






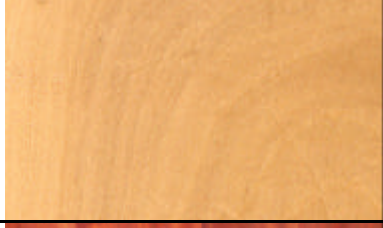

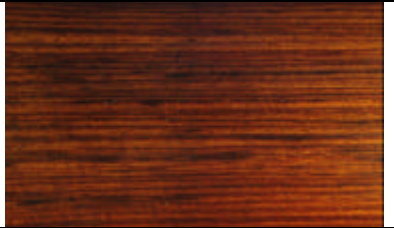






**Tropical timbers available in FSC-certified wood
Is available**

Trade Name	Bot. Name	IUCN Red List	Utilisation	Picture
Kwila	<i>Intsia bijuga</i> <i>I. palembanica</i>		Flooring, furniture, paneling, fine joinery, decorative turnery, cabinetmaking, musical instruments, specialty items. The wood is also a dye source.	
Jatoba	Hymenaea courbaril		Tool handles and other applications where good shock resistance is needed, steam-bent parts, flooring, turnery, furniture and cabinet work, railroad crossties tree-nails, gear cogs, wheel rims, and other specialty items. Tree exudes a rosin-like gum known commercially as South American copal. Seed pods contain an edible pulp.	
Cumaru / Tonka / Ebo	Dipteryx odorata		Heavy construction, cogs and shafts, barge and dock fenders, flooring, railroad crossties, pulp mill equipment, tool handles, bearings, turnery. A substitute for lignum vitae.	
Machiche	Lonchocarpus castilloi		Heavy construction, flooring, furniture components. Durable species suggested for railroad crossties.	

Padouk	<i>Pterocarpus indicus</i>		Rough construction lumber, particleboard and fiberboard, general carpentry, plywood, fine joinery, fancy turnery, carvings, flooring, decorative veneer, tool and knife handles. Furniture, boat building.	
Marupa	<u>Simarouba amara</u>		Interior construction, boxes and crates, furniture components, veneer and plywood, pattern making, millwork, particleboard and fiberboard.	
Curupau	Anadenanthera macrocarpa		Used for heavy exterior construction and marine work, flooring, railroad crossties, tool handles, turnery. The bark is extracted for its tannin	
Guatambu	Balfourodendron riedelianum	EN A1acd+2cd	Furniture, cabinetwork, tool handles, flooring, turnery. Suggested as a substitute for birch and hard maple	
Muirapiranga, Satinè	Brosimum paraense		General construction work, flooring, furniture, cabinet work, veneers, and tool handles.	

Indian Rosewood	Dalbergia latifolia		Fine furniture and cabinetwork, musical instruments, turnery, decorative veneers, specialty items	
Cocobolo	Dalbergia retusa		Highly favored in the cutlery trade for handles, inlay work, brush backs, musical and scientific instruments, jewelry boxes, chessmen, and other specialty items	
Eucalyptus	Eucalyptus diversicolor		Heavy construction but not for dock and harbor work, flooring, used locally for plywood.	
Morado	Machaerium scleroxylon		Fine furniture, decorative veneers, turnery, specialty items, and cabinet work. Generally useful for the same purposes as Brazilian rosewood (<u>Dalbergia nigra</u>).	
Honduras Mahagoni	Swietenia macrophylla	VU A1cd+2cd	Fine furniture and cabinet making, interior trim, paneling, fancy veneers, musical instruments, boat building, pattern making, turnery, and carving	

Ipe	Tabebuia impetiginosa		Railroad crossties, heavy construction, tool handles, turnery, industrial flooring, textile mill items, decorative veneers	
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Sources where you could search for FSC certified tropical timbers:





www.certifiedwood.org



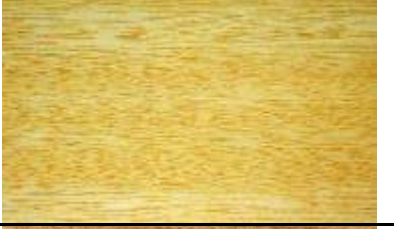


www.espen.de






www.preciouswoods.com




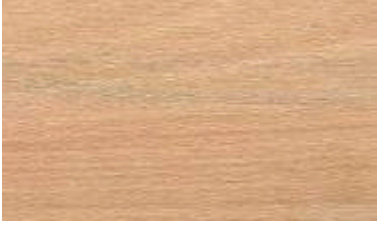

www.ecotimber.co.uk


Tropical Wood



Trade Name	Bot. Name	IUCN – Red List category	Utilisation	Picture
Abachi	<i>Triplochiton scleroxylon</i>	LR (lc)	Furniture components, plywood, joinery, millwork, boxes and crates, blockboard, particle and fiberboard, patternmaking, artificial limbs, sauna.	
Mahogany	<i>Swietenia humilis</i> , <i>Swietenia macrophylla</i> , <i>Swietenia mahagoni</i>	VU A1cd VU A1cd+2cd EN A1cd	Fine furniture and cabinet making, interior trim, paneling, fancy veneers, musical instruments, boat building, pattern making, turnery, and carving.	
Teak	<i>Tectona grandis</i>	NE	Shipbuilding, joinery, furniture, flooring, carving, cabinetwork, paneling, turnery, tanks and vats, fixtures requiring high resistance to acids.	
Merbau, Kwila	<i>Intsia bijuga</i> <i>I. palembanica</i>	VU A1cd	Flooring, furniture, paneling, fine joinery, decorative turnery, cabinetmaking, musical instruments, specialty items. The wood is also a dye source.	





Dark Red Meranti	<i>Shorea curtisii</i> , <i>S. ovata</i> , <i>S. pauciflora</i> , <i>S. singkawang</i>	LR lc EN A1cd EN A1cd CR A1cd	Veneer and plywood, joinery, flooring, furniture and cabinetwork, general construction, boatbuilding.	
Light Red Meranti	<i>Shorea acuminata</i> , <i>S. lebrosula</i> , <i>S. macroptera</i> , <i>S. parviflora</i>	CR A1cd EN A1cd	Light structural work, furniture components, joinery, plywood, cabinetwork, flooring, concrete form work, a general utility wood.	
White Meranti	<i>Shorea bracteolata</i> , <i>S. hypochra</i> and other species of the subgenus <i>Anthochorea</i> .	EN A1cd+2cd CR A1cd	Veneer and plywood, flooring, general construction, vats and casks, boat framing.	
Yellow Meranti	<i>Shorea acuminatissima</i> , <i>S. faguetiana</i> , <i>S. gibbosa</i> , <i>S. hopeifolia</i> , <i>S. multiflora</i> and other species of the subgenus <i>Richetia</i>	CR A1cd EN A1cd CR A1cd CR A1cd	Joinery, flooring, furniture components, plywood, paneling, light structural work. Dammar exudates are collected from trees in Malaya.	
Yellow Balau	<i>Shorea obtusa</i> , <i>S. robusta</i> , <i>S. atrinervosa</i> , <i>S. glauca</i> and others.	EN A1cd	Heavy construction, framing of boats, parquet flooring, heavy-duty flooring, utility and garden furniture.	

Bangkirai	<i>Shorea laevifolia</i>		Heavy construction, framing of boats, parquet flooring, heavy-duty flooring, utility and garden furniture.	
Sapelli	<i>Entandrophragma cylindricum</i>	VU A1cd	Furniture and cabinetwork, decorative veneers, plywood, joinery, flooring, paneling.	
Sipo	<i>Entandrophragma utile</i>	VU A1cd	Furniture and cabinetwork, joinery, decorative veneers and plywood, boat construction.	
Khaya / African Mahogany	<i>Khaya anthotheca, K. grandifoliola, K. ivorensis, K. madagascariensis, K. senegalensis</i>	VU A1cd VU A1cd VU A1cd EN A1cd VU A1cd	Furniture and cabinetwood, boatbuilding, joinery, veneer and plywood, paneling, flooring, shop fixtures.	
Bongossi /Azobe	<i>Lophira alata</i>	VU A1cd	Heavy durable construction work, harbor work, heavy-duty flooring, parquet flooring, railroad cross-ties	

Iroko, Kambala	<i>Milicia excelsa</i> , <i>M. regia</i>	VU A1cd VU A1d	Suggested as a teak substitute. Joinery, boatbuilding, piling and marine work, domestic flooring, furniture, veneer, railroad cross-ties, cabinetwork, shop fittings.	
Afrormorsia	<i>Pericopsis elata</i>	EN A1cd	Boatbuilding, joinery, flooring, furniture, decorative veneers, considered an excellent teak substitute.	
Wenge / Panga Panga	<i>Millettia laurentii</i> <i>M. stuhlmannii</i>	EN A1c,d	Parquet or strip flooring, joinery, general construction, specialty items. Wenge is used as a hickory substitute in sporting goods, also for decorative veneer.	
Ramin	<i>Gonystylus affinis</i> , <i>G. bancanus</i> , <i>G. brunnescens</i> , <i>G. confuses</i> , <i>G. keithii</i> , <i>G. macrophyllus</i> , <i>G. maingayi</i>	NE VU A1cd NE NE VU A1cd+2cd VU A1cd	Furniture, joinery, moldings, paneling, flooring, turnery, plywood, nonstriking handles (brooms), dowels, picture frames, a general utility wood.	
Keruing / Yang/ Apitong	<i>Dipterocarpus alatus</i> , <i>D. baudii</i> , <i>D. costulatus</i> , <i>D. grandiflorus</i> , <i>D. kerrii</i> , <i>D. verrucosa</i> and others.	EN A1cd+2cd, B1+2c CR A1cd+2cd CR A1cd+2cd, B1+2c CR A1cd+2cd CR A1cd+2cd, B1+2c	General construction work, framework for boats, flooring, pallets, chemical processing equipment, veneer and plywood, suggested for railroad cross-ties if treated.	

Parashorea White Seraya White Salaun	<i>Parashorea aptera</i> , <i>P. buchananii</i> , <i>P. chinensis</i> , <i>P. densiflora</i> , <i>P. globosa</i> , <i>P. lucida</i> , <i>P. macrophylla</i> , <i>P. malaanonan</i> , <i>P. parvifolia</i> , <i>P. plicata</i> , <i>P. smythiesii</i> , <i>P. stellata</i> , <i>P. tomentella</i>	CR A1cd EN A1cd, C2a, D EN A1cd, B1+2c EN B1+2e, D CR A1cd, B1+2c, C2a CR A1cd, B1+2c, C2a CR A1cd CR A1cd, B1+2c	Interior joinery, light construction, flooring, plywood, furniture and cabinetwork, general carpentry work, ships' decking.	
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Trade Name	Bot. Name	Utilisation	Picture
Kwila	<i>Intsia bijuga</i> <i>I. palembanica</i>	Flooring, furniture, paneling, fine joinery, decorative turnery, cabinetmaking, musical instruments, specialty items. The wood is also a dye source.	
Jatoba	Hymenaea courbaril	Tool handles and other applications where good shock resistance is needed, steam-bent parts, flooring, turnery, furniture and cabinet work, railroad crossties tree-nails, gear cogs, wheel rims, and other specialty items. Tree exudes a rosin-like gum known commercially as South American copal. Seed pods contain an edible pulp.	

Cumaru / Tonka / Ebo	<i>Dipteryx odorata</i>	Heavy construction, cogs and shafts, barge and dock fenders, flooring, railroad crossties, pulp mill equipment, tool handles, bearings, turnery. A substitute for lignum vitae.	
Machiche	<i>Lonchocarpus castilloi</i>	Heavy construction, flooring, furniture components. Durable species suggested for railroad crossties.	
Padouk	<i>Pterocarpus indicus</i>	Rough construction lumber, particleboard and fiberboard, general carpentry, plywood, fine joinery, fancy turnery, carvings, flooring, decorative veneer, tool and knife handles. Furniture, boat building.	
Marupa	<u><i>Simarouba amara</i></u>	Interior construction, boxes and crates, furniture components, veneer and plywood, pattern making, millwork, particleboard and fiberboard.	

IUCN Red List Categories and criteria:

EXTINCT (EX) - A taxon is Extinct when there is no reasonable doubt that the last individual has died.

EXTINCT IN THE WILD (EW) - A taxon is Extinct in the wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the following criteria (A to E):

- A) Population reduction in the form of either of the following:
- 1) An observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
 - a) direct observation
 - b) an index of abundance appropriate for the taxon
 - c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
 - d) actual or potential levels of exploitation
 - e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
 - 2) A reduction of at least 80%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d) or (e) above.
- B) Extent of occurrence estimated to be less than 100 km² or area of occupancy estimated to be less than 10 km², and estimates indicating any two of the following:
- 1) Severely fragmented or known to exist at only a single location.
 - 2) Continuing decline, observed, inferred or projected, in any of the following:
 - a) extent of occurrence
 - b) area of occupancy
 - c) area, extent and/or quality of habitat
 - d) number of locations or subpopulations
 - e) number of mature individuals
 - 3) Extreme fluctuations in any of the following:
 - a) extent of occurrence
 - b) area of occupancy
 - c) number of locations or subpopulations
 - d) number of mature individuals
- C) Population estimated to number less than 250 mature individuals and either:
- 1) An estimated continuing decline of at least 25% within three years or one generation, whichever is longer or
 - 2) A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
 - a) severely fragmented (i.e. no subpopulation estimated to contain more than 50 mature individuals)
 - b) all individuals are in a single subpopulation
- D) Population estimated to number less than 50 mature individuals.
- E) Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer.

ENDANGERED (EN)

A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the following criteria (A to E):

- A) Population reduction in the form of either of the following:
- 1) An observed, estimated, inferred or suspected reduction of at least 50% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
 - a) direct observation
 - b) an index of abundance appropriate for the taxon
 - c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
 - d) actual or potential levels of exploitation
 - e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
 - 2) A reduction of at least 50%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d), or (e) above.
- B) Extent of occurrence estimated to be less than 5000 km² or area of occupancy estimated to be less than 500 km², and estimates indicating any two of the following:

- 1) Severely fragmented or known to exist at no more than five locations.
- 2) Continuing decline, inferred, observed or projected, in any of the following:
 - a) extent of occurrence
 - b) area of occupancy
 - c) area, extent and/or quality of habitat
 - d) number of locations or subpopulations
 - e) number of mature individuals
- 3) Extreme fluctuations in any of the following:
 - a) extent of occurrence
 - b) area of occupancy
 - c) number of locations or subpopulations
 - d) number of mature individuals

C) Population estimated to number less than 2500 mature individuals and either:

- 1) An estimated continuing decline of at least 20% within five years or two generations, whichever is longer, or
- 2) A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
 - a) severely fragmented (i.e. no subpopulation estimated to contain more than 250 mature individuals)
 - b) all individuals are in a single subpopulation.

D) Population estimated to number less than 250 mature individuals.

E) Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer.

VULNERABLE (VU)

A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the following criteria (A to E):

A) Population reduction in the form of either of the following:

- 1) An observed, estimated, inferred or suspected reduction of at least 20% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
 - a) direct observation
 - b) an index of abundance appropriate for the taxon
 - c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
 - d) actual or potential levels of exploitation
 - e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
- 2) A reduction of at least 20%, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d) or (e) above.

B) Extent of occurrence estimated to be less than 20,000 km² or area of occupancy estimated to be less than 2000 km², and estimates indicating any two of the following:

- 1) Severely fragmented or known to exist at no more than ten locations.
- 2) Continuing decline, inferred, observed or projected, in any of the following:
 - a) extent of occurrence
 - b) area of occupancy
 - c) area, extent and/or quality of habitat
 - d) number of locations or subpopulations
 - e) number of mature individuals
- 3) Extreme fluctuations in any of the following:
 - a) extent of occurrence
 - b) area of occupancy

- c) number of locations or subpopulations
- d) number of mature individuals

C) Population estimated to number less than 10,000 mature individuals and either:

- 1) An estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer, or
- 2) A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:
 - a) severely fragmented (i.e. no subpopulation estimated to contain more than 1000 mature individuals)
 - b) all individuals are in a single subpopulation

D) Population very small or restricted in the form of either of the following:

- 1) Population estimated to number less than 1000 mature individuals.
- 2) Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km²) or in the number of locations (typically less than five). Such a taxon would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming Critically Endangered or even Extinct in a very short period.

E) Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

LOWER RISK (LR) - A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

- 1. **Conservation Dependent (cd)**. Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
- 2. **Near Threatened (nt)**. Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.
- 3. **Least Concern (lc)**. Taxa which do not qualify for Conservation Dependent or Near Threatened.

NOT EVALUATED (NE) A taxon is Not Evaluated when it has not yet been assessed against the criteria.

B) Detailed Information:

1. Abachi:

Triplochiton scleroxylon

Trade and local names: abachi (D), obeche (WAN, B), wawa (GH, GB), ayous (F, G, CAM), samba (CI, F).

Distribution

This species occurs in Benin, Cameroon, Congo, Côte d'Ivoire, Equatorial Guinea, Ghana, Guinea, Liberia, Nigeria, Sierra Leone and Zaire.

Habitat

T. scleroxylon occurs mainly in forests transitional between humid evergreen and semi-deciduous forests. It prefers base rich, high pH soils and is associated with a two-peak rainfall pattern (Hall & Bada, 1979 in Hawthorne, 1995a). The species has extended its range due to deforestation for agricultural purposes (White, 1983).

Population Status and Trends

It is very common in Ghana, especially outside the wet evergreen forest type (Hawthorne, 1995a). Increasingly smaller trees are being logged in Nigeria for match production which is putting pressure on the species (WCMC, 1991). Populations of this species only occur in north Congo especially in the Sangha region.

Regeneration

This species regenerates well in logged forest (Hawthorne, 1995a) and in abandoned farmland. It is fast growing and light demanding. Seed production is very irregular for this species; good seed years occur every 4-5 years. It is thought that the dry spell between the two rainy peaks is a stimulus for flowering (Hall & Bada, 1979 in Hawthorne, 1995a).

Threats

This species is severely threatened by over-exploitation in Ghana (Hawthorne, 1995a)

Utilisation

Used locally and internationally as a timber species. Sauna, plywood, veneer, aircraft construction, furniture and boxes

Trade

T. scleroxylon accounts for more of the timber volume extracted annually from west African forests than any other single species. It is Ghana's major timber species for the export trade; in 1989, it accounted for 56.6% of the country's log exports and 22.9% of lumber exports.

In 1994, 310,000 m³ of Obeche were exported in log form from Cameroon at an average price of US\$220.00/m³. Ghana exported Obeche logs and 131,360 m³ of sawnwood, air dried sold for an average of US\$274.00/m³ and kiln dried sold for US\$330.00/m³.

Togo exported *Triplochiton* spp. as sawnwood. As a veneer, Obeche was exported in 1995 from

Cameroon, and Ghana (sliced veneer: 660 m³ @ ave. US\$1214.00/m³; rotary peeled @ ave. US\$357.00/m³; jointed veneer @ ave. US\$1951.00/m³). Plywood *T. scleroxylon* was exported from Cameroon (10,000 m³ @ ave. US\$695.00/m³) and Ghana in 1994 (ITTO, 1995a).

In 1994, *T. scleroxylon* logs were imported into the Netherlands (2,000 m³), Portugal (408m³ @ ave. US\$18.00/m³), Switzerland (3,000 m³) and the USA (ITTO, 1995a). Italy imported 46,144 m³ and Switzerland imported 1,900 m³ of Obeche sawnwood. Portugal, Sweden, and the USA also imported Obeche sawnwood. In addition, Portugal and the United States imported Obeche veneer and plywood. (ITTO, 1995).

Conservation Status

IUCN Category and Criteria: LR (lc) (African Regional Workshop, 1996)

This species is considered Vulnerable (1994 IUCN threat category) due to excessive exploitation (Hawthorne, 1995b). It has been awarded a scarlet star in Hawthorne's (1995a) star system for Ghana, which means that it is common but it is under profound pressure from heavy exploitation. This species requires protection and exploitation has to be limited if it is to be sustainable (Hawthorne, 1995a).

Conservation Measures

It is protected by law in Côte d'Ivoire. Export of this species has been banned by Liberia. (WCMC, 1991).

2. Mahogany:

a) *Swietenia humilis*

Meliaceae

Trade and local names: caoba, coabilla, cóbano, gateado, Pacific coast mahogany, venadillo, zapatón, zopilote

Distribution

Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama

Habitat

A fairly widespread species of dry deciduous forest, savanna, rough scrub, rocky hillsides and cultivated fields.

Population Status and Trends

Trees are most often seen as scattered and isolated individuals, preserved in cultivated land and pastures. Large specimens are rare.

Threats

Habitat loss

Utilisation

The timber is used in local carpentry, but is of little commercial importance.

Trade

Reports of international trade in 1994 record Honduras as exporting 4000m³ plywood at an average price of US\$149/m³, 4000m³ veneer at an average price of US\$57/m³, 3000m³ sawnwood at an average price of US\$71/m³, 3000m³ logs at US\$57/m³. Importers of *Swietenia* spp. in the form of plywood include U.S.A., Portugal; in the form of veneer include U.S.A., Portugal and Greece; in the form of sawnwood include U.S.A., Sweden, Portugal, Greece; and Portugal is recorded as importing logs (ITTO, 1997).

CITES reported trade for this species in the period 1990 - 1994 consists of two transactions reported by Guatemala; 72m³ exported to Guadeloupe and 41m³ exported to the USA.

IUCN Conservation category

Conservation Measures

The species is listed on Appendix II of CITES

Forest Management and Silviculture

Some experimental plantings have been established, for example in Honduras, but have suffered from the impact of mahogany shoot borer, *Hypsipyla grandella* (Newton, *in litt.* 1998)

b) *Swietenia macrophylla*

Meliaceae

Trade and local names: Amerikanisches Mahagoni, echtes Mahagoni, Honduras-, Tabasco-, Nicaragua-Mahagoni (D); caoba (cAm), aguano (PA, PE, BR); orura (YV); zopilote (MEX); sapotón (SME); yulu (NIC), crura (BOL); acajou d'Amérique (F), American mahogani, baywood (GB), broadleaf mahogany (USA). acajou, águano, araputango, caoba, Honduras mahogany, large-leaved mahogany, mara, mogno

Distribution

Belize, Bolivia, Brazil (Acre, Amazonas, Goías, Maranhão, Mato Grosso, Pará, Rondônia, Tocantins), Colombia, Costa Rica, Dominica, Ecuador, El Salvador, French Guiana, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Peru, Venezuela

Habitat

This species tolerates a wide range of environmental conditions, often in areas of 1000 – 2000 mm annual rainfall but also in some very wet areas, over 4000 mm rainfall, and on a variety of soils.

Population Status and Trends

A large timber tree with an extensive distribution, originally described from cultivated specimens in India. Currently the most commercially important of the mahoganies, exploitation has been taking place for several centuries. Populations in the northern part of the species' range from Mexico to Colombia were depleted at a relatively early stage. Exploitation in Brazil began in the 1960s but has continued at a very rapid rate. The most extensive stands are found in Brazil. In Bolivia, the populations in Santa Cruz are essentially extinct and in Beni they are decimated. Mahogany operations continue at Pando but these populations, too, are expected to be exhausted within the decade (Killeen, 1997). Only a few populations remain in northeast Ecuador, where selective logging has caused genetic erosion and population decreases (Buitrón, 1996).

Mahogany regenerates in extensively cleared areas after large-scale disaster and therefore generally occurs in even-aged stands. Modern logging practises, therefore, commonly lead to the complete (or 95%, leaving non-commercially individuals) removal of stands over a large area, leaving few smaller individuals and an insubstantial seed source for future regeneration (Snook, 1996). Regeneration after selective and clear felling has been noted as poor or non-existent in a number of countries because of these characteristics of the species. Evidence of genetic erosion has been described by various experts, although no quantitative information is available to support these suggestions (Newton *et al.*, 1996). Harvesting and processing are only 50% efficient. There is little economic incentive to sustainably manage natural stands (Gullison, pers. comm. 1996).

Various countries record the species as threatened at a national level (Asociación Nacional para la Conservación de la Naturaleza, 1990; Buitrón, 1996; IBAMA, 1992; Jiménez Madrigal, 1993).

Threats

Commercial overexploitation

Utilisation

Originally preferred for making canoes and ships at a domestic level, mahogany is now considered one of the highest-quality woods in the world. It is principally used for interior finishing, furniture, ornaments, inlays and carving.

Trade

In Brazil and Bolivia over 70% of the mahogany harvested is bound for international trade. Most mahogany harvested in Guatemala is also for export, mainly to Mexico (Snook, 1996).

International trade data from 1994 reports that Honduras exported *Swietenia macrophylla* in the form of plywood, veneer, sawnwood and logs. Peru exported veneer in 1994 and sawnwood in 1995, Brazil exported 98,000m³ sawnwood in 1995. The species is also entering international trade from non-native sources

such as Fiji, Thailand, Trinidad and Tobago. Importers of *Swietenia* spp. in the form of plywood include U.S.A., Portugal; in the form of veneer include U.S.A., Portugal and Greece; in the form of sawnwood include U.S.A., Sweden, Portugal, Greece; and Portugal is recorded as importing logs (ITTO, 1997).

IUCN Conservation category

VU A1cd+2cd according to WCMC.

Conservation Measures

Proposals to list the species on CITES have repeatedly failed.

Populations are found in a number of national parks and forest reserves, such as the Biosphere Reserve Montes Azules in Chiapas and Calakmul in Campeche and the Mayan Biosphere Reserve in northern Petén. In Brazil 3.5 million ha of parks and reserves have been created within the mahogany. However the enforcement of protective measures in these areas is problematic and illegal logging is known to be widespread (Newton *et al.* 1996).

Techniques for the effective genetic conservation of mahogany are available. Progress has been made in establishing the correct conditions for long term seed storage. However there is no coordinated effort to ensure the *ex situ* conservation of important genotypes.

Forest Management and Silviculture

Regeneration is stochastic, depending on large-scale disturbance. The species is cultivated throughout the tropics. It is able to grow on most soil types but responds best when growing in deep fertile well-drained soils. Fruit crops are regularly borne after about 15 years age. Growth is very rapid under favourable conditions; annual volume increments of 15-20m³ per. ha. Have been achieved in the Antilles with rotations of 40-50 years (Lamprecht, 1989). The most serious unsolved problem in mahogany cultivation, particularly in the neotropics, is the damage caused to young trees by the shoot borer *Hypsipyla grandella* (Lamprecht, 1989).

Although some mahogany forests have now been certified as sustainable, the vast majority of mahogany is exploited in unmanaged stands and there are very few examples where attempts are being made to harvest the timber sustainably (Newton, *in litt.* 1998).

c) *Swietenia mahagoni*

Meliaceae

Trade and local names: acajou, caoba, coabilla, Cuban mahogany, madeira, mahok, mahoni, small-leaved mahogany, West Indian mahogany

Distribution

Anguilla, Antigua and Barbuda, Bahamas, Cayman Islands, Colombia, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe (Guadeloupe, St Martin-St Barthelemy), Jamaica, Martinique, Montserrat, St Kitts and Nevis, St Lucia, St Vincent, Turks and Caicos Islands, USA (Florida)

Habitat

A species of tropical, lowland closed and open forest types. In south Florida the species occurs in remaining areas of dry or moist forest, often on limestone.

Population Status and Trends

The first mahogany to appear in the European market five centuries ago. Natural stands became extensively exhausted before the early years of this century in many areas. Some authors have suggested that the species has experienced severe genetic erosion, but hard evidence of this is lacking (Newton *et al.* 1996). Well formed timber trees are now extremely rare and most individuals are highly branched, relatively short trees. It is reported to be one of the dominant species of semi-deciduous forest in the Sierra de Neiba in Hispaniola (Harcourt & Sayer, 1996). Various countries have recorded the species as threatened at a national level (Calderon, 1997; Jiménez, 1978).

Threats

Overexploitation

Utilisation

As with *S. macrophylla* the timber is of the highest-quality, used in cabinet and furniture-making, panelling and pianos.

Trade

Small quantities of timber from plantations are periodically available on the international market.

CITES reported trade in this species, added to Appendix II of the Convention following a decision by the Eighth Meeting of the Conference of the Parties in 1992, consists of the export of 72 carvings from the Dominican Republic to Spain as reported by Spain; 41 live plants and 32 timber pieces exported from the Dominican Republic to the USA as reported by the Dominican Republic (Oldfield and Collins, 1997).

IUCN Conservation category

EN C1 according to the Americas Regional Workshop for the WCMC/SSC *Conservation and sustainable management of trees* project (WCMC, 1996).

Conservation Measures

The species is listed in Appendix II of *CITES. In Florida the species is listed as threatened in Florida Statute 581.185.

Forest Management and Silviculture

Regeneration depends on large-scale disturbance; flooding, hurricane etc. Trees do not set seed until at least 12 years age. The establishment of plantations has had limited success because of attack by the shoot-borer *Hypsipyla grandella*.

3. Teak:

Tectona grandis

Verbenaceae

Trade name: Teak

Local names: Kyun, Lyiu (Myanmar), Teck (French), Teca (Spanish), Sagun, Tegu, Tegina, Thekku (India), Mai Sak (Thailand), Djati (Indonesia), Fati (Malay).

Distribution

Teak occurs naturally in Cambodia, India, north-west Laos, Myanmar, north Thailand and Vietnam but it has been widely planted outside its natural range since the fourteenth century.

Habitat

Teak naturally occurs in areas of monsoon climate under a wide range of site conditions.

Population status and trends

According to Hedegart (1976), in spite of centuries of heavy and usually dysgenic exploitation, natural Teak forests still offer valuable gene resources; but clearing, illegal exploitation, deliberate burning and grazing continue at an increasing rate to put pressure on natural populations. According to FAO (1990), Teak is considered a priority species for *in situ* conservation.

Within its area of natural distribution some varieties are Endangered in India (FAO, 1990). In that country there is a huge shortfall in general in the requirement and availability of timber (Chadha, 1988) but *Tectona grandis*, which occurs gregariously, is not under any threat (Lal *in litt.*, 1990). In Thailand Teak has been exploited for centuries. By the end of the nineteenth century extraction of Teak at an excessive rate was leading to forest deterioration. Protective legislation for the species and control over its exploitation were introduced. Teak is not considered to be a rare species within the country but it has disappeared from much of the otherwise undisturbed Thai forest.

Logging bans in Thailand and Laos have increased the international demand for Teak from Myanmar, leading to concern about the rate of felling within the country. Illegal felling in the Myanmar/Thai border area to supply Thai sawmills has been widely publicised. The protection of areas of undisturbed natural Teak forests to ensure future supplies of selected seed for commercial plantations is considered one of the highest forest conservation priorities in Myanmar (Blower, 1985).

It is uncertain whether the 'natural' Teak stands in Indonesia are indigenous or were originally planted by Hindu settlers. According to Lande (1987) the Teak forests in Java are rapidly decreasing because of increasing demands for agricultural land. In the other islands such as Celebes and Nusa Tenggara, the 'natural' Teak forests are decreasing rapidly, without sufficient management and planting.

Threats

Logging and forest clearance.

Utilisation

The heartwood is dark golden yellow and turns a dark brown with exposure and the wood has an oily feel. It is easily worked with hand and machine tools and glues well despite its oily nature. The wood is durable against decay fungi and termites but is not immune to marine borers. Teak is one of the world's most versatile and outstanding timbers, with many valuable properties. It has a wide range of uses, including both heavy and light construction work, house building, carpentry, furniture and wood carvings.

Trade

In India, the State Forest Departments and Forest Development Corporations extract timber on the basis of approved Management Plans and supply wood to consumers through open auctions. The rates for sawn Teak are Rs.18 000-20 000 per m³ (Chadha, 1988). No Teak is exported from India.

Annual exports of Teak from Thailand prior to the logging ban were as follows:

Export of sawn timber of *Tectona grandis* from Thailand (m³)

1984 1985 1986 1987 1988

168 8171 16059 14970 24117

Source: Forestry statistics of Thailand 1987-88

In 1995, Thailand exported 6,000 cu m of teak sawnwood (ITTO, 1996). Myanmar is the major source of teak extracted from natural forests for international trade. Teak has been one of the country's main foreign exchange earners with its exploitation a monopoly of the State Timber Corporation (Blower, 1985). In 1995, Myanmar exported 175,000 cu m of teak logs; together with 28,000 cu m of sawnwood and small quantities of veneer (ITTO, 1996).

In Java, Teak is the main product of Perum Perhutani, the state-owned timber company. About 500 000 m³ of timber are produced annually (Lande, 1987). In 1986 Indonesia exported 40 000 m³ of Teak.

Various importing countries do have a separate tariff heading for Teak in Customs statistics. Japan, Korea and Thailand, for example, have a tariff heading for Teak logs and Australia, UK and USA for sawn timber. It is therefore possible to determine the volumes of Teak imported by major importing countries and to infer export volumes from the currently available Customs statistics. UK imports 7000-8000 m³ of Teak annually, with Indonesia supplying 65% of the trade (WCMC, 1991).

Concern about the source of tropical hardwoods is likely to have an impact on the patterns of international trade in Teak. Martin (1989), for example, points out that suppliers and manufacturers (of garden furniture) are now moving away from Myanmar and Thailand because of serious questions about the forestry practices of these countries, with some companies now buying Teak only from Java. The Rainforest Action Network has urged its members to boycott 'Burmese and so-called Thai teak', pointing out that most of the Teak imported to USA is from Myanmar (Rainforest Action Network, 1989).

IUCN Conservation category NE

Conservation measures (source of information WCMC, 1991).

Legislation

India - The export of all timber from India is banned.

Myanmar - Teak is protected under the Burma Forest Act 1902, as amended.

Thailand - Early legislation introduced to control Teak exploitation in Thailand included:

- 1) the Royal Proclamation of 1884 concerning the sale of Teakwood;
- 2) the Royal Proclamation of 1887 concerning the transportation of Teakwood;
- 3) the Royal Proclamation of 1887 concerning possession of Teak logs;
- 4) the Teak Trees Protection Act of 1897;
- 5) the 1899 Act prohibiting the extraction of Teak timber without the payment of royalties or duties (Arbhabhirama *et al.*, 1987).

The Forest Act of 1941, as revised, gives specific protection to Teak. Since 1989 all logging has been banned in Thailand.

Presence in protected areas:

India **Tamil Nadu:** Anaimallai Wildlife Sanctuary; Kalakad Wildlife Sanctuary; Mudumalai Wildlife Sanctuary (teak plantations). **Karnataka:** Bandipur national Park (dominant species); Bhadra Wildlife Sanctuary (dominant species); Dandeli Wildlife Sanctuary (dominant species); Nagarhole National Park (dominant species). **Madhya Pradesh:** Barnawapara Wildlife Sanctuary; Bori Wildlife Sanctuary (dominant species); Indravati National Park; Kheoni Wildlife Sanctuary; Narsingah Wildlife Sanctuary (Teak plantations); Noradehi Wildlife Sanctuary (dominant species); Ratapani Wildlife Sanctuary. **Maharashtra:** Borivilli National Park (dominant species); Melghat (Dhankolkas) Tiger Reserve (30-40% planted with Teak); Nagzira Wildlife Sanctuary; Panch National Park (Teak covers 40% of the area); Tadoba National Park. **Uttar Pradesh:** Dudhwa National Park. **Andhra Pradesh:** Eturnagaram Wildlife Sanctuary; Kawal Wildlife Sanctuary; Kinnersani Wildlife Sanctuary; Lanjamadugu (Siwaram) Sanctuary. **Gujarat:** Gir Wildlife Sanctuary and National Park; Velavadar Blackbuck National Park (poorly grown Teak). **Kerala:** Parambikulam Wildlife Sanctuary (extensive Teak plantations -8,780 ha of semi mature Teak in 1988, natural Teak now rare); Peechi-Vazhani Wildlife Sanctuary (extensive plantations); Periyar Wildlife Sanctuary; Wynad Wildlife Sanctuary (> half Teak and eucalyptus plantation); Thattekkad Bird Sanctuary (Teak plantations). Rodgers and Panwar (1988), in a report of proposed protected areas name the following as having Teak present. **Gujarat:** Purna Wildlife Sanctuary. **Madyha Pradesh:** Saimura Wildlife Sanctuary; Gollapalli Wildlife Sanctuary. **Rajasthan:** Boroswar Wildlife Sanctuary (Teak biome). Myanmar Alaungdaw Kathapa National Park (classed as reserved forest since 1893; selectively logged for Teak in the past) Thailand Huai Kha Khaeng Sanctuary, Lum Nam Pai Sanctuary, Mae Tun Sanctuary, Doi Chiang Dao Sanctuary, Doi Pha Muang, Omkoi Sanctuary, Doi Suthep-Poi National Park, Khao Sam Lan National Park, Mae Ping National Park, Huai Tak Teak Reserve

Forest management and silviculture

The exploitation of Teak formed the basis for early forest management in India, Myanmar and Thailand. In India, for example, a commission was appointed in 1800 to investigate the availability of Teak in Kerala and minimum girth limits were introduced (Shyamsunder and Parameshwarappa, 1988). Regeneration of the species in natural forests is poor. Both within and outside its natural range, Teak is primarily cultivated in artificially established pure stands. It has been demonstrated, however, that Teak should be grown mixed with soil-enriching tree species (Lamprecht, 1989).

Since the price of Teak is relatively high and its sources of supply limited, it has been introduced to countries throughout the tropics, including Trinidad, Togo, Nigeria, Honduras, Cameroon, Zaire and Benin, where plantations have been established. For the production of good quality timber *T. grandis* needs a periodic marked dry period of 3-5 months and grows best where mean monthly maximum temperatures are 40°C and monthly minimum 13°C, with rainfall of 1 270-3 800 mm (Kaosa-ard, 1981). Growth and growth habits show great variation according to site conditions (Bedell, 1989) but only one variety (Teli from India) has been recognised. There is thus a good basis for improvement by provenance/individual tree selection, and breeding work is being carried out in many countries (Keiding, 1985).

Seed dormancy is an important characteristic of Teak. This results in uneven germination and, because the plants are sensitive to shade, later germinating plants are suppressed. Several factors are responsible for the big difference between potential and realised germination recorded in plantation trials but it is largely due to the inhibition of germination by dormancy.

Its seed stores well and may keep their viability for several years. However, they require pretreatment before sowing but this varies considerably depending on the source of the seeds and no methods are applicable for all types of Teak seed. Research is needed into this problem since it will be increasingly evident as more Teak seed is planted and transferred. Seed is now available from registered sources, selected seed stands and clonal seed orchards (Keiding, 1985).

4. Merbau:

a) *Intsia bijuga*

Common/Trade name: Indonesia and Malaysia: Merbau. Philippines: ipil. Papua New Guinea: kwila.

Local names

Cambodia: krakas prek. Indonesia: merbau (general), ipil (Sulawesi), ipi (Nusa Tenggara). Malaysia: merbau ipil (Sarawak, Sabah), kayu besi (Peninsular). Philippines: Ipil, Ipil laut, Moluccan Ironwood, Borneo Teak (UK), Kwila. Papua New Guinea: bendora, kwila, pas. Thailand: lumpaw, lumpho-thale (Surat Thani), pradu-thale (Central). Guam: Ifil. Samoa: Ifi-lele. Fiji: Vesi. Solomon Islands: U'ula. Viet Nam: Go Nuoc, g[ox] n[uw] [ows]s (general), b[aaf]n [ooj]i (southern).

Distribution

American Samoa, Australia, Burma, Cambodia, India, Indonesia, Madagascar (at low altitudes in the west), Malaysia, Myanmar, Pacific Islands, Papua New Guinea, Philippines, Seychelles, Tanzania, Thailand, and Viet Nam.

Habitat

It is a tree of lowland, tropical rain forest which is often found in coastal areas bordering mangrove swamps, rivers, or floodplains. It is also found inland up to 600m, in primary or old secondary forests (Soerianegara & Lemmens, 1993, Kade Sidiyasa 1994).

Population status and trends

Intsia bijuga produces one of the most valuable timbers of South East Asia. The species has been exploited so intensively for timber that in most countries few trees are left in natural stands. There have been few attempts to cultivate the species in plantations and the species was said to face imminent disappearance as an economic plant (National Academy of Sciences, 1979). Good stands still exist in parts of Indonesia, mainly Irian Jaya, and Papua New Guinea where it is found mainly in the Sepik and Madang provinces. In Papua New Guinea, *Intsia bijuga* is the more dominant than *I. palembanica*; however, this is reversed in Peninsular Malaysia. *I. bijuga* is never abundant in Peninsular Malaysia and rarely achieves timber size (Ser, 1982). The species has been recorded as threatened in Indonesia and Vulnerable in the Philippines (WCMC, 1991-check or ITTO report). The species is considered to be almost extinct in Sabah (Meijer, pers. comm. 1997).

Role of species in the ecosystem

Utilisation

This very attractive wood is one of the most valued timbers throughout South East Asia. It is stronger than Teak and is one of the most decay-resistant timbers known (when not in contact with the ground); in the Philippines it is used as a standard against which the durability of other timbers is assessed (National Academy of Sciences, 1979). Used for all high-class general construction, flooring (it produces the famous 'merbau floors'), posts, beams, etc. and also for musical instruments, furniture and cabinet making. Bark and leaves are used medicinally and the seeds are edible. In addition, the wood is a dye source.

Trade

The main importing countries are the Netherlands, where the wood is used for windows and doors, and Germany. Production of merbau has recently become more important in Indonesia, with production of about 137,000 m³ in 1992. The main production area is Irian Jaya and production is also significant in Aceh and the Moluccas. Japan imports kwila from Papua New Guinea, Sabah and Sarawak (Soerianegara & Lemmens, 1993). Approximately 4% of logs exported from

Papua New Guinea are *I. bijua* and *I. palembanica* (Eddowes, 1997). In 1995, Fiji exported 1000 m³ of sawnwood at an average FOB price of 413\$/m³ (ITTO, 1996). Malaysia (Peninsular) exported 42000 m³ of sawnwood at an average FOB price of 466\$/m³ in 1995 (ITTO, 1996).

IUCN Conservation category

VU A1cd according to WCMC

Conservation measures

Legislation:

Philippines - Classified as a premium hardwood under the DENR Administrative Order No. 78 Series of 1987, Interim Guidelines on the cutting/gathering of Narra and other premium hardwood species. Under this Order special permission from the Secretary of the Department of Environment and Natural Resources is required to fell *Intsia bijuga*, and various conditions are specified.

Presence in protected areas

Indonesia Ujung Kulon National Park, Java, Manusela Wai Nua/Wai Mual National Park, Moluccas Philippines St Paul Subterranean River National Park, Quezon National Park, Calauit Island National Park

Forest management and silviculture

Trials in the Solomon Islands have shown that it is easily established either from seed or as forest wildings potted in the nursery. The potential of the species in these trials was shown by the fact that the quickest growing individuals added 2 m height each year, but little general information is available about the full plantation potential of the species. Further research on silviculture is urgently needed (National Academy of Sciences, 1979). Some planting in Madagascar (Departement des Eaux et Forets, 1993).

b) *Intsia palembanica*

Common name: Indonesian - ipi; ipil; maharan ;

Thai - lumpho; mue-ba; salumpho

Synonym : [*Intsia bakeri*](#)

Distribution: Indonesia : *Kalimantan, Moluccas, Sulawesi, Sumatera*, Malaysia : *Peninsular Malaysia , Sabah, Sarawak*, Myanmar , Papua New Guinea : *Papua New Guinea*, Philippines : *Philippines*, Thailand : *Thailand*

5. Dark Red Meranti:

a) *Shorea curtisii*

Common/Trade name

Seraya, Dark Red Meranti

Local names

Saya daeng, Saraya daeng (Thailand), Seraya (Malaysia)

Distribution

Borneo, Peninsular Malaysia, Singapore, Sumatra, Thailand, the Riau and Lingga Archipelago.

Habitat

In Peninsular Malaysia *S. curtisii* is an important species of Hill Dipterocarp forests. It has a restricted occurrence, growing gregariously almost exclusively on ridge tops. It has been suggested that *S. curtisii* is ecologically adapted to such sites through its ability to resist moisture stress (Awang *et al.*, 1981). The species also occurs on deep and dry soils on coastal hills up to 850 m altitude throughout its range (Soerianegara & Lemmens, 1993)

Population status and trends

Shorea curtisii is abundant and currently considered to be 'nt' in Peninsular Malaysia. The species is, however, included in a list of species requiring conservation action in Peninsular Malaysia (Ng *et al.*, 1984) and the quality of available timber has suffered a decline (Wyatt-Smith, *in litt.*).

Utilisation

S. curtisii produces a light hardwood with fine grain which has medium/deep red heartwood. The general utility timber is suitable for furniture manufacture, interior finishing, flooring, panelling, doors and veneers. It is also used in plywood production. The wood is an important and valued source of dark red meranti. A resin can be obtained from the tree (Soerianegara and Lemmens, 1993).

Trade

S. curtisii is one of the best commercial timber species and is greatly in demand on the world market as sawn timber. It is unfortunately impossible to distinguish this species in reported trade statistics. In 1989 Peninsular Malaysia exported 643 541 m³ of Dark Red Meranti sawn timber and 143 428 m³ of Dark Red Meranti 'pinhole no defect' sawn timber.

IUCN Conservation category

LR lc - evaluated by Peter Ashton and confirmed at the Asia Regional Workshop (1997).

Forest management and silviculture

Shorea curtisii is one of the major commercial timbers derived from Hill Dipterocarp forests in Peninsular Malaysia. These are the most important source of the State's timber as most of the lowland forests are being converted to other forms of land use. The hill forests of Peninsular Malaysia are managed under the Selective Management System (SMS). Natural regeneration of desired species in the hill forests has generally been poor. It has been noted that economic considerations carry greater weight in logging operations involving *S. curtisii* than the need for sustained yield management, with excessive logging damage and undue selection of logs extracted (Wyatt-Smith, 1988). In Peninsular Malaysia there has been considerable research on the regeneration of *S. curtisii* within natural forests. Indications show that the species flowers less frequently than other Red Meranti species and its seedlings show poor viability (Nin, 1978). There is some evidence that *S. curtisii* seeds germinate more readily under canopy shade, but seedling growth is favoured in gap conditions of 20-40% full sun (Turner, 1990).

Conservation measures

Legislation

The Government of Malaysia has been urged to ban the export of Red Meranti by the wood moulding and furniture industries (Anon., 1989).

Presence in protected areas

Peninsular Malaysia: Taman Negara National Park, Kerau Game Reserve, Endau Rompin Proposed Reserve

Singapore: Bukit Timah Nature Reserve

According to Anon. (1985) the species is conserved in several Virgin Jungle Reserves.

b) Shorea ovata

Red List Category & Criteria: EN A1cd

Distribution: Indonesia (Sumatera), Malaysia, Philippines

Major Threats: Habitat Loss/Degradation - Extraction - Wood - Clear-cutting (ongoing)

Range and Population: A widespread species.

Conservation Measures: The tree occurs in some primary forest reserves.

c) Shorea pauciflora

Red List Category & Criteria: EN A1cd

Distribution: Indonesia (Sumatera), Malaysia (Peninsular Malaysia), Singapore

Major Threats: Habitat Loss/Degradation - Extraction - Wood - Clear-cutting (ongoing)

Habitat and Ecology: An immense tree of lowland and hill forest on well-drained soils **Threats:** The species is exploited for its valuable dark red meranti timber.

d) Shorea singkawang

Red List Category & Criteria: CR A1cd

Distribution: Indonesia (Sumatera), Malaysia (Peninsular Malaysia), Thailand

Major Threats: Habitat Loss/Degradation - Extraction - Wood - Clear-cutting (ongoing)

Habitat and Ecology: A dark red meranti timber species, usually found near lowland streams.

6. Light Red Meranti:

a) Shorea acuminata

Red List Category & Criteria: CR A1cd

Distribution: Malaysia

Major Threats: Habitat Loss/Degradation - Extraction - Wood - Clear-cutting (ongoing)

Habitat and Ecology: A large dipterocarp of well-drained, undulating land.

b) Shorea leprosula

Red List Category & Criteria: EN A1cd

Distribution: Indonesia (Sumatera), Malaysia (Peninsular Malaysia), Singapore, Thailand

Major Threats: Habitat Loss/Degradation - Extraction - Wood - Clear-cutting (ongoing)

Range and Population: This species is still found, sometimes in forest reserves.

Threats : Has suffered a massive population reduction mainly because of the rates of exploitation of its light red meranti timber.

c) Shorea macroptera

Common Names : kawang, melantai light red meranti, white lauan

- *ssp. baillonii*

Distribution: Indonesia : *Kalimantan*, Malaysia : *Sarawak*

- *ssp. macroptera*

Distribution: Indonesia : *Sumatera*, Malaysia : *Peninsular Malaysia* , Singapore, Thailand

- *ssp. Macropterifolia*

Distribution: Brunei Darussalam : *Brunei*, Malaysia : *Sabah, Sarawak*

- *ssp. Sandakanensis*

Distribution: Indonesia : *Kalimantan*, Malaysia : *Sabah*

- *ssp. Parvifolia*

Distribution: Indonesia : *Sumatera*, Malaysia : *Peninsular Malaysia* , Singapore , Thailand

- *ssp. velutina*

Distribution: Indonesia : *Sumatera*, Malaysia : *Peninsular Malaysia*

7. White Meranti:

a) Shorea bracteolata

Red List Category & Criteria: EN A1cd+2cd

Distribution: Indonesia (Sumatera),Malaysia (Peninsular Malaysia),Singapore

Major Threat/s Habitat Loss/Degradation - Extraction - Wood - Clear-cutting (ongoing) **Habitat and Ecology** Found mostly on well-drained lowland coastal hills.

Threats This tree is heavily exploited for white meranti timber, especially in Peninsular Malaysia.

b) Shorea hypochra

Red List Category & Criteria CR A1cd

Distribution Cambodia, Malaysia (Peninsular Malaysia), Thailand, Viet Nam

Habitat and Ecology This large tree is found in semi-evergreen and evergreen lowland dipterocarp forest.

8. Yellow Meranti:

a) *Shorea acuminatissima*

Red List Category & Criteria CR A1cd

Distribution Indonesia (Kalimantan), Malaysia (Sabah)

Major Threat/s Habitat Loss/Degradation - Extraction - Wood - Clear-cutting (ongoing) **Range and Population** An enormous tree, endemic to Borneo.

Habitat and Ecology Found in lowland mixed dipterocarp forest, often on hills and ridges near the coast.

Conservation Measures Some populations are known to occur in forest reserves.

b) *Shorea faguetiana*

Red List Category & Criteria EN A1cd

Distribution Indonesia, Malaysia (Peninsular Malaysia; Sabah; Sarawak), Thailand **Habitat and Ecology** This tree is often found on well-drained clay soils on ridges and undulating land

Conservation Measures Populations have been found in forest reserves.

c) *Shorea gibbosa*

Red List Category & Criteria CR A1cd

Distribution Singapore

Habitat and Ecology An emergent lowland tree that grows on deep clay-rich soils.

d) *Shorea hopeifolia*

Red List Category & Criteria CR A1cd

Distribution Indonesia (Sumatera), Malaysia, Philippines

Habitat and Ecology A large tree often found along streams on clay-rich soils.

e) *Shorea multiflora*

Distribution: Indonesia : *Sumatera*, Malaysia

Common name: Indonesian - damar hitam; resak pandan; tapis batu

9. Yellow Balau:

a) *Shorea obtusa*

Common name: Thai - teng

Distribution: Cambodia, Lao People's Democratic Republic, Myanmar , Thailand, Viet Nam

b) *Shorea robusta*

Distribution: Bangladesh, Bhutan, China , India : *Assam, Karnataka, Kerala, Tamil Nadu, Uttar Pradesh*, Nepal, Pakistan

c) *Shorea atrinervosa*

Common name: Indonesian - laru betina; meranti hursik; resak bamban; resak bunga; rihir minyak kuyung

Distribution: Brunei Darussalam : *Brunei*, Indonesia : *Sumatera*, Malaysia : *Peninsular Malaysia, Sabah, Sarawak*

d) *Shorea glauca*

Red List Category & Criteria EN A1cd

Distribution Indonesia (Sumatera),Malaysia,Thailand

Habitat and Ecology A semi-gregarious species that is found on rocky hillsides and ridges.

10. Bangkirai:

Shorea laevifolia

Synonym of: [Shorea laevis](#)

Common Names: balau, benuah, kayu masang, selangan batu

Distribution: Indonesia : *Sumatera*, Malaysia , Myanmar , Thailand

11. Sapelli

Entandrophragma cylindricum

Meliaceae

African mahogany, aboudikro, penkwa, sapele, sapelli, mboyo, kilouka, essie

Distribution

Angola, Cameroon, Congo, Côte d'Ivoire, DR Congo, Gabon, Ghana, Nigeria, Sierra Leone, Togo,

Uganda

Habitat

A species of lowland forest and woodland types.

Population status and trends

A relatively common species, although less common than *E. angolense*. It is exploited heavily throughout its range. Genetic erosion caused by the large-scale depletion of mature individuals from populations has occurred in some countries. In comparison with other species of *Entandrophragma* this species can occur in drier habitats, including abandoned fields. Populations in Congo are localised (N'Sosso, 1995). The Ugandan distribution is confined to forests at Budongo, Mabira, Bungoma and West Mengo (Okullo *et al.*, 1997)

Threats

Commercial exploitation, clear-felling/logging of the habitat, expansion of human settlement and agriculture.

Utilisation

A major source of African mahogany. It is also a source of veneer, charcoal and firewood.

Trade

In 1995 Ghana exported the species as plywood, selling at an average price of US\$242/m³, and in mixed *Entandrophragma* consignments of plywood, selling at US\$334/m³, as 1000m³ of veneer, selling at an average price of US\$978/m³, as 3000m³ of sawnwood, selling at an average price of US\$592/m³.

Côte d'Ivoire exported the species as plywood, selling at an average price of US\$472/m³, as sliced and rotary peeled veneer, selling at US\$947/m³ and US\$496/m³.

Cameroon exported 19,000m³ of plywood, selling at US\$1005/m³, 29,000m³ of veneer, selling at an average price of US\$795/m³, 20,000m³ of sawnwood, selling at an average price of US\$500/m³, and 311,000m³ of logs, selling at an average price of US\$251/m³.

Congo exported 73,000m³ of logs.

Gabon exported 20,000m³ of logs at an average price of US\$37,000/m³.

DR Congo exported 6000m³ of veneer at US\$596/m³, 10,000m³ of sawnwood at US\$408/m³ and 16,000m³ of logs at US\$178/m³ (ITTO, 1997).

IUCN Conservation category

VU A1cd according to Hawthorne (1995).

Conservation measures

There are protected populations and felling restrictions in place in various countries.

Forest management and silviculture

The species does not respond well to burning. Growth rates are amongst the slowest in the genus. Successful plantations are established in Côte d'Ivoire.

8. Sipo

Entandrophragma utile

Meliaceae

African mahogany, utile, assié, kilouka, mbel, sipo, efobrodedwo, ijebu

Distribution

Angola, Cameroon, Congo, Côte d'Ivoire, DR Congo, Gabon, Ghana, Liberia, Nigeria, Sierra Leone, Uganda

Habitat

The species grows in various lowland forest types.

Population status and trends

A widespread species, although it has a patchy distribution and can be rare or absent from likely places. It is reported to be relatively abundant at Mayombe (N'Sosso, 1995). Heavy exploitation of the timber continues throughout its range. Genetic erosion caused by the depletion of mature individuals has probably occurred in most countries. Local overcutting is also common in parts of West Africa. In Uganda populations are confined to forest at Budongo and Mabira, where it is extremely rare and close to extinction (Okullo *et al.*, 1997).

Threats

Commercial exploitation, local use, expansion of human settlement and agriculture.

Utilisation

An important source of African mahogany, used for interior and exterior construction work, furnituremaking.

Trade

Entandrophragma spp. are listed in exports of plywood from Ghana in 1995, selling at an average price of US\$334/m³. *E. utile* was exported from Ghana in 3000m³ of sawnwood, selling at an average price of US\$675/m³. DR Congo exported the species as veneer, selling at an average price of US\$665/m³, as 3000m³ of sawnwood, selling at an average price of US\$442/m³, and as 18,000m³ of logs, selling at an average price of US\$231/m³. Cameroon exported 63,000m³ at an average price of US\$291/m³. Côte d'Ivoire exported the species as veneer, selling at US\$372/m³ (ITTO, 1997).

IUCN Conservation category

VU A1cd according to Hawthorne (1995).

Conservation measures

There are protected populations and felling restrictions in place in various countries.

Forest management and silviculture

Regeneration is good after disturbance and the species is generally noted to be more light-demanding and tolerant of dry conditions. Growth rates are amongst the slowest in the genus and the seeds and seedlings suffer high mortality rates because of insect attack.

9. Khaya

a) *Khaya anthotheca*

Meliaceae

White mahogany, acajou d'Afrique, acajou blanc, krumben, anthotheca mahogany

Distribution

Angola, Cameroon, Congo, Côte d'Ivoire, DR Congo, Ghana, Liberia, Malawi, Mozambique, Nigeria, Sierra Leone, Tanzania, Uganda, Zambia, Zimbabwe

Habitat

The species occurs in lowland evergreen forest.

Population status and trends

A common and widespread species which is heavily exploited, particularly in East and West Africa. Regeneration is poor in places, especially where parent trees are scarce and serious genetic erosion is believed to have occurred. There is only limited commercial application in countries where the occurrence is limited, e.g. Zimbabwe (Goldsmith & Carter, 1981). This species is commonly confused with *K. grandifolia*.

Threats

Commercial exploitation, clear-felling/logging of the habitat

Utilisation

The species is commercially exploited as a source of African mahogany, used in cabinet and furnituremaking, veneer, panelling boat building and joinery.

Trade

The trade in African mahogany commenced in the 17th century and escalated in the 19th and 20th centuries after supplies of American mahogany had declined.

Export of mahogany from Ghana, 1992-1996

Year Volume (m³)

1992 14,134

1993 22,059

1994 20,157

1995 17,870

1996 18,112

Source: Ghanaian Timber Export Development Board in Hall, 1997.

In 1995 the species was exported as veneer, 10,000m³ of sawnwood and 9000m³ of logs from DR Congo, selling at an average price of US\$518/m³, US\$328/m³ and US\$199/m³.

Togo exported an unrecorded quantity of *Khaya* sawnwood in 1995.

IUCN Conservation category

VU A1cd according to Hawthorne (1995).

Conservation measures

There are protected populations, log export bans and felling restrictions in various countries.

Forest management and silviculture

The species is easily confused in smaller size classes with *K. grandifolia*. The two species can even hybridise. There are numerous experimental plantations but the species is not commercially available from plantation sources. The species is slow growing, attaining a DBH of 60cm after 40 years.

b) *Khaya grandifoliola*

Meliaceae

Benin mahogany, kruba, male, oganwo

Distribution

Benin, Côte d'Ivoire, DR Congo, Ghana, Guinea, Nigeria, Sudan, Togo, Uganda

Habitat

The species is found most frequently in dry semi-deciduous forest or rocky forest and forest outliers.

Population status and trends

Exploitation of the timber is heavy and has attributed to the comprehensive extraction of mature individuals from most populations.

Role of species in the ecosystem**Threats**

Commercial use, clear-felling/logging of the habitat

Utilisation

The timber is exploited as a source of African mahogany. The wood is esteemed less highly than *K. ivorensis*. The bark is also considered effective against malaria.

It is sometimes planted in towns as a roadside tree.

Trade

The trade in African mahogany commenced in the 17th century and escalated in the 19th and 20th centuries after supplies of American mahogany had declined.

Export of mahogany from Ghana, 1992-1996**Year Volume (m³)**

1992 14,134

1993 22,059

1994 20,157

1995 17,870

1996 18,112

Source: Ghanaian Timber Export Development Board in Hall, 1997.

Togo exported an unrecorded quantity of *Khaya* sawnwood in 1995.

IUCN Conservation category

VU A1cd according to Hawthorne (1995).

Conservation measures

Protected populations and log export bans are in place in various countries.

Forest management and silviculture

Regeneration is poor away from parent individuals and is best at the savanna-forest boundary. The species is easily confused in smaller size classes with *K. grandifolia*. The two species can even hybridise. There are numerous experimental plantations but the species is not commercially available from plantation sources. The species is slow growing, attaining a DBH of 60cm after 40 years.

c) *Khaya ivorensis*

Acajou; African Mahogany

Distribution

This species occurs in Angola, Cameroon, Congo, Côte d'Ivoire, Gabon, Ghana, Liberia, Sierra Leone, Nigeria and Zaire.

Habitat

In Ghana, this species occurs in many habitat types but seems to thrive best in moist and wet undisturbed evergreen forest (Hawthorne, 1995a).

Population Status and Trends

It is found scattered across almost the whole of Congo and is occasionally quite abundant (N'sosso, *in litt.* 1995). African mahogany is common in Ghana (Hawthorne, 1995a).

Regeneration

Trees of *Khaya ivorensis* can have good seed production at the age of 30; it seems that abundant seed production only occurs every 3-4 years, although some seed is produced every year. The seeds are wind dispersed (Hawthorne, 1995a). The species does not respond well to disturbance (burning or logging), as there is very little regeneration in disturbed areas. However, it does require small to medium light gaps for subsequent growth (Hawthorne, 1995a).

Role of Species in its Ecosystem

No information.

Threats

It is over-exploited for its popular timber (WCMC, 1991).

Utilisation

The timber is used for panelling, furniture, interior fittings and high quality joinery.

Trade

In 1989 Ghana exported 10,463m³ of lumber of this species. In a questionnaire survey of UK traders carried out for the ITTO, source countries for this species were given as Cameroon, Ghana, Liberia and Zaire. Gabon also exports this species; in 1987, from Port Owendo 9,667m³ were exported (IUCN, 1990), in 1994, 5,303.158 m³ were exported and in 1995, 7,510.019 m³ were exported (DIAF, 1996). In 1994, Cameroon exported 12,000 cu m and Ghana exported 11,130 cu m (ITTO, 1995b). At the end of the 1980s, with the price increases for Brazilian Mahogany and Utile, *Khaya* has become popular again in the UK market (WCMC, 1991).

Conservation Status

IUCN Category and Criteria: VU (A1c,d) (African Regional Workshop, 1996)

For Ghana, Hawthorne (1995a) has classified this a scarlet star species, which means it is common but under serious threat from heavy exploitation. Reduced exploitation and full protection are required.

Under the new IUCN threat categories (1994) this species is considered Vulnerable (Hawthorne, 1995b).

Conservation Measures

K. ivorensis is protected by law in Côte d'Ivoire and log export has been banned from Ghana and Liberia. It has been considered a priority species for *in situ* conservation by the FAO (1984).

Pest control for *Hypsilla* is required (African Regional Workshop, 1996).

d) *Khaya madagascariensis*

Meliaceae

Madagascar mahogany, hazomena, bangoma, manitrolatra, hazomahogo

Distribution

Comoros, Madagascar

Habitat

Populations are found in rainforest, along rivers, salt-water marshes and also in degraded forest up to 800m.

Population status and trends

In the north-west, the species occurs in Mahajanga, Port-Bergé, Mitsinjo, Ambilobe and also on the Comoros. It occurs further east on the mainland in Vohémas, Ambila and Mananjary. Both the habitat

and trees have been heavily exploited.

Role of species in the ecosystem

Threats

Commercial use, clear-felling/logging of the habitat

Utilisation

The timber is used in the manufacture of fine furniture.

Trade

The species is not specifically recorded in international trade from Madagascar.

IUCN Conservation category

EN A1cd according to WCMC

Conservation measures

Forest management and silviculture

Silvicultural studies are under way and the species has been used for afforestation in Kianjasa.

e) Khaya senegalensis

Meliaceae

bisselon, madachi, oganwo

Distribution

Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone, Sudan, Togo, Uganda

Habitat

A very widespread tree of savanna woodland in moister zones and transition vegetation types.

Population status and trends

Logging and local exploitation are largely uncontrolled and poorly monitored. In northern parts of the range exploitation may be leading to genetic erosion.

Role of species in the ecosystem

Threats

Commercial exploitation, clear-felling/logging of the habitat

Utilisation

The wood is heavier and inferior in quality to *K. ivorensis*, but is much used in savanna zones. The roots are also fed to animals and the bark has medicinal value. Trees are often planted by the roadsides for shade in Nigeria.

Trade

The trade in African mahogany commenced in the 17th century and escalated in the 19th and 20th

centuries after supplies of American mahogany had declined. The increasing rarity of large individuals of *K. senegalensis* has led to the species becoming less important in the international market.

IUCN Conservation category

VU A1cd according to WCMC

Conservation measures

Legal protection exists in various countries.

Forest management and silviculture

Natural regeneration from the seed is poor but does occur from suckers. The species is even more slow growing than other *Khaya* species. An attempt at cultivating the species in mixed plantations is being made on the west coast of Réunion and in production plantations in Mali and Upper Volta (Hall, 1997).

10. Bongossi:

Lophira alata

Ekki; Azobé

Distribution

Azobé is found in Cameroon, the Congo Basin, Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Liberia, Nigeria, Sierra Leone, and Zaire.

Habitat

It grows in evergreen and moist deciduous forests, in freshwater swamp forests and close to river banks (WCMC, 1991). Although this species has a definite preference for wet evergreen areas, it is assumed to be sensitive to non-evergreen forest soils and is unsuccessful on rocky soils. *L. alata* is a pioneer species and is representative of a disturbed forest (Hawthorne, 1995a). It is also sensitive to drought (Swaine & Veenendaal, 1994 in Hawthorne, 1995a).

Population Status and Trends

Azobé is a common species in Cameroon and regenerates well (WCMC, 1991). It has been suggested that Cameroon forests with an abundance of this species were once disturbed by humans (Letouzey, 1960 in Hawthorne, 1995a). It is also common in Ghana (Hawthorne, 1995a).

Role of Species in its Ecosystem

The seeds of this species are wind dispersed. Light gaps are necessary for successful regeneration, as seed germination does not occur in shady understorey (Hawthorne, 1995a).

It is estimated that it takes 220 years for a tree to reach a girth of 2.7m in Nigeria Leone) (Keay, 1961 in Hawthorne, 1995a).

Threats

This species is threatened by over-exploitation (Hawthorne, 1995a&b)

Utilisation

Azobé is used for heavy durable construction work, harbour work, flooring and in railway construction. The fruits can be used to make an edible oil.

Trade

L. alata logs were exported from Cameroon, Côte d'Ivoire, Gabon, Ghana in 1994 (ITTO, 1995a).

Cameroon exported 49 000m³ at an average price of US\$200.00/m³, Côte d'Ivoire exported 8 351m³ at an average price of US\$219.43/m³, Ghana exported 1 970m³ at an average price of US\$131.00/m³ and Gabon exported an unknown volume at an average price of US\$11.46/m³ (ITTO, 1995a).

Gabon exported a total of 12,416.85 m³ in 1994 and 8,518.17 m³ in 1995 (DIAF, 1996).

Conservation Status

IUCN Category and Criteria: VU (A1c,d) (African Regional Workshop, 1996)

This species is considered Vulnerable (1994 IUCN threat category) due to excessive exploitation (Hawthorne, 1995b). Hawthorne (1995a) has given this species a red star for Ghana, which means it is common but under pressure from exploitation and conservation measures are necessary.

Conservation Measures

This species has been selected by FAO for conservation action because of heavy utilisation pressure (Palmberg, 1987). It is protected by law in Côte d'Ivoire.

Regeneration work should be intensified (African Regional Workshop, 1996).

11. Iroko:

a) *Milicia excelsa*

synonym: *Chlorophora excelsa*

Iroko; Tule; Kambala

Distribution

This species is widely distributed across Africa; it occurs in Angola, Benin, Burundi, Burkina Faso, Central African Republic, Cameroon, Congo, Côte d'Ivoire, Ethiopia, Gabon, Equatorial Guinea, Sao Tomé & Príncipe, Ghana, Kenya, Malawi, Mozambique, Nigeria, Sierra Leone, Sudan, Tanzania, Togo, Uganda, Zaire and Zimbabwe.

Habitat

M. excelsa is found in transitional vegetation between closed forests and savanna. It is often found in gallery forest and can be found in deciduous, semi-deciduous or evergreen forest. Occasionally it is found in isolated relict forests from sea level to about 1300m. It is fairly abundant in the drier areas of semi-deciduous *Antiaris-Chlorophora* forest (FAO, 1986b).

Both *M. excelsa* and *M. regia* show a preference for dry, flat, light areas (Hawthorne, 1995a). Most effective seed germination occurs in half-shade, the seedlings are most commonly found in medium sized light gaps and then become light dependant (Hawthorne, 1995a). *M. excelsa* is considered to be a pioneer species which regenerates in disturbed, open areas and in logged forest (Hawthorne, 1995a). In Kenya, this species is found in relict moist forest and wooded grassland (Beentje, 1994) along the coast and in the central Meru district and Nyanza province (Marshall & Jenkins, 1994). It has been found at an altitude of 4500 m on Mount Kilimanjaro in Tanzania; although, it is usually found between sea level and 1200 m (FAO, 1986a). In West Africa this species is found in areas where rainfall is between 1150mm and 1900mm and the temperature is between 25 °C and 35 °C.

Population Status and Trends

Iroko is commonly found growing around villages and old farms as it is left to grow there because of its commercial value (FAO, 1986b).

This species is abundant, especially in Côte d'Ivoire, Cameroon, Congo, Gabon and Zaire (N'Sosso *in litt*, 1995). It is also commonly found in Ghana (Hawthorne, 1995a)

In Mozambique, *M. excelsa* is very scarce and dispersed (Moreno Saiz, 1996). This is also the case in Kenya where this species is now sparsely distributed due to heavy exploitation (Marshall & Jenkins, 1994).

Regeneration

There is very little regeneration of this species in Zimbabwe (African Regional Workshop, 1996). In

Mozambique, where an area was cleared but large trees of *M. excelsa* left standing, there seems to be regeneration in the open areas (African Regional Workshop, 1996).

Role of Species in its Ecosystem

The fruit of this species contains many small seeds which are dispersed by bats and birds (Osmaston, 1965 in Hawthorne, 1995a). Duikers and animals eat the newly emergent shoots (FAO, 1986b).

Threats

This species is heavily exploited in Ghana (Hawthorne, 1995a&b) and plantations of this species tend to be unsuccessful (FAO, 1986b). In Zimbabwe, *M. excelsa* is threatened by habitat degradation; it is found only in an area which is suffering from alluvial erosion. It is not, however, exploited in Zimbabwe (African Regional Workshop, 1996).

Utilisation

The high quality timber is used as a Teak substitute. It is widely used for all kinds of construction work and carpentry including domestic flooring, veneer and cabinetwork (WCMC, 1991). The timber is used for building ships and barrels. It is used externally because it has great resistance to bad weather (Moreno Saiz, 1996). Locally, this species has many medicinal uses; the bark is also used as a dye (FAO, 1986b). The wood is also exploited by the local people (African Regional Workshop, 1996).

Trade

This species is not distinguished from *Milicia regia* by commercial logging companies (Hawthorne, 1995a).

Iroko is a major commercial species in international trade. Tanzania and Uganda were in the past major sources of the timber and some Iroko is still exported from E. Africa. In Kenya users of this species claimed that supplies were variable and unpredictable (Marshall & Jenkins, 1994).

West African countries are now the main exporters, especially Ghana (traded together with *M. regia*) and Côte d'Ivoire (WCMC, 1991). The UK imported 22 648m³ in 1989. Côte d'Ivoire supplies 60% of the Iroko imported to the UK (WCMC, 1991).

In 1987, 11,988m³ were exported from Owendo, Gabon (IUCN, 1990). In 1994, Gabon exported 8,236.664m³ of Iroko and in 1995 exported 12,823.169m³ (DIAF, 1996).

According to the ITTO (1995a) in 1994 Iroko logs were exported by: Cameroon (65 000m³ at an average price of US\$245.00/m³), Congo (10 206m³), and Gabon (US\$39.75/m³). In addition Cameroon exported 12 000m³ of sawnwood at an average price of US\$640.00/m³ and Ghana exported 47 340m³ of air dried sawnwood (@ US\$520.00/m³) and an unknown volume of kiln dried sawnwood at an average price of US\$653.00/m³ (ITTO, 1995). Congo and Togo both export Iroko sawnwood (ITTO, 1995a). It is estimated that the formal commercial trade in Kenya uses between 800m³ and 1100m³/year of this species (Marshall & Jenkins, 1994).

There is illegal trade in *M. excelsa* from Kenya and Uganda and suspected illegal trade from Tanzania

(Marshall & Jenkins, 1994). Most of *M. excelsa* used in Kenya is imported (Marshall & Jenkins, 1994).

Conservation Status

IUCN Category and Criteria: VU (A1c,d) (African Regional Workshop, 1996)

This timber species is considered Vulnerable (1994 IUCN threat category) due to excessive exploitation (Hawthorne, 1995b). It has been awarded a scarlet star in Hawthorne's (1995a) own system, which means that it is common but it is under profound pressure from heavy exploitation in Ghana. This species requires protection and exploitation has to be limited if it is to be sustainable (Hawthorne, 1995a).

Conservation Measures

M. excelsa is protected by legislation in Côte d'Ivoire and Mozambique and is subject to a log export ban in Ghana. In Cabo Delgado, Mozambique, no Iroko has been cut since 1987 because it took a dramatic decline (Moreno Saiz, 1996). In Nigeria, Oyo State has a 10 year moratorium on exploitation. Uganda banned export of unworked timber in 1987, although there is still licensed trade with Kenya and, more recently, with Europe. In 1993, Tanzania also banned the export of unworked timber. Kenya has imposed a "Presidential Ban on Logging of Indigenous Timber" (1986), however, little is known about this ban except that it prohibits logging of indigenous timbers. (Marshall & Jenkins, 1994).

M. excelsa is found in the Shimba Hills National Reserve, although there are reports that this species is still being extracted (Marshall & Jenkins, 1994).

Vegetation type according to White (1983)

1. Guineo-Congolian rain forest

Drier peripheral semi-evergreen Guineo-Congolian rain forest and similar forest in the transition zones

Milicia excelsa is also commonly found in wetter secondary forest types.

Old secondary forest

2. Drier peripheral semi-evergreen Guineo-Congolian rain forest in the Guinea-

Congolia/Zambezia regional transition zone

3. Drier peripheral semi-evergreen Guineo-Congolian rain forest in the Lake Victoria regional

mosaic

4. Zanzibar-Inhambane lowland rain forest

5. Zanzibar-Inhambane undifferentiated forest

6. Zanzibar-Inhambane secondary grassland and wooded grassland

In this habitat type, *M. excelsa* from the original forest have been left standing.

7. Príncipe

M. excelsa is found in Reserves and National Parks in Zimbabwe but it is not well protected (African Regional Workshop, 1996).

Additional Information

Plantations in Ghana have been unsuccessful because of gall attacks (FAO, 1986b). *M. excelsa* is often found with galled leaves caused by the insect *Phytolyma lata*, it is thought that these outbreaks limit high densities of this species due to increased mortality (Hawthorne, 1995a).

b) *Milicia regia*

Synonym: *Chlorophora regia*

Iroko

Distribution

This widespread species occurs in Benin, Cameroon, Côte d'Ivoire, Gambia, Ghana, Guinea-Bissau, Guinea, Liberia, Sierra Leone and Senegal. Introduced into Nigeria.

Habitat

Both *M. excelsa* and *M. regia* show a preference for dry, flat, light areas (Hawthorne, 1995a). *M. regia* is found in the same forest types as *M. excelsa*, with a slight preference for moister forest (Hawthorne, 1995a).

Population Status and Trends

This species is common in Ghana (Hawthorne, 1995a)

Role of Species in its Ecosystem

No information.

Threats

This species is severely threatened by over-exploitation in Ghana (Hawthorne, 1995a).

Utilisation

The high quality timber is used as a Teak substitute. It is widely used for all kinds of construction work and carpentry including domestic flooring, veneer and cabinetwork.

Trade

This species is not distinguished from *Milicia excelsa* by commercial logging companies (Hawthorne, 1995a).

Iroko is a major commercial species in international trade. Tanzania and Uganda were in the past major sources of the timber and some Iroko is still exported from E. Africa (WCMC, 1991). West African countries are now the main exporters, especially Ghana (traded together with *M. regia*) and Côte d'Ivoire (WCMC, 1991).

The UK imported 22 648m³ in 1989. Côte d'Ivoire supplies 60% of the Iroko imported to the UK.

Conservation Status

IUCN Category and Criteria: VU (A1d) (African Regional Workshop, 1996)

This species is considered Vulnerable (1994 IUCN threat category) due to excessive exploitation (Hawthorne, 1995b). It has been awarded a scarlet star in Hawthorne's (1995a) own system, which means that it is common but it is under profound pressure from heavy exploitation. This species requires protection and exploitation has to be limited if it is to be sustainable (Hawthorne, 1995a).

Conservation Measures

This species is considered a priority for *in situ* conservation by FAO, 1984. It is legally protected in the Gambia and is subject to a log export ban in Ghana. Known to be resistant to *Phytolema* attack and deserves trials in plantation throughout its range (African Regional Workshop, 1996).

12. Afrormosia

Pericopsis elata

Synonym: *Afrormosia elata*

Leguminosae

African teak, afrormosia, afrormosia, assamela, awawai, ayin, kokrodua

Distribution

Cameroon, Congo, Côte d'Ivoire, DR Congo, Ghana, Nigeria

Habitat

A gregarious species, restricted to the drier parts of semi-deciduous forests.

Population status and trends

Four main areas of distribution can be defined; east Côte d'Ivoire and west Ghana, Nigeria and west Cameroon, the Sangha-Ngoko basin in Congo and the central basin in Zaire. Levels of exploitation have been unsustainable in all countries and the species and its habitat has declined through logging and clearance. Remaining populations are small and scattered. Natural regeneration is poor and insufficient to replace lost populations.

Role of species in the ecosystem

Threats

Commercial exploitation, clear-felling/logging of the habitat, burning, extensive agriculture.

Utilisation

Afrormosia provides an important alternative to teak. It is used in furniture making, interior and exterior work, flooring and boat-building.

Trade

Since 1948 trade in the timber has soared; the most significant producers being Ghana and Côte d'Ivoire. Log production in Congo in 1990 was 9004m³.

Afrormosia has been used in the furniture industry in the UK. Imports of sawn timber fell from 3500m³ in 1985 to insignificant levels in 1989.

IUCN Conservation category

EN A1cd according to the African Regional Workshop

Conservation measures

The species is currently listed in CITES Appendix II.

Forest management and silviculture

Although easily propagated from seed and stem cuttings, the species is not being planted on a large scale. Trees are capable of attaining 26m height in 16 years.

13. Wenge

a) Millettia laurentii

Wenge

Distribution

This species occurs in Cameroon, Congo, Gabon, Equatorial Guinea and Zaire.

Habitat

It is a species of semi-deciduous, dense forest and it is sometimes found in inundated swampy forests.

Population Status and Trends

No information also this could be inferred from forest extent and rate of decline.

Role of Species in its Ecosystem

No information.

Threats

This species is threatened by over-exploitation for timber (African Regional Workshop, 1996).

Utilisation

A decorative species used in furniture production, decorative veneers and speciality items (WCMC, 1991).

Trade

Zaire is the main source of Wenge for the European market. It is also exported by Congo and Gabon (WCMC, 1991). Gabon exported 589 m³ of *M. laurentii* from Owendo in 1987 (IUCN, 1990), a total of 390.580 m³ in 1994, and a total of 400.584 m³ in 1995 (DIAF, 1996)

Conservation Status

IUCN Category and Criteria: EN (A1c,d) (African Regional Workshop, 1996)

Conservation Measures

Special permission is required for exploitation of this species in Cameroon.
Regeneration work is urgently required (African Regional Workshop, 1996).

b) *Millettia stuhlmannii*

Distribution: Congo, Mozambique, Tanzania, Zimbabwe

14. Ramin:**a) *Gonystylus affinis***

Thymelaeaceae

Distribution

Indonesia (West Kalimantan?), Malaysia (Peninsular Malaysia, southwest Sarawak).
In Peninsular Malaysia this species occurs along the west coast, from Kedah to N. Johore.

Habitat

This species is found in lowland open rainforest, mixed dipterocarp forest and heath forest, at altitudes up to 330 m.

Population status and trends**Role of species in the ecosystem****Threats****Utilisation**

The 'ramin' timber is used for house construction. Especially used for door and window frames, furniture, plywood, toys and handles of non-impact tools.

Trade

No information.

IUCN Conservation category

NE

Conservation measures**Forest management and silviculture**

b) Gonystylus bancanus

Thymelaeaceae

Trade name Ramin

Local names Melawis (Malaya), Garu Buaja (Indonesia), Lanutan-Bagio

(Philippines)

Distribution

Brunei, Indonesia (Kalimantan, Sumatra), Malaysia (Peninsular Malaysia, Sabah, Sarawak)

Habitat

G. bancanus differs from other species in the genus in being a peat-swamp species. Habitats are lowland freshwater swamp and coastal peat-swamp forest including peripheral mixed swamp forest and *Shorea albida* forest. Also found in heath forest. *G. bancanus* grows at altitudes up to 100m.

In Peninsular Malaysia peat swamp forest occurs in low-lying plains just behind the coast, mainly in the central and southern parts of the peninsula. On the west coast the peat forests occur on heavy alluvial clay, whereas on the east coast they occur on coarse sand and white clay. Large areas of peat swamp forest have been cleared for agriculture, with extensive development of oil palm and pineapple plantations (Appanah *et al.*, 1989).

Peat swamp forests are widespread in Sarawak, accounting for 14 736 km² or 11.9% of the land area. Some conversion to rice and pineapple fields, and coconut and sago plantations has taken place but so far on a relatively small scale. Timber production has been the main use of the forests.

The only extensive area of peat swamp with *Gonystylus* in Sabah is located in the south-west region (Fox, 1978).

G. bancanus occurs in Indonesian peat swamp forests of Sumatra, Kalimantan and Irian Jaya.

Estimates of the total peat area in Sumatra and Kalimantan vary between 16.5 and 27 million ha. The species is also a component of freshwater swamp forests in the lowlands of Sumatra, Kalimantan and Irian Jaya (Silvius *et al.*, 1987).

Total areas of swamp forest of Indonesia

Extent (1000 ha) Peat swamp Freshwater

Original area 2069511 560

Remaining area 169755 185

Area in reserves 1670 670

Source: Silvius *et al.*, 1987.

Population status and trends

A gregarious, often dominant tree of lowland freshwater swamp and peat-swamp forest. This species has been heavily depleted as it is the most important source of 'ramin' timber. *G. bancanus* has been heavily depleted in Indonesia (Haeruman, 1985). It is Vulnerable in Peninsular Malaysia

because of heavy exploitation, habitat loss, poor natural regeneration and lack of silvicultural knowledge about the species (Anon., 1985). According to Repetto and Gillis (1988), the swamp forests of Sarawak were largely depleted of Ramin by 1981. The ITTO mission to Sarawak, reported that Ramin was being heavily overcut.

Role of species in the ecosystem

Threats

It is threatened by over-exploitation and habitat loss. Burning is a major current threat.

Utilisation

Ramin is used for furniture, joinery, mouldings, flooring, plywood.

Trade

Ramin is exported by Sarawak as sawn timber. In 1987 Ramin accounted for 87% of total sawn timber exports from the State. Sawn timber is mainly exported to EC countries such as Italy (37%), UK (13%), Netherlands (10%), FRG (9%), Belgium (6%) and Spain (5%). The quantity of Ramin exported in 1987 was 153 879 m³ and in 1988, 175 000 m³. The volume exported during the period January-March 1989 was 40 000 m³, an increase of around 33% over exports during the same period of the previous year (source: Forestry Department). In 1989, Peninsular Malaysia exported 16 187 m³ of Ramin sawn timber, as recorded by MTIB.

In the early 1980s Ramin was Indonesia's first species for sawn wood exports, accounting for 37.7% in volume, 45.8% in value. The average annual amount exported was 598 000 m³, with a value of US\$119 million (Laurent, 1986). In 1986 Indonesia exported 377 000 m³ of Ramin (source: Forestry Department).

In 1989 the UK imported 19 817 m³ (as recorded in Customs statistics).

IUCN Conservation category

VU A1cd – according to WCMC.

Conservation measures

Legislation:

Indonesia - The export of Ramin in the form of logs or sawn timber is banned.

Presence in protected areas:

Indonesia Gunung Palung Nature Reserve, Kalimantan, Mandor Nature Reserve, Kalimantan, Gunung Penrisen/Gunung Nyiut Game Reserve, Kalimantan, Berbak Game Reserve, Sumatra

Peninsular Malaysia The presence of Ramin in the Kuala Langat Selatan Forest Reserve, Selangor VJR No 10 is noted by Putz (1978). It has been noted (Anon., 1985) that the great majority of the disjunct lowland populations of *G. bancanus* lack all protection, being outside National Parks, Virgin Jungle Reserves and commercial Forest Reserves

Other conservation needs:

Appanah *et al.* (1989) call for the conservation of peat swamp forests in Peninsular Malaysia as a source of timber, for genetic resource conservation and to maintain the hydrological balance. They call for the conversion of forested land for agricultural purposes to be discouraged.

According to Wong Khoo Meng (*in litt.*), conservation of *Gonystylus* habitats is important in Brunei.

Forest management and silviculture

Ramin is the most valuable timber of the peat swamp forests of Sarawak. There have been concerns that the timber is not being cut on a sustainable basis, leading to concern about the future of timber production from this forest type as a whole. The extent of illegal logging is not known but it has been a problem: there was a report, for example, of 1378 m³ of Ramin logs seized in Sarikei Division, Sarawak (Anon., 1988).

The methods of harvesting and transport of Ramin in Kalimantan are described in detail by Laurent (1986). Production is entirely by hand. The only limited mechanised operations are the use of chainsaws for felling and cross-cutting and micro-engines for pulling small trucks from log processing/loading yards to the floating wood yard.

c) *Gonystylus brunnescens*

Thymelaeaceae

Distribution

Indonesia (Kalimantan), Malaysia (Peninsular Malaysia, Sabah, Sarawak). In Peninsular Malaysia in Trengganu, Pahang, Perak and Pangkor Island.

Habitat

Usually occurring in non-inundated dipterocarp rainforest on hills and low-lying land, often near the sea, to an altitude of 1500m.

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

The wood is used as 'ramin' timber.

Trade

IUCN Conservation category

NE

Conservation measures

Forest management and silviculture

d) Gonystylus confusus

Thymelaeaceae

Distribution

Indonesia? (Sumatra?), Malaysia (Peninsular Malaysia), Singapore. The species occurs throughout Peninsular Malaysia except in Perlis and Malacca.

Habitat

A tree confined to non-inundated lowland rainforest up to 600m altitude. Fairly common in evergreen, non-inundated rainforest on hills and low-lying land.

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

The wood is used as 'ramin' timber.

Trade

IUCN Conservation category

NE

Conservation measures

Forest management and silviculture

e) Gonystylus keithii

Thymelaeaceae

Distribution

Indonesia (Kalimantan), Malaysia (Sabah, Sarawak)

Habitat

Evergreen, non-inundated rainforest mostly on sandy soils, up to altitude of 400m.

Population status and trends

The species has a scattered occurrence.

Role of species in the ecosystem

Threats

Utilisation

The wood is used as 'ramin' timber. The fruits are used as a source of vertebrate poison.

Trade

IUCN Conservation category

VU A1cd+2cd – according to WCMC.

Conservation measures

Forest management and silviculture

f) *Gonystylus macrophyllus*

Thymelaeaceae

Distribution

Indonesia (Bali, Irian Jaya, Kalimantan, Moluccas, Sulawesi, Sumatra), Malaysia (Peninsular Malaysia), Papua New Guinea (North Solomons, Papua New Guinea), Philippines?, Solomon Islands (South Solomon). The most widespread species of the genus.

Habitat

Primary forest reaching an altitude of 1500m

Population status and trends

The species has a scattered occurrence. The species is extremely rare in Papua New Guinea and occurs only on New Georgia and Choiseul of the Solomon Islands where it is locally common.

Utilisation

It is one of the important 'ramin' timber species and the heartwood is used as incense. Other products include gum, resin and oil.

IUCN Conservation category

VU A1cd – according to WCMC.

g) *Gonystylus maingayi*

Thymelaeaceae

Distribution

Brunei, Indonesia (Sumatra), Malaysia (Peninsular Malaysia, Sabah, Sarawak), Singapore

exploited for its valuable 'ramin' timber. The roots are used locally as a medicine administered after childbirth.

Habitat

Restricted to primary rainforest and peat-swamp forest up to 200m altitude.

The species was stated to be uncommon in Peninsular Malaysia (Tree Flora of Malaysia, Vol 2, 1973).

Threats

It is likely that this species has been adversely affected by the burning of peatswamp forests especially in Sumatra.

Utilisation

Exploited for its valuable 'ramin' timber. The roots are used locally as a medicine administered after childbirth.

15. Keruing

a) Dipterocarpus alatus

Red List Category & Criteria EN A1cd+2cd, B1+2c

Distribution Bangladesh, Cambodia India (Andaman Is.; Assam), Myanmar, Philippines, Thailand, Viet Nam

Range and Population Recently *D. philippinensis* has been discovered to be conspecific. The conservation status is based on the rate of habitat loss.

Habitat and Ecology In Indo-China and Thailand the species occurs gregariously along river banks, and in the Philippines it is found in mixed dipterocarp forest.

Threats Habitat loss.

b) Dipterocarpus baudii

Red List Category & Criteria CR A1cd+2cd

Distribution Cambodia, Indonesia (Sumatera), Malaysia, Myanmar, Thailand, Viet Nam

Range and Population A species found scattered in the greatly reduced lowland evergreen forests of South East Asia.

Habitat and Ecology Lowland evergreen forest.

Threats Habitat destruction.

c) Dipterocarpus costulatus

Red List Category & Criteria CR A1cd+2cd, B1+2c

Distribution Indonesia (Kalimantan; Sumatera), Malaysia (Peninsular Malaysia; Sarawak)

Range and Population The conservation status is based upon the rate of habitat loss.

Threats Habitat loss.

d) Dipterocarpus grandiflorus

Red List Category & Criteria CR A1cd+2cd

Distribution India (Andaman Is.), Indonesia (Sumatera), Malaysia (Peninsular Malaysia; Sabah), Myanmar, Philippines, Singapore, Thailand, Viet Nam

Range and Population The conservation status of the species is based on rates of habitat loss and conversion.

Habitat and Ecology A relict species of the Pleistocene Sundaland, occurring in primary semi-evergreen and evergreen dipterocarp forest.

Threats Substantial amounts of keruing timber and also large quantities of oleo-resin are harvested. **Conservation Measures** Some populations are known to exist within reserves.

e) Dipterocarpus kerrii

Red List Category & Criteria CR A1cd+2cd, B1+2c

Distribution India (Andaman Is.), Indonesia (Kalimantan; Sumatera), Malaysia (Peninsular Malaysia), Myanmar, Philippines, Thailand, Viet Nam

Habitat and Ecology A species which is locally common in lowland semi-evergreen and evergreen dipterocarp forest.

f) Dipterocarpus verrucosus

Distribution: Brunei Darussalam, Indonesia : *Kalimantan, Sumatera*, Malaysia : *Peninsular Malaysia, Sabah, Sarawa*

16. Parashorea spp.

- **Light weight timbers:** *Parashorea macrophylla, P. malaanonan, P. tomentella;*

Trade and local names: light weight timbers: Weißes seraya, w. lauan (D); white seraya, urat mata (MAL-Sab); seraya puteh (MAL-Sar); white lauan, bagtikan (PI); pendan (RI).

- **Heavy timbers:** *P. aptera, P. densiflora, P. lucida, P. parviflora, P. smythiesii, P. stellata.*

Trade and local names: heavy white seraya, urat mata batu (MAL-Sab), gerutu, meranti gerutu (MAL); khai kheo, khiansai (T); thinkadu, tavoy wood (BUR); cho chi (VN); may nao (LAO);

This timber group is not to be mixed up with the trade timber 'white meranti' (*Shorea/anthoshorea*).

Not protected under CITES regulations.

a) Parashorea aptera

Red List Category & Criteria: CR A1cd

Distribution: Indonesia (Sumatera)

Range and Population: Eastern Sumatra.

Habitat and Ecology: Found below 70 m on sandy soils on low hills.

b) Parashorea buchananii

Distribution: Myanmar

c) Parashorea chinensis

Red List Category & Criteria: EN A1cd, C2a, D

Distribution: China (Guangxi; Yunnan), Viet Nam

Major Threat/s:Habitat Loss/Degradation - Extraction - Wood - Selective logging (ongoing), Intrinsic factors - Poor recruitment/reproduction/regeneration (ongoing)

Range and Population: Found in areas within Mengla, Maguan and Hekou in Yunnan, parts of south-west Guangxi and the northern provinces of Viet Nam. In China only a few large trees are left, the Yunnan population being restricted to an area of 20 km². In Viet Nam the species is sometimes found in pure stands.

Habitat and Ecology: An emergent tree, reaching heights of 80 m, in primary forest areas.

Threats : Insect attacks, resulting in premature fruit-fall, are frequent. Populations have been overexploited for their timber in both countries.

d) Parashorea densiflora

Red List Category & Criteria: EN A1cd, B1+2c

Distribution: Malaysia (Peninsular Malaysia)

Range and Population: Peninsular Malaysia.

Habitat and Ecology: A tree scattered throughout the lowland dipterocarp forest.

Threats : Timber exploitation.

e) Parashorea globosa

Red List Category & Criteria: EN B1+2e, D

Distribution: Indonesia (Sumatera), Malaysia (Peninsular Malaysia)

Habitat and Ecology: Lowland dipterocarp forest.

Threats : Forest degradation.

f) *Parashorea lucida*

Red List Category & Criteria: CR A1cd, B1+2c, C2a

Distribution: Indonesia (Kalimantan; Sumatera), Malaysia (Sarawak)

Major Threat/s: Habitat Loss/Degradation - Extraction - Wood - Clear-cutting (ongoing)

Habitat and Ecology: This species is found in mixed dipterocarp forest on hills.

g) *Parashorea macrophylla*

Red List Category & Criteria: CR A1cd, B1+2c, C2a

Distribution: Brunei Darussalam, Malaysia (Sarawak)

Major Threat/s: Habitat Loss/Degradation - Extraction - Wood - Clear-cutting (ongoing)

Range and Population: Sarawak and Brunei.

Habitat and Ecology: A large timber tree which is confined to moist clay-rich soils.

Conservation Measures: An occurrence has been recorded in a proposed reserve.

h) *Parashorea malaanonan*

Synonym of: *Parashorea plicata*

Red List Category & Criteria: CR A1cd

Distribution: Brunei Darussalam, Malaysia (Sabah; Sarawak), Philippines

Major Threat/s: Habitat Loss/Degradation - Extraction - Wood - Clear-cutting (ongoing)

Habitat and Ecology: A very large dipterocarp tree of lowland primary forest.

Threats : Used as white seraya timber and is the most important commercial timber of northern Borneo.

Conservation Measures: This threatened species is located in a proposed reserve site.

i) *Parashorea parvifolia*

Distribution: Brunei Darussalam, Malaysia : *Sabah*

j) Parashorea smythiesii

Distribution: Brunei Darussalam, Indonesia : *Kalimantan*, Malaysia : *Sabah, Sarawak*

k) Parashorea stellata

Red List Category & Criteria: CR A1cd, B1+2c

Distribution: Malaysia (Peninsular Malaysia), Myanmar, Thailand, Viet Nam

Major Threat/s: Habitat Loss/Degradation - Extraction - Wood - Clear-cutting (ongoing)

Habitat and Ecology: This slow-growing tree is found in seasonal lowland and evergreen dipterocarp hill forest.

l) Parashorea tomentella

Distribution: Malaysia : *Sabah*

Sources: <http://sea.unep-wcmc.org/isdb/trees/index.cfm?>,
<http://www2.fpl.fs.fed.us/TechSheets/techmenu.html>,
<http://www.redlist.org/>,
http://www.unep-wcmc.org/species/tree_study