminary Study of Pygmy Swiftlet's (*Collocalia troglodytes*) Nesting and Breeding Behavior in Rajah Sikatuna Protected Landscape Riverside, Bohol".