

ASIA

Abies nordmanniana subsp. *equi-troujani*

Distribution

This species is endemic to Kaz-Dagh and Ulu-Dagh in western Turkey.

Habitat

This temperate species is found in moist coniferous montane forest and is found in both open and closed forest. It is found in seasonal climates between 1000-2000 m (SSC Conifer Specialist Group, 1996).

Population Status and Trends

Usually found in pure stands, this species is locally abundant but has a scattered distribution (SSC Conifer Specialist Group, 1996).

Regeneration

Seeds of this shade tolerant species are wind dispersed.

Role of Species in its Ecosystem

Not known.

Threats

This species is threatened by habitat degradation, changes in land use, and overgrazing (SSC Conifer Specialist Group, 1996).

Utilisation

A. nordmanniana subsp. *equi-troujani* is a timber species.

Trade

Not known.

Conservation Status

IUCN Threat Category and Criteria: LR 1c (SSC Conifer Specialist Group, 1996)

Conservation Measures

No information.

References

SSC Conifer Specialist Group, 1996. Discussions held by the SSC Conifer Specialist Group as part of the WCMC/SSC *Conservation and Sustainable Management of Trees* Project. March, 1996.

Acacia crassicarpa

Leguminosae
red wattle

Distribution

Australia (Queensland), Papua New Guinea

Habitat

A species of tropical, lowland, dry, broadleaved, forest and woodland types, including savannah woodland, monsoon forest and gallery-type forest. Associated species include *Acacia aulaeocarpa*, *Melaleuca* spp., *Lophostemon suaveolens* and *Tristanopsis ferruginea*.

Population status and trends

In Papua New Guinea, this species is confined to dry and seasonal monsoon forests of the Western Province. Populations occur in logging areas and the timber is actively sought after (Eddowes, 1997)

Role of species in the ecosystem

No information.

Threats

Overexploitation, habitat destruction, fire.

Utilisation

The wood is used for joinery, furniture, cabinet-work, veneer and flooring. The timber has an attractive form and red hue.

Trade

The timber is traded on a minor international scale.

IUCN Conservation category

VU A1cd+2cd, B1+2abcd according to Eddowes (1997).

Conservation measures

There are probably one or two specimens planted in LAE National Botanic Gardens, Morobe Province, Papua New Guinea. CSIRO (Australia) have made extensive seed collections of a range of *Acacia* spp. from Papua New Guinea.

Forest management and silviculture

Plantations have been established in Indonesia.

References

Eddowes, P.J. 1997. Completed data collection forms for New Guinea.

Acer laurinum

Aceraceae

perdu, walik elar, wuru dapang, wuru putih

Distribution

Borneo, China (Hainan), Java, Lesser Sunda Islands, Myanmar, (Mindanao Island) Philippines, Sulawesi, Sumatra, Thailand?

Habitat

The only truly tropical maple. A giant tree of primary montane forest, rarely secondary or devastated forest, occurring up to 2000m. In Sabah and Sarawak populations are apparently confined to soils of relatively high nutrient status, on igneous rocks between 200 and 1500m in the upper limits of mixed dipterocarp forest and on granodiorite rocks in lower montane oak-laurel forest between 1200 and 1600m.

Population status and trends

A widespread and relatively common species, although it appears to be rare in truly non-seasonal parts of Peninsular Malaysia, Sumatra and Borneo. In Sabah only two collections have been made and the species is frequent within a very local distribution in Sarawak (Soepadmo and Wong, 1995). The distribution in the Philippines is also local (Asia Regional Workshop, 1997). According to Sosef, Hong and Prawirohatmodjo (1998) the species is uncommon but fairly widespread and does not seem to be threatened.

Role of species in the ecosystem

No information

Threats

No specific information on threats to this species.

Utilisation

The white undersides to the leaves provide an attractive ornamental attribute to the species. Utilisation of the timber is very limited due to its scarcity and absence of heartwood (Sosef, Hong and Prawirohatmodjo 1998).

Trade

IUCN Conservation category

DD according to the Asia Regional Workshop (WCMC, 1997).

Conservation measures

It is now in cultivation in the Botanical Garden of the University of Groningen, The Netherlands.

Forest management and silviculture

The species is of low forestry interest (Asia Regional Workshop, 1997). Nothing is known about its propagation (van Gelderen *et al.*, 1994).

References

- Asia Regional Workshop. 1997. Discussions held during the Third Regional Workshop for the WCMC/SSC Conservation and sustainable management of trees project, Hanoi, Viet Nam, 18-21 August 1997.
- Soepadma, E. and Wong, K.M. (Eds.) 1995. *Tree Flora of Sabah and Sarawak. Volume I*. Government of Malaysia, ITTO, ODA.
- Sosef, Hong and Prawirohatmodjo 1998.
- van Gelderen, D.M., P.C. de Jong and H.J. Oterdoom. 1994. *Maples of the world*. Timber Press, Portland.
- WCMC. 1997. Report on the Third Regional Workshop held at Hanoi, Viet Nam, 18-21 August 1997
- WCMC/SSC Conservation and sustainable management of trees project.

Afzelia rhomboidea

Leguminosae

afzelia, balayong, kupang, Malaca teak, tanduk, tarum, tindalo

Distribution

Eastern Sumatra, northern Borneo and Philippines. In the Philippines it occurs in Luzon, Masbate, Marinduque, Leyte, Cebu and Mindanao.

Habitat

The species is scattered on low hills and ridges or in areas which are temporarily inundated with freshwater at low and medium altitudes (Soerianegara & Lemmens, 1993). In the Philippines it is found near the coast and along the edges of dipterocarp forests.

Population status and trends

Populations in the Philippines have become depleted through logging and kaingin making (de Guzman *et al*, 1986). There is little specific information on populations elsewhere. It is likely that habitat conversion, especially for oil palm plantation, has affected populations in Sumatra (Asia Regional Workshop, 1997). Large trees are sometimes left standing as they are too time-consuming and hard to cut (Asia Regional Workshop, 1997).

Role of species in the ecosystem

No information

Threats

Commercial overexploitation, habitat destruction and degradation (Asia Regional Workshop, 1997).

Utilisation

The wood is widely used in local crafts and in high grade construction, cabinet and furniture work.

Trade

The species is probably still in trade in the Philippines (Soerianegara, & Lemmens, 1993).

IUCN Conservation category

VU A1c,d according to the Asia Regional Workshop (WCMC, 1997).

Conservation measures

In the Philippines the DENR Administrative Order No. 78 Series of 1987, Interim Guidelines on the Cutting/Gathering of Narra and other Premium Hardwoods, imposes restrictions on the felling of this species.

Forest management and silviculture

A slow-growing species (Asia Regional Workshop, 1997).

References

- Asia Regional Workshop. 1997. Discussions held during the Third Regional Workshop for the WCMC/SSC *Conservation and sustainable management of trees* project, Hanoi, Viet Nam, 18-21 August 1997.
- de Guzman, E.D., Umali, R.M, Sotalba, E.D. 1986. Guide to Philippine flora and fauna Volume III.
- Soerianegara, I. & Lemmens, R.H.M.J. (Eds.) 1993. Plant Resources of South-East Asia (PROSEA) 5(1) Timber trees: major commercial timbers. Pudoc Scientific Publishers, Wageningen.
- WCMC. 1997. Report on the Third Regional Workshop held at Hanoi, Viet Nam, 18-21 August 1997 WCMC/SSC *Conservation and sustainable management of trees* project.

Agathis borneensis

Araucariaceae

bembueng, bindang, damar minyak, damar pilau, hedje, tambunan

Distribution

Brunei, Indonesia (Kalimantan, Sumatra), Malaysia (Peninsular Malaysia, Sabah, Sarawak). *Agathis dammara* and *A. philippensis* are treated as separate species.

Habitat

A common species of tropical moist mixed closed forest up to 2200m. Pure stands occur on low-lying sandy peat soil in Borneo and Peninsular Malaysia.

Population Status and Trends

Large stands of trees have been completely extracted through much of its range, most notably in Kalimantan. The stands of 100-400m³/ha volume in South Kalimantan have been seriously depleted (Soerianegara & Lemmens, 1993). Exploitation continues to be heavy and regeneration in residual stands is insufficient to replace lost populations. In the past the tree has also been destructively exploited for copal.

Role of species in the Ecosystem

Threats

Overexploitation, clear-felling/logging of the habitat.

Utilisation

Agathis species are distinctive, highly-sought and exploited for their valuable timber. It is excellent for joinery, boat building, construction, panelling, turnery, utensils. It also makes a good veneer, pulp and paper, charcoal and activated carbon. The resin or Manila copal is used in varnishes. Heavy exploitation had reduced the economic importance of the genus.

Trade

Agathis spp. are reported in exports from Indonesia and Malaysia. Indonesia exported 760,000m³ in the form of round logs in 1973. In 1987 and 1988 67,000m³ and 83,000m³ of sawnwood was exported at a value of US\$20.1 million and US\$22.2 million respectively. Sarawak exported 22,000m³ in log form in 1987 and Sabah exported 130,000m³. By the 1990s sawnwood had taken over in the market in Peninsular Malaysia. The largest export volume of 8300m³ in round wood is reported in 1967. Sawnwood exports increased from 3250m³ in 1973 to 3300m³ in 1986 and 6000m³ in 1989 and decreased again to 5500m³ and 3500m³ in 1990 and 1992 respectively (Soerianegara & Lemmens, 1993).

The peak in the world production of copal occurred in the earlier part of the century, the large part coming from Indonesia. 18,000t was produced in 1926 and in 1987 Indonesia was still exporting 2650t at a value of US\$650,000 in 1987 but production has declined since then (Soerianegara & Lemmens, 1993).

IUCN Conservation category

VU A1acd according to the SSC Conifer Specialist Group (Farjon *et al.*, 1996).

Conservation Measures

Important populations are held in Badas Forest Reserve in Brunei, Gunung Palung Nature Reserve in Kalimantan, Bukit Barisan Selatan National Park in Sumatra and Taman Negara National Park in Peninsular Malaysia.

Forest Management and Silviculture

It is planted as a plantation tree and in enrichment planting (Soerianegara & Lemmens, 1993). Regeneration is only successful under a closed canopy (Lamprecht, 1989). Data from *A. dammara* plantations indicate that the usual rotation for pulpwood production in plantations is 20 years. More time is needed for timber production. Annual wood production is 23-32m³/ha in 30years and 22-28m³ in 50years. A total yield of 570m³/ha may be obtained after 40 years.

References

- de Laubenfels, D.J. 1988. Coniferales. Flora Malesiana series I - spermatophyta, flowering plants 10(3)
- Farjon, Aljos. *et al.* 1996. Discussions of the SSC Conifer Specialist Group involving the application of revised IUCN red list categories to conifer species.
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- Lamprecht, H. 1989. Silviculture in the tropics: tropical forest ecosystems and their tree species; possibilities and methods for their long-term utilization. Dt. Ges. für Techn. Zusammenarbeit (GTZ). GmbH, Eschborn.
- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.
- Whitmore, T.C. Utilization, potential and conservation of *Agathis*, a genus of tropical Asian conifers.

Agathis endertii

Araucariaceae

bulok

Distribution

Indonesia (Kalimantan), Malaysia (Sabah, Sarawak)

Habitat

Isolated stands are confined to moist lowland forest or heath forest, often associated with sandstone kerangas up to 1400m.

Population Status and Trends

Although the species is widespread, it occurs in isolated populations.

Role of species in the Ecosystem

No information.

Threats

Over exploitation, clear-felling/logging of the habitat.

Utilisation

The wood is used as kauri. *Agathis* species are distinctive, highly-sought and exploited for their valuable timber. It is excellent for joinery, boat building, construction, panelling, turnery, utensils. It also makes a good veneer, pulp and paper, charcoal and activated carbon. The resin or Manila copal is used in varnishes.

Trade

Although present in much smaller quantities in trade, the species is included in the export figures outlined for *A. borneensis*.

IUCN Conservation category

LR/nt according to the SSC Conifer Specialist Group (Farjon *et al.*, 1996).

Conservation Measures

Forest Management and Silviculture

References

- de Laubenfels, D.J. 1988. Coniferales. *Flora Malesiana* series I - spermatophyta, flowering plants 10(3)
- Farjon, Aljos. *et al.* 1996. Discussions of the SSC Conifer Specialist Group involving the application of revised IUCN red list categories to conifer species.
- Farjon, Aljos, Christopher N. Page, & Nico Schellevis. 1993. A preliminary world list of threatened conifer taxa. *Biodiversity and Conservation* 2: 304-326.
- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.

Agathis moorei

Araucariaceae

Distribution

New Caledonia

Habitat

A species of tropical, lowland, moist, open forest occurring on shales, sandstones, schists up to 1000m.

Population Status and Trends

Scattered populations are found throughout the northern half of the island, mostly on non-ultramafic substrates. Substantial declines have occurred through overexploitation of the timber in recent years. Copal is also extracted at moderate levels.

Role of species in the Ecosystem

Threats

Local overexploitation, clear-felling/logging of the habitat

Utilisation

Two grades of timber are produced according to their site of origin. The best quality is the heavy red kaori. White kaori is less durable and softer. Dammar or copal is used in the manufacture of paint, varnish, linoleum and turpentine. The species is also a good source of firewood.

Trade

The timber is sold as red or white kaori in mixed parcels with *A. ovata* and *A. lanceolata*, both endemic to New Caledonia.

IUCN Conservation category

VU B1+2c according to the SSC Conifer Specialist Group (Farjon *et al.*, 1996).

Conservation Measures

Forest Management and Silviculture

References

- Farjon, Aljos. *et al.* 1996. Discussions of the SSC Conifer Specialist Group involving the application of revised IUCN red list categories to conifer species.
- Jaffré, T., P. Bouchet, & J.-M. Veillon. 1996. Threatened Plants of New Caledonia: Is the system of protected areas adequate? *Biodiversity & Conservation*: 36.
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- Laubenfels, D.J. de. 1972. *Flore de la Nouvelle-Calédonie et Dépendances*. Paris: Muséum National d'Histoire Naturelle. 167pp.

Agathis spathulata

Araucariaceae

New Guinea kauri

Distribution

Papua New Guinea

Habitat

A species of tropical, submontane, moist, mixed, closed forest, occurring as an emergent or in groves on exposed sites between 900 - 1980m.

Population Status and Trends

Scattered emergents survive in small exposed groves of rainforest in the eastern highlands. Over-exploitation of the timber is a threat.

Role of species in the Ecosystem

No information.

Threats

Clear-felling/logging of the habitat

Utilisation

The species is a major source of timber and locally used as a fuelwood.

Trade

IUCN Conservation category

LR/nt according to SSC Conifer Specialist Group (Farjon *et al.*, 1996).

Conservation Measures

Forest Management and Silviculture

References

- de Laubenfels, D.J. 1988. Coniferales. *Flora Malesiana* series I - spermatophyta, flowering plants 10(3)
- Farjon, Aljos, Christopher N. Page, & Nico Schellevis. 1993. A preliminary world list of threatened conifer taxa. *Biodiversity and Conservation* 2: 304-326.
- Farjon, Aljos. *et al.* 1996. Discussions of the SSC Conifer Specialist Group involving the application of revised IUCN red list categories to conifer species.
- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. *Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers*. Wageningen: Pudoc Scientific Publishers. 610 pp.

Agathis vitiensis

Araucariaceae

dakua makadre, Fijian kauri

Distribution

Fiji

Habitat

The species occurs at higher elevations in the montane zone, usually mixed formation with other softwoods.

Population Status and Trends

A massive tree and important timber species, found in low densities. It could become of conservation concern if logging was to become more intensive (Farjon *et al.*, 1996).

Role of species in the Ecosystem

Threats

Overexploitation, clear-felling/logging of the habitat.

Utilisation

The species is a major source of timber used in light construction, flooring, ship and boat-building, furniture, veneer and plywood, pulpwood, musical instruments, joinery, turnery and carving, and a local source of fuelwood.

Trade

The species is recorded in 1995 in exports of veneer, amounting to 1000m³ valued at an average price of US\$1039/m³, and in exports of sawnwood amounting to 5000m³ valued at an average price of US\$445/m³ (ITTO, 1997).

IUCN Conservation category

LRnt according to the SSC Conifer Specialist Group (Farjon *et al.*, 1996).

Conservation Measures

Forest Management and Silviculture

References

- Farjon, Aljos, Christopher N. Page, & Nico Schellevis. 1993. A preliminary world list of threatened conifer taxa. *Biodiversity and Conservation* 2: 304-326.
- Farjon, Aljos. *et al.* 1996. Discussions of the SSC Conifer Specialist Group involving the application of revised IUCN red list categories to conifer species.
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- Keating, W.G. & E. Bolza. 1982. Characteristics, properties and uses of timbers. Volume 1. South-East Asia, northern Australia and the Pacific. Inkata Press.
- Smith, A.C. 1979. Flora Vitiensis Nova: a new Flora of Fiji. Hawaii, Pacific Tropical Botanic Garden.

Aglaia penningtoniana

Meliaceae

Distribution

Papua New Guinea

Habitat

Occurring between 30 and 1550m the species is found in tropical, lowland to montane rainforest.

Population Status and Trends

A variable species endemic to Papua New Guinea. The levels of selective logging and conversion of forest for agriculture may pose potentially serious threats.

Role of species in the Ecosystem

Threats

Overexploitation, extensive agriculture.

Utilisation

Little information is available on the species use but it is thought to be of value as a timber.

Trade

IUCN Conservation category

VU A1c according to Pannell (1997).

Conservation Measures

Forest Management and Silviculture

References

- Lemmens, R.H.M.J., I. Soerianegara, & W.C. Wong (eds.). 1995. Plant Resources of South-East Asia No 5(2). Timber trees: Minor commercial timbers. Leiden: Backhuys Publishers. 655 pp.
- Pannell, C. 1997. Comments regarding the threat status of *Aglaia* trees.
- Pannell, C.M. 1992. A taxonomic monograph of the genus *Aglaia* Lour. (*Meliaceae*). London: HMSO. 1-379.

Aglaia perviridis

Meliaceae

tengkorak lang, tenkohalang, goi xanh

Distribution

Bangladesh, Bhutan, China, India (Andaman and Nicobar Is - Andaman Is), Malaysia (Peninsular Malaysia), Thailand, Viet Nam

Habitat

Occurring between 100 and 1330m, the species is found in tropical or subtropical primary evergreen forest, monsoon and secondary forest on limestone or deep ferrallitic wet and well-drained soils.

Population Status and Trends

Although a common species much of the habitat is threatened with destruction. In Viet Nam populations are sporadic in Que Phong and Qui Chau Districts.

Role of species in the Ecosystem

Threats

Utilisation

The fruit is eaten locally. The timber is used in construction, ship and boat-building, for household utensils and agricultural tools. It is often planted as an ornamental tree.

Trade

IUCN Conservation category

VU A1c according to Pannell (1997).

Conservation Measures

Forest Management and Silviculture

Regeneration is said to be poor in Viet Nam and saplings are rarely found under the canopy of mother trees (Chinh *et al.*, 1996).

References

- Chinh, N.N. *et al.* 1996. Vietnam Forest Trees. Forest Inventory and Planning Institute. Agricultural Publishing House, Hanoi.
- Lemmens, R.H.M.J., I. Soerianegara, & W.C. Wong (eds.). 1995. Plant Resources of South-East Asia No 5(2). Timber trees: Minor commercial timbers. Leiden: Backhuys Publishers. 655 pp.
- Pannell, C. 1997. Comments regarding the threat status of *Aglaia* trees.
- Pannell, C.M. 1992. A taxonomic monograph of the genus *Aglaia* Lour. (*Meliaceae*). London: HMSO. 1-379.

Aglaia silvestris

Meliaceae

ganggo, pacar kidang, kayu wole, bekak, segera, lantupak, salamingai, panuhan, chanchamot.

Distribution: Cambodia, India (Andaman and Nicobar Is - Andaman Is, Andaman and Nicobar Is - Nicobar Is), Indonesia (Irian Jaya, Java, Kalimantan, Moluccas, Sulawesi, Sumatra), Malaysia (Peninsular Malaysia, Sabah, Sarawak), Papua New Guinea (Bismarck Archipelago, North Solomons, Papua New Guinea), Philippines, Solomon Islands (South Solomon), Thailand, Viet Nam

Habitat

A species of primary forest, swamps, savannah, kerengas, monsoon forest, moss forest, also occurring along roads and rivers up to 2100m.

Population Status and Trends

A widespread, variable species found in diverse habitat types up to 2100m throughout Malesia and Indochina. Habitat destruction is a continuous and potentially very serious threat.

Role of species in the Ecosystem

Threats

Utilisation

The wood is light and used in house-building and for making agricultural tools. The fruit are edible.

Trade

IUCN Conservation category

LR/nt according to Pannell (1997).

Conservation Measures

Forest Management and Silviculture

Propagation and planting experiments are taking place on a small scale.

References

- Chinh, N.N. *et al.* 1996. Vietnam Forest Trees. Forest Inventory and Planning Institute. Agricultural Publishing House, Hanoi.
- Kessler, Paul J.A., Kade Sidiyasa, Ambriansyah Zainal, & Arifin Zainal. 1995. Checklist of secondary forest trees in East and South Kalimantan, Indonesia. 84pp.
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- Pannell, C. 1997. Comments regarding the threat status of *Aglaia* trees.
- Pannell, C.M. 1992. A taxonomic monograph of the genus *Aglaia* Lour. (*Meliaceae*). London: HMSO. 1-379.

Ailanthus integrifolia

Simaroubaceae

ai lanit, kayu ruris, pohon langit, malasapsap, balokas, makaisa, white siris

Distribution

India (Assam), Papua New Guinea (Bismark Archipelago), Solomon Islands, Viet Nam, and all islands in Malesia except Java and the Lesser Sunda Islands.

Habitat

Mixed seasonal primary rainforest up to 900 m. Trees are scattered, never gregarious, in valleys along streams and in open locations. It is most often found on well-drained deep soils like fertile sandy loams.

Population status and trends

Although the species has a large distribution it is rare in most regions. It is locally common in New Guinea (Lemmens, Soerianegara and Wong, 1995).

Role of species in the ecosystem

Threats

Utilisation

The wood is used for house building, furniture manufacture, paper pulp, fuel and charcoal amongst other things. The leaves, bark, roots and resin have medicinal properties. The leaves also provide a black dye and the resin is burnt for its fragrance.

Trade

The timber is sometimes traded together with similar timber as 'mixed light-coloured hardwood'. Japan imports small amounts of *white siris* mainly from Papua New Guinea but it is not thought to be present in European trade (WCMC, 1991). In Papua New Guinea logs fetch a minimum price of US\$43/m³.

IUCN Conservation category

LR/lc according to the Asia Regional Workshop (WCMC, 1997).

Conservation measures

A close relative of the *tree of heaven* (*A. altissima*), this species is also widely planted.

Forest management and silviculture

The species is propagated by seed. Plantations have been developed in certain areas, for example in Java and India, but the timber is sourced from the wild in Papua New Guinea. It is believed that the establishment of plantations may benefit from a taungya system in which a low annual crop such as chilli or eggplant is planted in the first year. The species is fast-growing. Planted trees in Java showed an annual increment of 15m³/ha in the first ten years. In India increments of 20m³/ha have been attained. On suitable sites the timber may be harvested at 35-40 years. Natural regeneration of planted trees has been observed to occur after four years but seed production is variable. In the wild regeneration is poor in the shade but more successful in open weed-free situations. In summary the species has great plantation development, especially if seed production can be better controlled (Lemmens, Soerianegara and Wong, 1995).

References

- Asia Regional Workshop. 1997. Discussions held during the Third Regional Workshop for the WCMC/SSC *Conservation and sustainable management of trees* project, Hanoi, Viet Nam, 18-21 August 1997.
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- WCMC. 1997. Report on the Third Regional Workshop held at Hanoi, Viet Nam, 18-21 August 1997 WCMC/SSC *Conservation and sustainable management of trees* project.

Alloxylon brachycarpum

Proteaceae

pink oak, satin oak, silky oak

Distribution

Indonesia (Irian Jaya, Moluccas), Papua New Guinea. In Irian Jaya the species is confined to the Digul district and the Aru Islands.

Habitat

A medium to large sized tree scattered in tropical primary lowland open forest. It occurs in seasonal dry climates in monsoon/gallery forest, associated with: *Acacia aulacocarpa*, *Acacia crassicarpa*, *Flindersia* spp., *Grevillea* spp. (Eddowes, 1997).

Population status and trends

The population in Papua New Guinea is restricted in range and confined to a fragile ecosystem in the Oriomo River area in Western Province, where logging and habitat destruction are serious threats (Eddowes, 1997).

Role of species in the ecosystem

Seeds are dispersed by birds and probably by small marsupials.

Threats

Habitat destruction.

Utilisation

The wood is used as a decorative veneer and for cabinet work, furniture and turnery (Eddowes, 1997).

Trade

The timber is found in minor international trade (Eddowes, 1997). In 1996 Papua New Guinea exported 121 cu m of 'pink silky oak' logs (Sosef, Hong and Prawirohatmodjo, 1998).

IUCN Conservation category

EN A2cd according to Eddowes (1997). This evaluation refers to the situation in Papua New Guinea only, however the species is undoubtedly endangered in Indonesia as well (Eddowes, 1997b).

Conservation measures

There are no known conservation measures and it is not thought to be in cultivation (Eddowes, 1997).

References

Eddowes, P.J. 1997. Completed data collection forms for New Guinea.

Eddowes, P.J. 1997b. Letter to Sara Oldfield containing annotations to the Draft Red List Summary Report for Papua New Guinea trees.

Alstonia pneumatophora

Apocynaceae

basung, pulai basong, pulai puteh

Distribution

Peninsular Malaysia, Sumatra, Sulawesi, Borneo.

Habitat

The species occurs in mixed peat-swamp forest on shallow peat, often where it overlies sand near the coastal fringe. It becomes abundant near the mouth of large rivers.

Population status and trends

Most *Alstonia* species are common and widespread. They do not seem vulnerable to genetic erosion because they often easily invade severely disturbed places. However, stands heavily depleted in places as a result of deforestation caused by logging and shifting cultivation (Soerianegara & Lemmens, 1993).

Role of species in the ecosystem

Threats

Logging and shifting cultivation.

Utilisation

Pulai is a lightweight hardwood used to make boxes and crates, veneers and plywood, interior trim, furniture components and carvings. The wood of the aerial roots is used as a substitute for cork. The latex is used medicinally and when mixed with oil makes glue sticks (Soerianegara & Lemmens, 1993).

Trade

The species is present in trade with other members of the genus. *Pulai*, as applied to the genus as a whole, is one of the six most important export timbers of Indonesia. Export of sawnwood increased from 50,000m³ in 1987 to 70,000m³ in 1989, raising a price of US\$18.5 million. Sarawak and Sabah also export smaller amounts; Sabah exported 20,000m³ of round logs and 9500m³ of sawnwood in 1992 (Soerianegara & Lemmens, 1993). Peninsular Malaysia reported in 1995 the presence of 2000m³ of sawnwood in exports valued at an average price of US\$312/m³ (ITTO, 1997). It is not thought to be present in European trade (WCMC, 1991).

IUCN Conservation category

LR 1c according to Kade Sidiyasa and the Asia Regional Workshop (1997).

Conservation measures

Forest management and silviculture

Alstonia spp. in general are fast-growing but often show scarce natural regeneration. Seedlings are found scattered or in groups particularly at forest edges and in secondary forest. In most countries *pulai* is harvested selectively from natural forest and there is little experience of silviculture (Soerianegara & Lemmens, 1993).

References

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Aquilaria malaccensis

Thymelaeaceae

agarwood, agar, aloewood, eaglewood, gaharu

Distribution

India (Arunachal Pradesh, Assam, Meghalaya, Manipur, Tripura, West Bengal, Mizoram, Nagaland, Sikkim), Bhutan, Myanmar, Bangladesh, Malaysia, Indonesia (Kalimantan, Sumatra), Philippines. Populations in Indochina appear to belong to a different species (Asia Regional Workshop, 1997).

Habitat

This large evergreen tree is found in primary or secondary forest up to 1000m. In Malaysia, the species can be found up to 750m on plains, hillsides and ridges in primary and secondary forest (Whitmore, 1973).

Population Status and Trends

Populations are widespread but patchy in distribution in Indonesia and Malaysia. According to the Indonesian National Forest Inventory *Aquilaria* spp population densities are 1.87 individuals per hectare in Sumatra, 3.37 individuals per hectare in Kalimantan and 4.33 individuals per hectare in Irian Jaya. In Malaysia estimates lie at 2.5 individuals per hectare (Soehartono in WCMC, 1997). As the most important source of *agarwood* populations are heavily exploited throughout the species range. Only 10% of the trees in any population are likely to be infected with the fungus that causes the wood to decay, producing *agarwood*. Traditionally local people have harvested only infected trees but demand in the last ten years has led to excessive harvesting of both diseased and healthy trees (Soehartono in WCMC, 1997). There is even a belief that the diseased wood develops in felled trees. Major centres of production are located at Riau and Aceh in Sumatra, also Kalimantan and Irian Jaya. The increasing rarity of the species has led to traders searching for populations in more remote areas by helicopter and in some cases outside the species range (Anon, 1997). Production from plantations is still very minor. The Indian populations are critically endangered (Asia Regional Workshop, 1997). In addition, according to the pre-1994 IUCN Red List Category system the following populations were considered threatened at the national level Bangladesh (Endangered), Bhutan (Rare), Myanmar (Vulnerable), Malaysia (Indeterminate), Singapore (Rare), Sumatra (Endangered).

Role of species in the ecosystem

Threats

Overexploitation.

Utilisation

The fungal infested wood is used as a medicine, incense, insect repellent and ingredient in perfumes. The timber is used for making furniture.

Trade

Agarwood often contains a mix of *Aquilaria* spp. In the form of powder or wood chips different species are indistinguishable (Soehartano in WCMC, 1997). Trade in *agarwood* between India and Arabian countries has continued for centuries. Indonesia is now a major exporter, supplying up to 300 tons pa. to Hong Kong, Japan, Taiwan, Singapore, Saudi Arabia, United Arab Emirate, Oman and Yemen. The lowest grade *agarwood* fetched prices of US\$100/kg in 1993 and the highest grade US\$10,000/kg in UAE, Saudi Arabia and Bahrain (Kumar & Menon in press in Anon, 1997). Between 1990 and 1991, India exported a total of 432,370 kg, valued at Rs. 6,223,447 (Anon, 1994).

Since 1995 the species has been included in Appendix II of CITES and member states, such as Indonesia, have been reorganising procedures of harvesting and trade to fit CITES regulations. Enforcement has been difficult and illegal felling and trade have been reported in Indonesia and India.

IUCN Conservation category

VU A1cd according to the Asia Regional Workshop (1997).

Conservation Measures

The species is included in Appendix II of CITES. In India, the extraction of this species is either banned or regulated depending on the state under the Indian Forest Act and Administration Order of State Forest Department (Anon, 1994). Export is prohibited from India under item 7 of para 158 of prohibited items, however exports are still officially recorded (Anon, 1994).

Forest management and silviculture

The best *agarwood* yields are from trees of 50 years age or more but resin is produced as early as 20 years. Plantations of 10 to 15 ha have been established in East Sumatra, West Kalimantan and West Java. The plantations set up in the early 1990s in India have come under heavy pressure and are largely destroyed (Anon, 1997). Experiments are underway to establish a method of injecting the fungus into healthy trees.

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Araucaria cunninghamii

Araucariaceae

alloa, colonial pine, hoop pine, ningwik, pien, Richmond River pine

Distribution

Australia (New South Wales, Queensland), Indonesia (Irian Jaya), Papua New Guinea

Habitat

An emergent tree which occurs mainly in Fagaceae forest above 1000m up to 2745m. Relatively dense stands are found in forest on loam, clay, sand or peat soils on ridges, sometimes on swampy terrain. In Australia, it is scattered in rainforest. In New Guinea associated species include *Araucaria hunsteinii*, *Castanopsis*, *Lithocarpus*, *Flindersia*, *Elaeocarpus*, *Podocarpus* and *Toona* and in Australia *Flindersia zanthoxyla*, *F. australis*, *F. pubescens*, *Dysoxylum* spp., *Ceratopetalum apetalum* and the members of Lauraceae and Celastraceae are associated.

Population Status and Trends

In New Guinea, stands have been heavily exploited, especially for the plywood industry. Areas such as Bulolo in Papua New Guinea are exhausted. Numerous small patches, however, still remain in a range of habitats and large scale logging is no longer viable. Large amounts of timber are being produced from plantation sources in Australia (Soerianegara & Lemmens, 1993).

Role of species in the Ecosystem

A dominant species. Regeneration in the wild takes place in disturbed habitats.

Threats

Commercial overexploitation.

Utilisation

The timber is useful as a light structural timber, for ship and building, furniture, veneer, plywood, pulpwood, joinery and turnery. The seeds are edible and trees are planted as ornamentals.

Trade

Araucaria timber is commercially important but mainly locally traded. *Araucaria* plywood was a major export item from Papua New Guinea until 1980 when the supplies of logs from natural sources became low. The species is reported in plywood exports in 1995 from Papua New Guinea (ITTO, 1997).

IUCN Conservation category

Not evaluated.

Conservation Measures

Export of *Araucaria* logs has been banned from Papua New Guinea.

Forest Management and Silviculture

Extensive plantations have been set up in Australia and South Africa. In Australia 44,500 ha have been planted and provided an annual timber production of 211,000 m³ in 1988-1989 and 248,000 m³ in 1989-1990. Plantations mixed with *A. hunsteinii* cover 8000ha in Papua New Guinea, where trees have reached heights of 30m after 38 years growth. Trees in Queensland are reported to reach 33m in 34 years and in Peninsular Malaysia the same height is reached in 30 years. Plantation material produces a premium quality pulp. Trees usually start to bear cones at 15 to 25 years age. Propagation can be achieved from seed, which can be stored for up to six years.

References

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Araucaria hunsteinii

Araucariaceae

klinki pine

Distribution

Papua New Guinea

Habitat

The species is found in Fagaceae forest on well-drained sites, mainly occurring between 700 and 1000m but extending up to 2100m. Associated species include *Acmena acuminatissima*, *Elmerillia tsiampacca*, *Ficus* spp., *Flindersia amboinensis*, *F. pimenteliana*, *Pometia pinnata* and *Xanthophyllum papuanum*.

Population Status and Trends

Stands have become scattered because of heavy exploitation in the past. The habitat is also frequently cleared or degraded by shifting agriculture, fire and damage caused by feral pigs. Large scale exploitation of *Araucaria* in Papua New Guinea is no longer viable because of low supplies.

Role of species in the Ecosystem

It is said to be the tallest tree in Malesia.

Threats

Grazing/damage by feral/exotic animals, burning, extensive agriculture

Utilisation

The timber is useful as a light structural timber, for ship and building, furniture, veneer, plywood, pulpwood, joinery and turnery. It is specifically recommended for aircraft frame manufacture. Trees are planted as ornamentals.

Trade

Araucaria timber is commercially important but mainly locally traded. *Araucaria* plywood was a major export item from Papua New Guinea until 1980 when the supplies of logs from natural sources became low. The species is reported in plywood exports in 1995 from Papua New Guinea (ITTO, 1997).

IUCN Conservation category

LR/nt according to SSC Conifer Specialist Group (Farjon *et al.*, 1997).

Conservation Measures

Araucaria logs are banned from export in Papua New Guinea.

Forest Management and Silviculture

Small plantations covering 8000ha of *A. cunninghamii* and *A. hunsteinii* exist in Papua New Guinea and the species has been introduced to Australia, Fiji and Peninsular Malaysia on an experimental scale.

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Calophyllum canum

Guttiferae

bintangor merah

Distribution

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

Habitat

The species occurs in well-drained mixed dipterocarp forest and peat swamps up to 1200m. Considerable morphological variation is evident, correlating with a wide ecological range.

Population Status and Trends

It is expected that *Calophyllum* species will be more heavily harvested when other timber supplies have become exhausted.

Role of species in the Ecosystem

Threats

Utilisation

A source of *bintangor*, a general purpose timber suitable for light construction, flooring and panelling, boat-building, joinery, furniture, veneer and plywood. The latex is used to stupefy fish.

Trade

Bintangor is the generic term referring to timber derived from all members of the genus. In Sarawak, this species represents one of the most important sources of *bintangor*. *Bintangor* is exported in large quantities to Japan, especially from Borneo. Round logs exported from Sabah in 1987 amounted to 42,000m³ with a value of US\$2.8 million. In 1992 17,500m³ of logs and 41,500m³ of sawnwood was exported at a value of US\$10.3 million. Peninsular Malaysia reported the presence of 16,000m³ of *Calophyllum* sawnwood in exports in 1995, valued at an average price of US\$167/m³ (ITTO, 1997).

IUCN Conservation category

NE

Conservation Measures

Forest Management and Silviculture

Preliminary data from Peninsular Malaysia indicate that members of the genus may be slow-growing, taking 70 years to attain a diameter of 50cm.

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Calophyllum carrii* var. *longigemmatum

Guttiferae

Distribution

Indonesia (Irian Jaya) and Papua New Guinea

Habitat

A medium to large tree scattered in primary, lowland, moist, non-seasonal, broadleaved, closed forest between 15 - 300m.

Population status and trends

This variety is only known from an area near Jayapura, Irian Jaya, and West Sepik Province in Papua New Guinea. It occurs in areas that are subject to intensive logging activities (Eddowes, 1997).

Role of species in the ecosystem

Bats, feral pigs, birds and water act as dispersal agents (Eddowes, 1997). Pollinated by insects and wild bees (Eddowes, 1997).

Threats

Logging is the major threat.

Utilisation

The wood is used for plywood, furniture and as a veneer (Eddowes, 1997).

Trade

The timber is found in major international trade (Eddowes, 1997). In 1995 Papua New Guinea recorded the export of 231,000m³ of *Calophyllum* logs, valued at an average price of US\$156/m³ (ITTO, 1997).

IUCN Conservation category

VU B1+2abcde according to Eddowes (1997).

Conservation measures

No specific conservaiton measures ar eknown.

Forest management and silviculture

Preliminary data from Peninsular Malaysia indicate that members of the genus may be slow-growing, taking 70 years to attain a diameter of 50cm.

References

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Calophyllum euryphyllum

Guttiferae

Distribution

Indonesia (Irian Jaya, Moluccas), Papua New Guinea (Bismarck Archipelago, Papua New Guinea)

Habitat

This tree is scattered in primary rainforest up to 610m, sometimes on coral.

Population Status and Trends

Populations are restricted to Central and Milne Bay Districts, Papua New Guinea, the islands of Geelvink Bay and the Vogelkop Peninsula, Irian Jaya, also on the Aru Islands and the Bismarck Archipelago (except New Ireland). It is expected that *Calophyllum* species will be more heavily harvested when other timber supplies have become exhausted.

Role of species in the Ecosystem

Threats

Utilisation

A source of *bintangor*, a general purpose timber suitable for light construction, flooring and panelling, boat-building, joinery, furniture, veneer and plywood.

Trade

The species is probably traded as *calophyllum* in Papua New Guinea. In 1995 Papua New Guinea recorded the export of 231,000m³ of *calophyllum* logs, valued at an average price of US\$156/m³ (ITTO, 1997).

IUCN Conservation category

LRlc according to Stevens (1997).

Conservation Measures

Forest Management and Silviculture

Preliminary data from Peninsular Malaysia indicate that members of the genus may be slow-growing, taking 70 years to attain a diameter of 50cm.

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Calophyllum inophyllum

Guttiferae

Alexandrian laurel, beach calophyllum, bintangor laut, bitaog, Borneo mahogany, dingkaran, krathing, naowakan, njamplung, palo maria, penaga laut, ponnyet, saraphee naen

Distribution

Australia, British Indian Ocean Territory (Chagos Archipelago), Brunei, Fiji, India, Japan, Kenya, Madagascar, Malaysia, Mozambique, Myanmar, New Caledonia, Papua New Guinea (Bismarck Archipelago, Papua New Guinea), Philippines, Singapore, Sri Lanka, Taiwan, Tanzania, Thailand, Tuvalu, Viet Nam

Habitat

A widespread tree of sandy beaches near the coast and occasionally inland on sandy soils up to 200m.

Population Status and Trends

At local levels populations are heavily harvested.

Ecology

Fruits are dispersed by the sea and by fruit bats.

Role of species in the Ecosystem

Threats

Utilisation

Compared to other *Calophyllum* the timber is more durable and stronger, with a finer grain. It is used for construction work, furniture, cartwheel hubs, musical instruments, canoes and boats. The oil from the seed is used for illumination, soap making and medicinal purposes. The latex and pounded bark also have medicinal uses. Fruit are edible. Trees are planted for shade and ornament.

Trade

The timber is often traded separately as *beach calophyllum*. Fiji is recorded as exporting *Calophyllum* spp. as plywood, veneer and sawnwood in 1995 (ITTO, 1997). In the same year Papua New Guinea recorded the export of 231,000m³ of *calophyllum* logs, valued at an average price of US\$156/m³ and Peninsular Malaysia reported the presence of 16,000m³ of *Calophyllum* sawnwood in exports, valued at an average price of US\$167/m³ (ITTO, 1997).

IUCN Conservation category

LRlc according to Stevens (1997).

Conservation Measures

Trees are widely planted both within and outside the natural range, e.g. in West Africa and tropical America, as a source of oil.

Forest Management and Silviculture

Preliminary data from Peninsular Malaysia indicate that members of the genus may be slow-growing, taking 70 years to attain a diameter of 50cm.

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Calophyllum insularum

Guttiferae
bintangor

Distribution

Indonesia (Irian Jaya)

Habitat

A tree scattered in primary colline rainforest up to 200m.

Population status and trends

The entire population is restricted to islands in Geelvink Bay. The possible exploitation of the timber would place the species in a seriously threatened position. The more imminent threat, however, is habitat clearance for agriculture and settlement (Eddowes, 1997).

Role of species in the ecosystem

The flowers are pollinated by birds and the seeds are dispersed by birds (Eddowes, 1997).

Threats

Expansion of human settlements, extensive agriculture

Utilisation

The wood is used for plywood, furniture and as a veneer (Eddowes, 1997).

Trade

The timber is possibly traded internationally (Eddowes, 1997).

IUCN Conservation categories

EN B1+2c according to Eddowes (1997).

Conservation measures

None exist.

Forest management and silviculture

Preliminary data from Peninsular Malaysia indicate that members of the genus may be slow-growing, taking 70 years to attain a diameter of 50cm.

References

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Calophyllum papuanum

Guttiferae

Distribution

Indonesia (Irian Jaya, Moluccas), Papua New Guinea

Habitat

This canopy tree is usually found in colline or montane forest up to 1850m, sometimes in depleted Agathis forest, rarely occurring in swamp forest.

Population Status and Trends

It is expected that *Calophyllum* species will be more heavily harvested when other timber supplies have become exhausted.

Role of species in the Ecosystem

Threats

Utilisation

The timber is used in building and is considered a decorative substitute for dark-coloured mahogany, if suitably stained, and for all kinds of mahogany if transparently coated. It is also substituted for red meranti.

Trade

The timber is traded in Papua New Guinea as *calophyllum*. In 1995 Papua New Guinea recorded the export of 231,000m³ of *calophyllum* logs, valued at an average price of US\$156/m³ (ITTO, 1997).

IUCN Conservation category

LRlc according to Stevens (1997)

Conservation Measures

Forest Management and Silviculture

Preliminary data from Peninsular Malaysia indicate that members of the genus may be slow-growing, taking 70 years to attain a diameter of 50cm.

References

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Calophyllum waliense

Guttiferae

Distribution

Papua New Guinea (Bismarck Archipelago)

Habitat

Trees are scattered in tropical moist non-seasonal forest on ridges. It is often found in *Calophyllum* forest between 100 and 550m.

Population Status and Trends

Restricted to Manus Island, the species is vulnerable to habitat destruction and logging. The island has been heavily exploited for its timber resources (Eddowes, 1997).

Role of Species in the Ecosystem

The flowers are pollinated by insects and the seeds are dispersed by bats and birds (Eddowes, 1997).

Threats

Clear felling/logging

Utilisation

The wood is used as a veneer and for furniture and plywood (Eddowes, 1997).

Trade

The timber is possibly present in minor international trade (Eddowes, 1997). The timber is traded in Papua New Guinea as *calophyllum*. In 1995 Papua New Guinea recorded the export of 231,000m³ of *calophyllum* logs, valued at an average price of US\$156/m³ (ITTO, 1997).

IUCN Conservation category

EN B1+2abcde according to Eddowes (1997).

Conservation Measures

None exist

Forest Management and Silviculture

This species is not found in cultivation (Eddowes, 1997).

References

- Conn, B.J. (ed.). 1995. Handbooks of the Flora of Papua New Guinea. Malaysia: Melbourne University Press. 1-292.
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Canarium luzonicum

Burseraceae

belis, malapili, piling-liitan

Distribution

Philippines

Habitat

This species occurs in primary forest at low to medium altitudes.

Population Status and Trends

Habitat loss is likely to be the greatest threat to remaining populations. The timber has not been of great commercial importance to date (Lemmens *et al.*, 1995). The species is, however, the main commercial source of *Manila elemi*. This resin is obtained by cutting small strips of bark and collecting the exudate (Coppen, 1995).

Role of species in the Ecosystem

Flowers are probably insect pollinated. Fruit eating pigeons, monkeys and occasionally bats act as seed dispersers.

Utilisation

The *kedondong* timber is used for light construction. A valuable volatile oil, *Manila elemi*, is distilled from the resin and used locally for caulking ships, in torches, varnishes and glues. It is also commercially exported for the manufacture of varnish and medicinal ointments. The seeds are edible and the bark yields a tannin of reasonable quality.

Trade

Canarium timber is usually mixed with the timber of other members of Burseraceae and sold as *kedondong*. The production of fruits appears to be more commercially important than of timber (Lemmens *et al.* 1995).

IUCN Conservation category

VU A1cd according to WCMC

Conservation Measures

Forest Management and Silviculture

Canarium spp. can be propagated by seed. Natural regeneration is believed to be scarce because of the scattered distribution of trees and possibly also because of levels of fruit harvesting. A single tree yields 4-5kg of resin.

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Canarium pseudosumatranum

Burseraceae

kala, kedondong senggah, lamshu senggi

Distribution

Malaysia (Peninsular Malaysia)

Habitat

This species is scattered as very large trees in lowland forest and hill forest between 300 and 920m.

Population Status and Trends

Populations are poorly known but recorded from Perlis, Kedah, Perak, Selangor, Negeri Sembilan and Pahang.

Role of species in the Ecosystem

Flowers are probably insect pollinated. Fruit eating pigeons, monkeys and occasionally bats act as seed dispersers

Threats

Clear-felling/logging of the habitat, expansion of human settlement

Utilisation

The wood is used as *kedondong* timber for house building, light construction, floorings, interiors, furniture, joinery, canoes, veneer and plywood.

Trade

Canarium timber is usually mixed with the timber of other members of Burseraceae and sold as *kedondong*. The production of fruits appears to be more commercially important than of timber (Lemmens *et al.* 1995). The export of *kedondong* as sawnwood, valued at US\$638/m³, is recorded in 1995 (ITTO, 1997). In 1983 16,350m³ of kedondong sawnwood at a value of US\$675,000 was exported to Singapore (69%), South Korea (19%) and Hong Kong (12%). The following year 9500m³ at a value of US\$395,000 was exported to Singapore (99%) and Japan (1%) (Lemmens *et al.*, 1995).

IUCN Conservation category

LRcd according to Chua (1997).

Conservation Measures

Forest Management and Silviculture

Canarium spp. can be propagated by seed. Natural regeneration is believed to be scarce because of the scattered distribution of trees and possibly also because of levels of fruit harvesting.

References

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- ITTO. 1997. Annual review and assessment of the world tropical timber situation. 1996. International Tropical Timber Organization (ITTO).
- Lemmens, R.H.M.J., I. Soerianegara, & W.C. Wong (eds.). 1995. Plant Resources of South-East Asia No 5(2). Timber trees: Minor commercial timbers. Leiden: Backhuys Publishers. 655 pp.

Cantleya corniculatum

Icacinaceae

dedraru

Distribution

Sumatra, Sabah, Sarawak, Peninsular Malaysia, Riau, Lingga Archipelago and Bangka.

Habitat

The species grows in drier parts of primary freshwater swamp forest or in drier hill forest, on marshy or sandy soils, up to 300 m.

Population Status and Trends

Populations are scattered and confined to lowlands where they are at great risk from logging and habitat clearance. The species experiences the same kind of problems that are faced by *Aquilaria* species but at a lesser level (Asia Regional Workshop, 1997).

Role of Species in the Ecosystem

This is the sole member of the genus

Threats

Overexploitation

Utilisation

The timber is highly valued and much sought after. It is heavy and hard with a fragrance similar to sandalwood for which it is used as a substitute. It is also used for house and ship building and heavy construction.

Trade

The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation Category

VU A1c,d according to the Asia Regional Workshop (1997).

Conservation Measures

There are no records of the species in seed or germplasm banks (Sosef, Hong and Prawirohatmodjo, 1998).

Forest Management and Silviculture

Natural regeneration is generally sparse and silvicultural research is urgently needed (Sosef, Hong and Prawirohatmodjo, 1998).

References

- Asia Regional Workshop. 1997. Discussions held during the Third Regional Workshop for the WCMC/SSC *Conservation and sustainable management of trees* project, Hanoi, Viet Nam, 18-21 August 1997.
- Sosef, Hong and Prawirohatmodjo, 1998.
- WCMC. 1991. *Provision of data on rare and threatened tropical timber species*. Unpublished report, prepared under contract to the EC.

Cephalotaxus oliveri

Olive Plum Yew

Distribution

This species is found in Guixhou, Hubei, Sichuan, Yunnan, Guangdong, Guangxi, Hunan, Jiangxi, Vietnam and eastern India.

Habitat

This species is found in low altitude (300-1500m) subtropical closed forests. It is mainly found in evergreen broad-leaved forests or in evergreen and deciduous broad-leaved mixed forests in valleys and by streams.

Population Status and Trends

Populations of *C. oliveri* have been rapidly decreasing. This species is scattered in forests throughout its range (China Plant Red Data Book, 1992).

Regeneration

This is a shade tolerant species which has moderately slow growth. Seeds germinate after ripening for one year in the broad-leaf litter; once the seeds have germinated the seedlings require shade. (China Plant Red Data Book, 1992)

Role of Species in its Ecosystem

No information.

Threats

This species is threatened by over-exploitation and habitat loss (China Plant Red Data Book, 1992).

The dioecious nature of *C. oliveri* means that this species is further threatened by infrequent regeneration (China Plant Red Data Book, 1992).

Utilisation

Used for timber. *C. oliveri* contains the alkaloids cephalotaxine and harringtonine which can be extracted from the leaves, shoots and seeds which have medicinal value for treating leukaemia and lymphoma (China Plant Red Data Book, 1992), however, no widespread exploitation has yet taken place (SSC Conifer Specialist Group, 1996).

Trade

It is not known whether international trade in products from this species currently take place.

Conservation Status

IUCN Category and Criteria: VU (A1d) (SSC Conifer Specialist Group, 1996).

Conservation Measures

This species is found in several nature reserves (Emei Mountain in Sichuan, Shuanghuang Mountains and Zhangjiajie in Hunan (China Plant Red Data Book, 1992).

Note: *C. oliveri* is a relict species which is markedly different to other members of the same genus (China Plant Red Data Book, 1992).

References

- Li-Kuo, F. and Jian-Ming, J., 1992. *China Plant Red Data Book - Rare and endangered plants*. Vol. 1. Science Press:Beijing. pp. 741.
- SSC Conifer Specialist Group, 1996. Discussions held by the SSC Conifer Specialist Group as part of the WCMC/SSC *Conservation and Sustainable Management of Trees Project*. March, 1996.

Cercidiphyllum japonicum

Cercidiphyllaceae

katsura tree, lianxiangshu

Distribution

China (Anhui, Gansu, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Shanxi, Sichuan, Zhejiang), Japan

Habitat

A species of temperate forest, occurring between 400 and 2700m. In China it is also found in subtropical regions in mixed mesophytic forest and evergreen oak and *Schima* forest. In Japan it occurs in valleys in beech forest.

Population Status and Trends

A rare tree in China, found in remnant patches of broadleaved forest. Regeneration is poor and there is evidence of infestations at the seedling stages. Cutting has also contributed to population declines (Fu & Jin, 1992). In Japan populations are concentrated in the north and scattered in the south.

Role of species in the Ecosystem

Threats

Poor regeneration

Utilisation

One of the most important trees yielding timber in Japan. The wood is light and soft and largely used for interior finish, furniture, carpentry.

Trade

IUCN Conservation category

LR/nt according to WCMC

Conservation Measures

Populations are likely to occur in various nature reserves in China.

Forest Management and Silviculture

References

- FAO Forestry Department. 1986. Databook on endangered tree and shrub species and their provenances. Rome: FAO. 524pp.
- Fu, Li-kuo & Jian-ming Jin (eds.). 1992. China Plant Red Data Book. Beijing: Science Press. xviii-741.
- National Environment Protection Bureau. 1987. The list of rare and endangered plants protected in China. Botanical Institute of Chinese Academy of Sciences, Beijing: Academy Press. 96pp.

Chamaecyparis obtusa* var. *formosana

Distribution

This taxon is endemic to Taiwan.

Habitat

This temperate species is found in moist coniferous montane forests with a seasonal climate. It is found at altitudes between 1800-2500m.

Population Status and Trends

C. obtusa var. *formosana* has been declining since 1960, although it is still abundant in its range (SSC Conifer Specialist Group, 1996).

Regeneration

Seeds of the species are wind dispersed.

Role of Species in its Ecosystem

This shade tolerant species is associated with *Chamaecyparis formosensis* and other conifers.

Threats

C. obtusa var. *formosana* is threatened by over-exploitation, habitat loss and changes in land use/management (SSC Conifer Specialist Group, 1996).

Utilisation

It is a timber species.

Trade

Currently no evidence of international trade in this species is known.

Conservation Status

IUCN Threat Category and Criteria: VU (A1c,d) (SSC Conifer Specialist Group, 1996)

Conservation Measures

There is an important population of *C. obtusa* var. *formosana* in Yuanyang Lake reserve.

References

SSC Conifer Specialist Group, 1996. Discussions held by the SSC Conifer Specialist Group as part of the WCMC/SSC *Conservation and Sustainable Management of Trees* Project. March, 1996.

Chloroxylon swietenia

Rutaceae

East Indian satinwood

Distribution

India, Sri Lanka

Habitat

The species occurs in dry mixed evergreen or deciduous forest.

Population Status and Trends

A slow growing species which has become very scarce in Sri Lanka because of timber exploitation (de S. Wijesinghe *et al.*, 1990).

Role of Species in the Ecosystem

Threats

Overexploitation, habitat loss.

Utilisation

The heart wood is rated for its extreme durability, but the sapwood is vulnerable to attack by termites. The wood is used for decorative veneers, furniture and cabinet work, turnery and interior joinery. The gum is also useful.

Trade

IUCN Conservation Category

Vu A1c according to the Asia Regional Workshop (1997).

Conservation Measures

Forest management and Silviculture

References

- Asia Regional Workshop. 1997. Discussions held during the Third Regional Workshop for the WCMC/SSC *Conservation and sustainable management of trees* project, Hanoi, Viet Nam, 18-21 August 1997.
- de S. Wijesinghe, L.C.A., Gunatilleke, I.A.U.N., Jayawardana, S.D.G., Kotagama, S.W. and Gunatilleke, C.V.S. 1990. *Biological conservation in Sri Lanka (A national status report)*. Natural Resources, Energy and Science Authority of Sri Lanka, Colombo.

Cinnamomum parthenoxylon

Lauraceae

Distribution

China, India, Indonesia, Thailand and Viet Nam

Habitat

In Viet Nam the species is found in tropical evergreen rainforests up to 700 m altitude, on sheltered slopes, growing on deep well-drained fertile soils (Vu Van Dung, 1996).

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

The wood of this species is used in furniture making, construction, flooring, utensils and wood-carving.

Trade

The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

The species has been recorded as threatened in Indonesia (WCMC, 1991). It is recorded as Insufficiently Known in the Red Data Book of Viet Nam (Phan Thuc Vat, 1996).

Forest management and silviculture

The species is light demanding. Natural and coppice regeneration are good in secondary forests (Vu Van Dung, 1996).

Conservation measures

References

- Asia Regional Workshop. 1997. Discussions held during the Third Regional Workshop for the WCMC/SSC *Conservation and sustainable management of trees* project, Hanoi, Viet Nam, 18-21 August 1997.
- Phan Thuc Vat 1996. *Red data book of Viet Nam. Volume 2 Plants*. Science and Technics Publishing House.
- Vu Van Dung (Ed.) 1996. *Viet Nam Forest Trees*. Agricultural Publishing House, Hanoi.
- WCMC. 1991. *Provision of data on rare and threatened tropical timber species*. Unpublished report, prepared under contract to the EC.

Cynometra inaequifolia

Leguminosae

Distribution

Malaysia (Peninsular Malaysia, Sabah), Philippines, Thailand?

Habitat

Lowland closed forest

Population status and trends

The species has been considered to be ** in the Philippines

Role of species in the ecosystem

Threats

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

Utilisation

Used as a source of kekatong timber.

Trade

Kekaton is not an important export timber, with only very small amounts reported and not specifically in this species.

IUCN Conservation category

VU A1d - WCMC

Conservation measures

Forest management and silviculture

All timber extraction for kekatong is from natural forest, and there has been no replanting or enrichment planting (Soerianegara and Lemmens, 1993).

References

- Erfurth, T. & H. Rusche. 1976. The marketing of tropical wood. (unpublished). FO: MISC/76/8.
- Penafiel, S. 1990. Annotation to list of tropical timbers for the Philippines.
- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. *Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers*. Wageningen: Pudoc Scientific Publishers. 610 pp.

Dacrydium nausoriense

Podocarpaceae
tangitangi, yaka

Distribution

Fiji

Habitat

A tree of dry, seasonal, submontane woodland and scrub between 600 - 800m.

Population status and trends

Endemic to the Nausori Highlands in western Viti Levu, the species occurs in small stands within a closely confined area. There is evidence that regeneration is poor. The area is unprotected and the stands are open to cutting, burning, agricultural and pastoral activities.

Role of species in the ecosystem

Threats

Poor regeneration, burning, clear-felling/logging of the habitat, expansion of human settlement, extensive agriculture, forestry management, pastoralism/ranching

Utilisation

The timber is used on a local scale.

Trade

IUCN Conservation category

EN A1cd, B1+2ce, C1 according to SSC Conifer Specialist Group (Watt, 1996).

Conservation measures

Forest management and silviculture

References

- Farjon, Aljos, Christopher N. Page, & Nico Schellevis. 1993. A preliminary world list of threatened conifer taxa. *Biodiversity and Conservation* 2: 304-326.
- Smith, A.C. 1979. Flora Vitiensis Nova: a new Flora of Fiji. Hawaii, Pacific Tropical Botanic Garden.
- Watt, Alistair. 1996. Completed data collection forms for conifers of New Caledonia and Fiji.

Dalbergia annamensis

Leguminosae

Distribution

Endemic to Viet Nam, occurring in Phú Yên and Khánh Hòa provinces

Habitat

Lowland dry open forest, at altitudes up to 500m.

Population status and trends

The species is scattered in lowland dry forest.

Role of species in the ecosystem

Threats

This species is endangered by over-exploitation for its valuable wood. Clear-felling is another threat.

Utilisation

Trade

Minor international trade.

IUCN Conservation category

EN A1cd according to Nghia (1997).

Conservation measures

Forest management and silviculture

The species is not in cultivation.

References

Ministry of Science, Technology and Environment. 1996. Sách đỏ Viet Nam Phan Thuc Vat. Hanoi: Science and Technics Publishing House. 484pp.

Nghia, N.H. 1997. Completed data collection forms for Vietnamese *Dalbergia* spp.

Dalbergia bariensis

Leguminosae

Distribution

Cambodia, Laos, Thailand, Viet Nam

Habitat

Lowland and submontane broadleaved forest up to 1000m altitude.

Population status and trends

The species is widely distributed and scattered. A rapid decline in number of large trees has occurred because of overexploitation of the timber.

Role of species in the ecosystem

Associated with species of *Leguminosae* and *Dipterocarpaceae*

Threats

Timber exploitation and general clear-felling/logging of the habitat.

Utilisation

Trade

Minor international trade

IUCN Conservation category

EN A1cd according to Nghia (1997).

Conservation measures

It is legally protected from cutting in Viet Nam and occurs in protected areas. The species is not in cultivation.

Forest management and silviculture

References

Lock, J.M. & J. Heald. 1994. Legumes of Indo-China. The Royal Botanic Gardens, Kew. 164pp.

Ministry of Science, Technology and Environment. 1996. Sach do Viet Nam Phan Thuc Vat. Hanoi: Science and Technics Publishing House. 484pp.

Nghia, N.H. 1997. Completed data collection forms for Vietnamese *Dalbergia* spp.

Dalbergia cambodiana

Leguminosae

Distribution

Cambodia, Viet Nam

Habitat

This species occurs in moist lowland forest up to an altitude of 500m.

Population status and trends

Widely distributed but scattered

Role of species in the ecosystem

Threats

Illegal exploitation; clear-felling/logging of the habitat

Utilisation

The wood is valuable

Trade

Minor international trade

IUCN Conservation category

EN A1cd according to Nghia (1997).

Conservation measures

This species is not in cultivation.

Forest management and silviculture

References

Nghia, N.H. 1997. Completed data collection forms for Vietnamese *Dalbergia* spp.

Dalbergia cochinchinensis

Payung; Thailand Rosewood

Distribution

This species is found in Cambodia, Thailand, Laos and Viet Nam.

Habitat

In Viet Nam the tree grows sparsely in open and semi-deciduous forests, occasionally in pure stands. Mainly concentrated at altitudes of 400-500 m preferring deep sandy clay soil and calcareous soil (Vu Van Dung, 1996).

Population status and trends

In Viet Nam, *D. cochinchinensis* is found south of Quang Nam-Da Nang, mainly in Gia Lai and Kon Tum; it in other provinces it is sparsely distributed in a few localities (Chính et al, 1996).

Regeneration

This species is shade tolerant as a sapling and becomes light demanding. *D. cochinchinensis* has quite a slow growth rate. It regenerates well by coppicing (Chính et al, 1996).

Role of species in the ecosystem

No information.

Threats

Deforestation and exploitation are threats to this species.

Utilisation

D. cochinchinensis is considered a 'first class prime timber', as it is hard, durable, easy to work and resistant to insects. The distinctive heartwood makes beautiful patterns when cut and the wood is used to make furniture, carvings, musical instruments and sewing machines (Chính et al, 1996).

In Viet Nam the species is classified as a first class prime timber. It is used for furniture, wood turnery, fine-art articles, musical instruments and sewing machines (Vu Van Dung, 1996).

Trade

No specific information on trade in this species is available.

IUCN Conservation category

VU A1c,d (Asia Regional Workshop, 1997).

This species is considered Vulnerable in Viet Nam (Chính et al, 1996; Phan Thuc Vat, 1996). It is also of conservation concern in Thailand (Phengkklai, pers. comm. 1989).

Conservation measures

A current IPGRI project is looking at the distribution of genetic resources of this species in its range countries. It is found in some nature reserves (Asia Regional Workshop, 1997).

Forest management and silviculture

References

- Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August 1997
- Chính, N.N, Chung, C.T., Cấn, V.V., Dung, N.X., Dung, N.K., Đào, N.K., Hop, T., Oanh, T.T., Quynh, N.B., Thìn, N.N., 1996. *Viet Nam Forest Trees*. Forest Inventory and Planning Institute. Agricultural Publishing House: Hanoi. pp.788.
- Phan Thuc Vat 1996. *Red data book of Viet Nam. Volume 2 Plants*. Science and Technics Publishing House.
- Phengkklai, pers. comm. 1989.
- Vu Van Dung (Ed.) 1996. *Viet Nam Forest Trees*. Agricultural Publishing House, Hanoi.

Dalbergia latifolia

Indian rosewood, Bombay blackwood, lalshisham, Palisandre de l'Inde (Fr), Indonesia: sonokeling, sonobrits, sonosunga (Java). Viet Nam: tr[aws]c (Soerianegara & Lemmens, 1993).

Distribution

This species is found in Nepal, Java and western and north-eastern India, in the states of Kerala, Karnataka and Tamil Nadu. It also occurs in Madhya Pradesh and Andhra Pradesh and sporadically in northern India (Kumar, 1994).

Habitat

Mainly found in monsoon forests in association with species such as *Tectona grandis*, *Albizia chinensis*, and *Cassia fistula*. In the southwestern part of its range, it also occurs in evergreen forests. The annual rainfall in its natural habitat is between 750 and 5000 mm on deep, well-drained, moist soils. The species thrives in a variety of edaphic conditions including alluvial, lateritic and gneissic soils and broken rock (Lamprecht, 1989).

Population status and trends

The species is reported to have declined in Mysore and Kerala (Sirvarajan, 1969).

Role of species in the ecosystem

Threats

Because of the high value of the timber, it is under considerable pressure of illegal felling and theft, though such data has not been quantified so far (Kumar, 1994).

Utilisation

This species is of great commercial significance (Collins, Sayer and Whitmore, 1991). The timber is used for fine furniture and cabinet making, musical instruments, turnery and decorative veneers. The species is planted as a shade tree (Soerianegara & Lemmens, 1993).

Trade

In 1990 a total of 16 750 m³ of *Dalbergia* timber was harvested in Java, the majority of which was *D. sissoo* which is planted. The price of sonokeling wood from Java is comparable with that of teak wood (Soerianegara & Lemmens, 1993).

IUCN Conservation category

VU A1c,d (Asia Regional Workshop, 1997).

Conservation measures

Plantations have been established in India, Java and Africa. Protection is provided under the Indian Forest Act. Export in the form of logs and sawn timber is banned (Kumar, 1994).

Forest management and silviculture

A light demanding species, both natural and artificial propagation are possible. Direct seeding, coppicing and vegetative propagation with root cuttings are all practised. Rotations of between 60 and 150 years are required for the production of high-grade timber (Lamprecht, 1989).

References

- Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, Viet Nam, August 1997
- Collins, N.M., Sayer, J.A. and Whitmore, T.C. (Eds.) 1991. *The Conservation Atlas of Tropical Forests Asia and the Pacific*. Simon & Schuster: Singapore.
- Kumar, A. 1994. Personal communication to M. Read and S. Oldfield.
- Lamprecht, H. 1989. *Silviculture in the Tropics*. GTZ
- Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.) 1995. *Plant Resources of South-East Asia (PROSEA) 5(2) Timber Trees: Minor commercial timbers*. Backhuys Publishers, Leiden 655pp.
- Sirvarajan, M. 1969. On the export trade of Indian rosewood. *Indian Forester* 95(12).
- Soerianegara, I. & Lemmens, R.H.M.J. (Eds.) 1993. *Plant Resources of South-East Asia (PROSEA) 5(1) Timber trees: major commercial timbers*. Pudoc Scientific Publishers, Wageningen.
- WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Dalbergia mammosa

Leguminosae

Distribution

Central and southern Viet Nam

Habitat

Dense semi-deciduous forest or transitional forest between evergreen and dry dipterocarp forest, up to 800 m. altitude, sometimes along streams. Found on deep and well-drained old basalt or old alluvial soils.

Population status and trends

Scattered in broadleaved forest, the entire population has declined through over-exploitation of the valuable timber.

Role of species in the ecosystem

Grows in association with *Terminalia chebula*, *Terminalia nigrovenulosa*, *Stereospermum cylindricum*, *Hymenodyction exselsum*, *Allospondias lakoensis* and *Hopea odorata*.

Threats

Over-exploitation of the valuable timber through illegal felling; clear-felling/logging of the habitat

Utilisation

Trade

Minor international trade

IUCN Conservation category

EN A1cd according to Nghia, 1997.

Conservation measures

The species is legally protected as it is included in the Council of Ministers Decision 18/HDBT (17 January 1992) as a species with high economical value which is subject to over-exploitation. It is not in cultivation.

Forest management and silviculture

References

- Chinh, N. N. *et al.* 1996. Vietnam Forest Trees. Hanoi: Agricultural Publishing House. 1-788.
- Lock, J.M. & J. Heald. 1994. Legumes of Indo-China. The Royal Botanic Gardens, Kew. 164pp.
- Ministry of Science, Technology and Environment. 1996. Sach do Viet Nam Phan Thuc Vat. Hanoi: Science and Technics Publishing House. 484pp.
- Nghia, N.H. 1997. Completed data collection forms for Vietnamese *Dalbergia* spp.

Dalbergia oliveri

Leguminosae

Distribution

Myanmar, Thailand, Viet Nam

Habitat

Dense evergreen or semi-deciduous forest up to 1200m.

Population status and trends

Scattered in dense evergreen or semi-deciduous forest within a relatively restricted area of distribution, the population has declined through overexploitation.

Role of species in the ecosystem

Grows in association with *Dalbergia cochinchinensis*, *Albizzia chinensis*, *Sindora siamensis* and *Dipterocarpus alatus*.

Threats

Over-exploitation; clear-felling/logging of the habitat

Utilisation

Produces a beautiful red wood

Trade

Minor international trade.

IUCN Conservation category

EN A1cd according to Nghia, 1997.

Conservation measures

In Viet Nam the species is included in the Council of Ministers Decision 18/HDBT (17 January 1992) as a species with high economical value which is subject to over-exploitation. A protected population occurs in Nam Cát Tiên National Park. This species is not in cultivation.

Forest management and silviculture

References

- Lock, J.M. & J. Heald. 1994. *Legumes of Indo-China*. The Royal Botanic Gardens, Kew. 164pp.
- Nghia, N.H. 1997. Completed data collection forms for Vietnamese *Dalbergia* spp.
- Sutter, H. 1986. Annotations to: List of plants in the WCMC database for Burma.
- Suvatti, C. 1978. Flora of Thailand. Bangkok: Royal Institute.

Dalbergia tonkinensis

Leguminosae

Distribution

China (Guangdong - Hainan), Viet Nam

Habitat

Primary and secondary lowland forest up to 500m.

Population status and trends

A tree known from scattered populations in areas of primary and secondary forest in Viet Nam and Hainan Island of China. In Viet Nam heavy exploitation of the beautiful timber has led to considerable population declines. Habitat loss on Hainan Island through logging, has also been significant.

Role of species in the ecosystem

Associated species are *Aglaia gigantea*, *Canarium album* and *Ailanthus altissima*

Threats

Logging of the species; clear-felling/logging of the habitat; forest clearance for agriculture.

Utilisation

The timber is utilised and the species is also grown as an ornamental.

Trade

Minor international trade

IUCN Conservation category

VU A1cd – Ban, 1997

Conservation measures

Small scale cultivation.

Forest management and silviculture

References

- Ban, N.T. 1997. Some remarks on the red list summary report for Viet Nam trees. 1 pp.
- Chinh, N. N. *et al.* 1996. Vietnam Forest Trees. Hanoi: Agricultural Publishing House. 1-788.
- Loc, Phan Ke. 1986. Lists of rare and endangered plant species of Vietnam (1986-1988).(unpublished).
- Lock, J.M. & J. Heald. 1994. Legumes of Indo-China. The Royal Botanic Gardens, Kew. 164pp.
- Ministry of Science, Technology and Environment. 1996. Sach do Viet Nam Phan Thuc Vat. Hanoi: Science and Technics Publishing House. 484pp.
- Nghia, N.H. 1997. Completed data collection forms for Vietnamese *Dalbergia* spp.

Dehaasia caesia

Medang

Distribution

Java, Sumatra, Borneo

Habitat

Lowland forest

Population status and trends

The risk of genetic erosion for *Dehaasia* spp. is generally considered to be small because they are not restricted in distribution (Sosef, Hong and Prawirohatmodjo, 1998). .

Role of species in the ecosystem

Threats

Utilisation

The wood is a Light Hardwood (Wong, 1982).

Trade

This is one of the main species traded as medang. The timber is not thought to occur in European trade (WCMC, 1991).

Conservation category

The species has been recorded as Rare in Indonesia (WCMC, 1991).

Conservation measures

Forest management and silviculture

References

WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Dehaasia cuneata

Distribution

Thailand, Indonesia and Peninsular Malaysia

Habitat

Lowland and hill forest.

Population status and trends

The species is naturally scattered. It has been recorded as Rare in Indonesia (WCMC, 1991). The species is probably extinct in Java. The risk of genetic erosion for *Dehaasia* spp. is generally considered to be small because they are not restricted in distribution (Sosef, Hong and Prawirohatmodjo, 1998).

Role of species in the ecosystem

No information

Threats

Utilisation

This species is not used as timber in Malaysia or Indonesia (Asia Regional Workshop, 1997).

Trade

The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

Forest management and silviculture

References

WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Dialium cochinchinense

Leguminosae

Distribution

Cambodia, Laos, Malaysia (Peninsular Malaysia), Myanmar, Thailand, Viet Nam

Habitat

Dense evergreen and semi-deciduous forest and in transitional forest between evergreen and open dipterocarp forest, the species is recorded up to 800 m altitude.

Population status and trends

Trees of the genus *Dialium* are naturally scattered and large-scale logging may endanger species (Soerianegara and Lemmens, 1993). Occurring in various forest types throughout Indo-China south into Peninsular Thailand and Malaysia, this species is becoming rarer in many places because of overexploitation. In Viet Nam, it is considered to be threatened.

Role of species in the ecosystem

The fruits are eaten by animals and are carried in water currents.

Threats

Exploitation of the species and clear-felling/logging of the habitat.

Utilisation

The timber is used as keranji which is highly-valued locally. The sweet pulp of the fruits is edible and the tree is used locally as a shade tree (Soerianegara and Lemmens, 1993)

Trade

Minor international trade. Trees are difficult to cut because of the dense wood and as they are also scattered, commercial extraction is not favoured.

IUCN Conservation category

LR/nt - WCMC

Conservation measures

A protected population occurs in Kon Cha Rang Nature Reserve, Viet Nam. Planted in villages of northern Peninsular Malaysia for fruit trees.

Forest management and silviculture

Research is required on silvicultural and management aspects (Soerianegara and Lemmens, 1993).

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Diospyros discolor

Distribution

Native to the Philippines and Taiwan; occasionally planted elsewhere.

Habitat

Population status and trends

The species has been recorded as threatened in both the Philippines and Taiwan.

Role of species in the ecosystem

Threats

Utilisation

This species is occasionally cultivated for its mabolo fruits.

Trade

Conservation category

The species has been recorded as threatened in the Philippines and Taiwan (WCMC. 1991).

Conservation measures

Forest management and silviculture

References

WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Diospyros ebenum

Blackwood, Ceylon ebony, Mauritius ebony (Lemmens, Soerianegara and Wong, 1995), ebony, tendu, Calamander Maram or Kalu-mediriya.

Distribution

Southern India and Sri Lanka, cultivated in Peninsular Malaysia.

Habitat

Dry forests. Grows as an understorey tree in mixed evergreen dry zone forests of Sri Lanka.

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

Produces commercial ebony; the fruits are also used medicinally, as a famine food and fish poison. Sometimes planted as a shade tree for cardamom (Lemmens, Soerianegara and Wong, 1995).

Trade

Commercial ebony long known in international trade; mainly exported to China for furniture and to Europe as a decorative wood (Lemmens, Soerianegara and Wong, 1995). It was the main commercial ebony in trade for centuries. In Sri Lanka large scale general harvesting of timber in the dry zone forests has taken place since the early 1800s. Initially selective felling of prime species took place with some export to the UK. Timber exports continued until a gradual decline after the 1960s (Abeywickrama *et al* 1991). Ebony on sale in the UK is imported from Sri Lanka.

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

There is a general ban on the export of timber from India. Sri Lanka also bans the export of this species.

Forest management and silviculture

References

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- Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.) 1995. *Plant Resources of South-East Asia 5(2) Timber Trees: Minor commercial timbers*. Backhuys Publishers, Leiden 655pp.
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Diospyros ferrea

Ebenaceae

Distribution

Angola, Australia, Benin, Cambodia, Cameroon, Central African Republic, Côte d'Ivoire, Fiji, Ghana, Guinea, Guinea-Bissau, India, Indonesia, Japan, Laos, Madagascar, Malaysia (Peninsular Malaysia), Mali, Myanmar, Nigeria, Papua New Guinea, Philippines, Senegal, Sierra Leone, Singapore, Sri Lanka, Taiwan, Thailand, Zimbabwe.

Habitat

In Papua New Guinea the species is found in tropical, lowland, moist, broadleaved, closed forest, open forest; mainly in primary rainforest and on limestone (Eddowes, 1997). It is associated with *Syzygium*, *Palaquium*, *Aglaia* spp and *Eucalyptopsis papuana* (Eddowes, 1997).

Altitude: 0 – 50(?)m (Eddowes, 1997)

Population status and trends

This family is in dire need of an orderly revision, especially the Papua New Guinea species; the major species that produce the famed commercial striped and black ebony from Papua New Guinea are still broadly lumped under the very doubtful *Diospyros ferrea* group (Eddowes, 1997b). Therefore the major species of Papua New Guinea, which are clearly highly endangered through over-exploitation, cannot be correctly classified due to the unsatisfactory taxonomy of the group (Eddowes, 1997b).

Role of species in the ecosystem**Threats**

In Papua New Guinea the species is threatened mainly by clear-felling or logging of the habitat (Eddowes, 1997). Secondary threats include the expanding human settlements and increased subsistence farming (Eddowes, 1997).

Utilisation**Trade**

The timber is found in major international trade (Eddowes, 1997).

The export of *Diospyros* spp. is banned in round log form from Papua New Guinea (Eddowes, 1997).

IUCN Conservation category

EN A1cd+2cd, B1+2abcde according to Eddowes, P.J. (1997).

Conservation notes: A valuable ebony timber tree. Due to the doubtful status of the *Diospyros ferrea* species group, as applied, it is difficult to assign a specific IUCN threat category. In Papua New Guinea, it occurs in primary rainforest and is all but restricted to Woodlark Island and possibly some other small islands in the D'Entrecasteaux group. Although the export of *Diospyros* spp. is banned in round log form from Papua New Guinea, this tree has been vigorously exploited in this and other regions and is highly endangered. This species is in dire need of immediate and strict conservation measures if this species is to survive in perpetuity. The above category applies to Papua New Guinea but could well be applied to other countries in its range.

Conservation measures**Forest management and silviculture**

Status in cultivation: small scale

References

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Diospyros insularis

Ebenaceae

Ebony

Distribution

Papua New Guinea (Bismarck Archipelago, North Solomons), Solomon Islands (South Solomon)

Habitat

A tree of primary, lowland, rainforest found up to 50m (Eddowes, 1997).

Population status and trends

It is found in only a few localities in the Solomon Islands and New Ireland of the Bismarck Archipelago (Eddowes, 1997). It is considered to highly endangered, possibly critically endangered, due to exploitation and habitat destruction.

Role of species in the ecosystem

The seeds are dispersed by bats and large birds (i.e. pigeons) (Eddowes, 1997).

Trade

It occurs in international trade (Eddowes, 1997). This species is currently banned from log export in the round form in Papua New Guinea (Eddowes, 1997).

Threats

The species is threatened by clear-felling or logging of the habitat (Eddowes, 1997).

Uses

The wood is used for carving artifacts, musical instruments and as a veneer (Eddowes, 1997).

IUCN Conservation category

EN A1cd+2cd, B1+2c according to Eddowes, P.J. (1997).

Conservation measures

This species is currently banned from log export in the round form in Papua New Guinea. There are no other conservation measures known (Eddowes, 1997).

Forest management and silviculture

The species is not known in cultivation (Eddowes, 1997).

References

- Eddowes, P.J. 1997. Completed data collection forms for New Guinea.
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Diospyros mun

Distribution

D. mun is endemic to Viet Nam. In the northern provinces it is found at Ha Tuyen, Lang Son, Hoa Binh, Ha Tinh, Quang Binh; in the south it occurs at the communes of Cam Thinh Dong and Cam Thinh Tay, district Cam Ranh, province Khanh Hoa.

Habit

The species grows on limestone mountains in the Northern provinces, up to elevations of 800 m. Further south it occurs on yellow ferallitic soils developed from schists.

Population status and trends

Populations of this slow-growing species have declined in the wild because of the demand for timber for the export market.

Trade

D. mun yields black heartwood which is valued for craft objects and especially for chopsticks (Vu Van Dung and Vu Van Can, 1991). Timber is reported to be available in UK trade (WCMC, 1991).

IUCN Conservation Category

VU A1d – according to Amy MacKinven based on Red Data Book of Viet Nam.

Conservation measures

D. mun is included in a list of prime tree and animal species to be protected in Viet Nam (Dang Huy Huynh et al. 1989).

A Ministerial decision on the list of Endangered Forest Wild Fauna and Flora (Decree No. 18) 17.1.92. stipulates protection and management regulations for these species. Under this legislation exploitation of *D. mun* is controlled by an annual quota. The export of round logs and semi-processed wood of the species is forbidden.

In 1992, the Government of Viet Nam announced a ban on all wood exports, aimed at ending widespread deforestation in parts of the country. Prior to this Viet Nam had banned log exports and had quotas for the export of sawn timber (Callister, 1992).

D. mun occurs within a number of protected areas in Viet Nam. These include the Cuc Phuong National Park where it grows in primary humid evergreen forest (Hoang Hoe and Vo Quy, 1990).

Additional protection needs

According to Vu Van Dung and Vu Van Can (1991) protection of the species is needed, especially at the Nature Reserve of Cam Thinh Dong, district Cam Ranh and at another reserve in Quang Binh province. *Ex situ* conservation measures are also urgently needed.

Forest management and silviculture

References

Callister, 1992

Dang Huy Huynh et al. 1989

Hoang Hoe and Vo Quy, 1990

WCMC, 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Diospyros philippinensis

synonyms: *Diospyros cunalon*

Diospyros cumingii

Diospyros flavicans

Philippine Ebony; Kamagong

Distribution

This species is endemic to the Philippines and Northern Sulawesi.

Habitat

Philippine ebony grows in primary forest at altitudes up to 200 m (PROSEA, 1995).

Population Status and Trends

Very little lowland forest remains in the Philippines. Records of *D. philippinensis* are often from forest fragments or from habitats smaller than 50 km² (Madulid, *in litt.*, 1996)

Role of Species in its Ecosystem

No information.

Threats

According to Madulid (1996) this species is rarely exploited for timber.

Utilisation

The timber is used for turnery, piano keys, carving, brush backs, inlaying, parts of stringed instruments and marquetry.

Trade

D. philippinensis from the Philippines is not legally traded in the international market, therefore no official records exist (Madulid, 1996). Illegal trade in *D. philippinensis* is widespread, even though there has been a ban on log exports since 1989 (Blockus et al, 1992 in CITES Proposal). In 1991, a shipment of illegally cut *Diospyros sp.* (Kamagong) worth US\$ 90,171 was seized in a Philippines port before it was illegally exported to Malaysia (Callister, 1992 in Madulid, 1996).

Conservation Status

The global threat status of *D. philippinensis* is unknown according to the WCMC Plants Database. The Philippines has had one of the highest deforestation rates for tropical rain forests (Collins, Sayer, and Whitmore 1991), making this species probably Endangered due to decline in habitat of more than 50 % in three generations, although more information is needed for Northern Sulawesi.

Conservation Measures

Philippine ebony is protected in the Philippines (PROSEA, 1995) and felling restrictions are in force.

D. philippinensis is found in many of the Philippine protected areas (i.e. Mount Arayat National Park, Mounts Palay Palay Mataas NA Gulod National Park, Initai National Park) (Dep't of Environment and Natural Resources, 1992 in CITES Proposal).

There are no known plantations of *D. philippinensis* in the Philippines (Madulid, *in litt.*, 1996)

References

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- Madulid, D. A., 1996. Letter to Amy MacKinven dated 11th July 1996 re: *Diospyros pilosanthera* and *D. philippinensis*.

Diospyros pilosantha

synonym: *Diopspsyros hiernii*

Distribution

This widespread species is found in Myanmar, Thailand, Cambodia, Viet Nam, Peninsular Malaysia, Indonesia (Sumatra, Java, Borneo, and the Moluccas) and the Philippines.

Habitat

D. pilosantha occurs in primary lowland and medium altitude forest (upto 900m) and is frequently found in peat swamp forest, swampy areas, and in river valley forests. This species can also be found in forests on rocky slopes, in old-growth secondary forests and in open forests near the coast (Madulid *in litt.*, 1996)

Population Status and Trends

Records of *D. pilosantha* are often from forest fragments or from habitats smaller than 50 km² (Madulid, *in litt.*, 1996)

Role of Species in its Ecosystem

No information.

Threats

According to Madulid (1996) this species is rarely exploited for timber. The forests containing *D. pilosantha* have been degraded by legal and illegal logging and loss of habitat due to land conversion (i.e. agricultural land, grassland).

Utilisation

The wood is used for fancy woodwork, furniture, cabinet making and tool handles.

Trade

D. pilosantha from the Philippines is not legally traded in the international market, therefore no official records exist.

In 1991, a shipment of illegally cut *Diospyros sp.* (Kamagong) worth US\$ 90,171 was seized in the port before it was illegally exported to Malaysia (Callister, 1992 in Madulid, 1996).

Conservation Status

The global threat status of *D. pilosantha* is unknown according to the WCMC Plants Database.

The new IUCN threat categories have not yet been applied to this species.

Conservation Measures

D. pilosantha occurs in the protected forests of Palawan and Mt. Makiling, Philippines (Madulid, *in litt.*, 1996); the rest of the range in the Philippines (i.e. any public land) are under the jurisdiction of the Dep't of Environment and Natural Resources (DENR). There are no known plantations of *D. pilosantha* in the Philippines (Madulid, 1996).

References

Madulid, D. A., 1996. Letter to Amy MacKinven dated 11th July 1996 re: *Diospyros pilosantha* and *D. philippinensis*.

Diospyros rumphii

Macassar ebony. Indonesia: maitem, moyondi (Sulawesi), mologotu (Moluccas), (Lemmens, Soerianegara and Wong, 1995).

Distribution

Sulawesi and the Moluccas (Lemmens, Soerianegara and Wong, 1995).

Habitat

Lowland forest up to 400 m altitude (Lemmens, Soerianegara and Wong, 1995).

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

Trade

The species is an important source of black and streaked ebony (Lemmens, Soerianegara and Wong, 1995).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

Forest management and silviculture

References

- Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August, 1997
- Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.) 1995. *Plant Resources of South-East Asia (PROSEA) 5(2) Timber Trees: Minor commercial timbers*. Backhuys Publishers, Leiden 655pp.

Durio dulcis

Bombacaceae

Distribution

Indonesia (Kalimantan), Malaysia (Sabah, Sarawak)

Habitat

Lowland mixed dipterocarp forest up to 800m.

Population status and trends

A large tree found scattered in lowland mixed dipterocarp forest. *Durio* spp. generally are scattered, uncommon and regenerate poorly. Genetic erosion has been reported for this species and protection is required (Lemmens, Soerianegara and Wong, 1995).

Role of species in the ecosystem

Threats

Forest clearance and degradation because of agriculture and logging are major threats to the habitat.

Utilisation

The fruits and timber are utilised. The wood is probably one of the most important sources of durian timber in Sarawak.

Trade

The fruit are sold in local and urban markets.

IUCN Conservation category

VU A1c - WCMC

Conservation measures

No specific conservation measures known.

Forest management and silviculture

The species is rarely planted because of its short fruiting period.

References

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Durio kutejensis

durian kunin (Brunei); lai, sekawi (Dayak, Kalimantan); durian tinggang (Malay, Kalimantan), durian merah (Sabah) and rain isu (Iban, Sarawak)

Distribution

Borneo (Sabah, Sarawak, Brunei, Kalimantan). Cultivated in other areas of Malesia e.g. Java and E. Kalimantan.

Habitat

This species is found in primary mixed dipterocarp forest on fertile clay rich soils (Soerianegara and Lemmens 1995).

Population Status and Trends

Wild trees are confined to the foothills of central Borneo. *Durio* spp. are usually scattered and uncommon (Lemmens *et al*, 1995). Natural regeneration of *Durio* spp. in the wild tends to be poor and seedlings are scattered. In Indonesia this species is suffering from some genetic erosion in the wild (Lemmens *et al*, 1995).

Role of species in the ecosystem

The fruits of *Durio* sp. are eaten by animals, especially orang-utans, which act as seed dispersers (Lemmens *et al*, 1995).

Threats

The natural habitat of this species is threatened by forest degradation due to logging and shifting agriculture (Pers. Comm. van Valkenburg, 1997).

Utilisation

The fruit is popular and is the durian relative that comes closest to the 'real' durian (*Durio zibethinus*) (Verheij & Coronel, 1992). The wood is thought to be utilised as durian timber (Lemmens *et al*, 1995). Durian timber is not durable and is only suitable for construction indoors; it is also used for cheaper furniture, cabinets, light-traffic flooring, fittings, panelling, partitioning, plywood, chests, boxes, wooden slippers, low-quality coffins and ship building (Lemmens *et al*, 1995).

The wild populations may be very important for improving cultivated species (Lemmens *et al*, 1995). *Durio kutejensis* having an aromatic but less pungent odour than the true durian could be used in breeding a variety appealing to non-Asian markets (Soengeng-Reksohardjo, 1961 in Smith *et al*, 1992). This species starts fruiting when it is only 4-5 m tall (van Valkenburg, 1997).

Trade

This species is traded on a large scale in E. Kalimantan and has the potential for more widespread trade (van Valkenburg, 1997). Lai is traded in local markets at the height of the durian season, sometime between January and April and there is sometimes a second season in July/August (van Valkenburg, 1997). Prices vary between Rp.500 to RP.1000/fruit depending on size of the fruit and the supply (van Valkenburg, 1997).

Timber of *Durio* is traded together with timber of other *Bombacaceae* genera (Lemmens *et al*, 1995). Durian timber is exported primarily from Sabah and Sarawak mainly to Japan (Lemmens *et al*, 1995). In 1987 Sabah exported a total of 5,300 m³ round logs for US\$67/m³ and in 1992 they exported 8,500m³ round logs and sawn wood with a total value of US\$655,000 (US\$170/m³ for sawn wood and US\$68/m³ for round logs) (Lemmens *et al*, 1995).

IUCN Conservation category

VU A1c - preliminary evaluation by Amy MacKinven, WCMC.

Conservation Measures

Forest management and silviculture

The seeds of *Durio* spp. tend to be recalcitrant as they cannot withstand desiccation or low temperatures (Lemmens *et al*, 1995). Often management systems do not take into account the sporadic occurrence and regeneration of Durian species (Lemmens *et al*, 1995).

References

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Dyera costulata

Hill jelutung. Indonesia: jelutung bukit (general), melabuai (Sumatra), pantung gunung (Kalimantan). Malaysia: jelutung bukit (general), jelutung pipit, jelutung daun lebar (Peninsula). Thailand: teen-pet daeng (Peninsula), ye-luu-tong, luu-tong (Malay, Peninsular) (Lemmens, Soerianegara and Wong, 1995).

Distribution

Peninsular Thailand, Peninsular Malaysia, Singapore, Sumatra, Borneo and intervening islands (Lemmens, Soerianegara and Wong, 1995).

Habitat

The species occurs in primary evergreen lowland or hill forest, in well-drained locations up to 300 m (Lemmens, Soerianegara and Wong, 1995).

Population status and trends

Jelutung has a scattered natural distribution and has declined as a result of tapping for latex and felling for timber. The risk of extinction was recognised 60 years ago. In Peninsular Malaysia the species has been reported to be threatened (Ng *et al* 1984). Jelutung does, however, regenerate readily in logged-over forest. It is also planted commercially for timber.

Role of species in the ecosystem**Threats**

Exploitation for latex, felling for timber, conversion of lowland forests to agriculture.

Utilisation

It has a number of speciality uses such as pattern making in foundry work, for drawing boards, pencils, picture frames, dowels, carving, blackboards, wooden toys, clogs, brush handles and battery separators, and it is also used for furniture parts, door knobs, ceilings, partitioning, matchsticks, matchboxes and packing cases. The roots are used as a substitute for cork and their wood for axe handles. The latex is used in the manufacture of chewing gum, in paints, as priming for concrete, or for sizing paper. Follicles are occasionally used as torches by the local population or burnt to repel mosquitos (Lemmens, Soerianegara and Wong, 1995).

Trade

In the period from 1980-1990 the export of jelutung sawn timber from Peninsular Malaysia was 32000-44000m³/year with a value of US\$ 5.1-10.8 million a year; in 1992 it was 19000 m³ with a value of US\$ 8.3 million (US\$440/m³) (Lemmens, Soerianegara and Wong, 1995). In 1995, Malaysia (Peninsular) exported 5000 m³ of sawnwood at an average price of 710\$/m³ (ITTO, 1996).

The export from Sabah was 67000 m³ in 1987 with a value of US\$4.5 million and 23000 m³ (55% as sawn timber, 45% as logs) in 1992 with a total value of US\$ 3.5 million (US\$ 215/m³ for sawn timber, US\$ 82/m³ for logs). Japan imports comparatively large amounts of jelutung, mainly from Sarawak and Sabah (Lemmens, Soerianegara and Wong, 1995).

In 1987, Indonesia exported 2,183,462US\$ worth of this species as jelutung (WWF and IUCN, 1994-1995).

In Malaysia, the trade in latex has declined since the peak production period 1930-1940. The export of jelutung latex from Indonesia was still around 3500 t in 1989 (Lemmens, Soerianegara and Wong, 1995).

Indonesia is the main source of jelutung gum. Most is exported to Singapore, mainly for re-export to the US. Some is exported directly to Japan and Europe where Italy is the main importer (Coppén, 1995).

IUCN Conservation category

LR-lc (Asia Regional Workshop, 1997).

Conservation measures

Jelutung is subject to a log export ban in Peninsular Malaysia, and special permission has been required to cut the tree in Thailand (Ministry of Agriculture and Cooperatives Decree of 1988).

Regulations on the methods of tapping the latex were introduced in the 1930s (Coppén, 1995).

Forest management and silviculture

In Peninsular Malaysia *D. costulata* is chosen for enrichment planting because it is easy to handle in the nursery, survives well when planted out, has a good rate of growth and has good market potential. Prolonged contact with acid water in peat forest harms young plants. *D. costulata* is a very light-demanding species and once a young tree is well established in full light, it tends to spread its crown and develop into a pronounced 'wolf tree'. Sudden opening of the canopy is favourable for its development (Lemmens, Soerianegara and Wong, 1995).

D. costulata coppices readily and is extremely resistant to girdling (Lemmens, Soerianegara and Wong, 1995).

References

- Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August 1997
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Dyera polyphylla

Apocynaceae

Distribution

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

Habitat

Swamp forest, peat-swamp forest and kerangas on ground water podzols.

Population status and trends

A tree restricted to and scattered in swamp forest, peat-swamp forest and *kerangas on groundwater podzols. the risk of extinction due to over-exploitation was recognised 60 years ago. It is considered endangered in Sarawak. Relatively little is known about this species compared the more common *Dyera costulata*, but considering its restricted distribution and threatened habitat it is apparently at a greater risk of extinction.

Role of species in the ecosystem

Threats

Over exploitation and habitat loss; the current burning of peat swamp forests is likely to seriously impact this species.

Utilisation

The wood is traded as 'jelutong' timber and trees are tapped for the valuable latex.

Trade

See information for *D. polyphylla*.

IUCN Conservation category

EN A1cd - WCMC

Conservation measures

Forest management and silviculture

There is some plantation development.

References

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Erfurth, T. & H. Rusche. 1976. The marketing of tropical wood. (unpublished). FO: MISC/76/8.
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Erythrophleum fordii

Leguminosae

Distribution

China (Guangdong, Guangxi), Taiwan, Viet Nam

Habitat

Monsoon or rainforest up to 800m.

Population status and trends

The Chinese populations are largely reduced to trees left standing around populated areas. The species range in Viet Nam extends from the border with China to Quang Nam-Da Nang Province. Occurring, in monsoon or rainforest it can form a scattered or dominant component.

Role of species in the ecosystem

No information.

Threats

In China, overcutting is the main threat. Clear-felling and logging of the habitat together with clearance for agriculture are other threats to the species.

Utilisation

A valuable timber tree.

Trade

IUCN Conservation category

EN A1cd – Nghia

Conservation measures

No conservation measures are recorded for populations in China. In Viet Nam seeds have been collected from nine areas within the distribution range of the species and ex situ conservation stands will be established at Cau Hai Silviculture Centre (Nghia, 1997).

Forest management and silviculture

In China, plantations were established in the 1950s to increase supplies of the hard wood but demands are still in excess of what can be sustainably provided.

References

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Eugenia flosculifera

Myrtaceae

Kelat

Distribution:

Malaysia (Peninsular Malaysia), Singapore

Habitat:

A lowland, tropical moist species, scattered in the non-seasonal primary forests of Peninsular Malaysia and Singapore. Occurs at an altitude of between 30 - 300m.

Population status and trends:

Role of species in the ecosystem:

This species occurs scattered at the primary stage of succession. Bees, flies and butterflies are pollinators. Monkeys, squirrels and bats are species dispersal agents.

Threats:

Clear-felling/logging of the habitat

Utilisation:

Used as a food for minor international trade, and the stem as timber.

Trade:

IUCN Conservation category

NE

Conservation measures:

This species is conserved within the permanent forest reserves of Peninsular Malaysia. Protection in Virgin jungle reserves and national parks is uncertain. Asian *Eugenia* are now included in *Syzygium*.

Forest management and silviculture:

Status in cultivation:

none

References:

- Chua, L. *et al.* 1997. Completed data collection forms for endemic trees of Peninsular Malaysia.
Ng, P.K.L. & Y.C. Wee (eds.). 1994. The Singapore Red Data Book. Singapore: The Nature Society. 343pp.

Eugenia koordersiana

Myrtaceae

Distribution

Peninsular Malaysia

Habitat

A lowland, tropical moist forest tree occurring up to 200m altitude.

Population status and trends

Widely distributed and abundant in primary forest of Peninsular Malaysia.

Role of species in the ecosystem

Butterflies, bees and flies are pollinators of the species. Dispersal agents include bats, squirrels and monkeys.

Threats

clear-felling/logging of the habitat

Utilisation

Timber

Trade

Major international trade

IUCN Conservation category

LR/lc - Kochummen, K.M.

Conservation measures

Conservation measures for the species, are in place in productive forest reserves. The species is not in cultivation.

Forest management and silviculture

References

Chua, L. *et al.* 1997. Completed data collection forms for endemic trees of Peninsular Malaysia.

Eugenia ridleyi

Myrtaceae

Kelat (Peninsular Malaysia), obah (Sabah), Ubah (Sar.).

Distribution:

Malaysia; widely occurring throughout lowland Malaya, with distribution being more frequent locally., Singapore and Thailand

Habitat:

Inhabits tropical, lowland, moist and non-seasonal closed forest between 30 and 200m altitude.

Population status an trends:

Role of species in the ecosystem:

This species occurs scattered in primary forest. Flies, bees and butterflies are pollinators. Monkeys, squirrels and bats act as dispersal agents.

Threats

Clear felling and logging of the habitat.

Utilisation

The stem is utilised for it's timber and is sold in minor international trade.

Trade

Primarily used for timber, it has a minor role in international trade

IUCN Conservation category:

LR/lc according to Kochummen, K.M.

Conservation measures

A level of protection is provided by the productive forest reserves of Peninsular Malaysia it is conserved. Asian *Eugenia* are now included in *Syzygium*.

Forest management and Silviculture

This species is not in cultivation.

References:

Chua, L. *et al.* 1997. Completed data collection forms for endemic trees of Peninsular Malaysia.

Ng, P.K.L. & Y.C. Wee (eds.). 1994. The Singapore Red Data Book. Singapore: The Nature Society. 343pp.

Eusideroxylon zwageri

Ironwood, Belian, Borneo Ironwood, bois de fer (Fr). Brunei: belian. Malaysia: belian (Sarawak, Sabah), tambulian (Sabah), im muk (Cantonese, Sabah), Ulin. Indonesia: belian (general), ongleng, tulian, tebelian (Kalimantan). Philippines: tambulian, sakian, biliran (Sulu).

Distribution

Sumatra, Bangka, Belitung, Borneo, Sulu Archipelago, Kalimantan, Sabah, Sarawak, Philippines (Palawan).

Habitat

E. zwageri is widespread in Borneo and Sumatra as a scattered component of the Dipterocarp forest and in some localities forms a single dominant variant. It is generally found in lowland areas of primary forest 5-400 m, in flat or sloping terrain, and also occurs in old secondary forest (Suselo, 1987).

Population status and trends

Belian is one of the most renowned timbers of Borneo. It has been favoured both for local use and the export trade. Over-exploitation together with forest clearance have led to the decline of this slow-growing timber species. The increased availability of forest roads opened by concessionaires is leading to greater problems of uncontrollable exploitation in Kalimantan (Partomihardjo, 1987).

On the flat lowlands of southern Sumatra, great stands of ironwood, (*E. zwageri*) once stood, these have now been almost entirely destroyed (WWF and IUCN, 1994-1995).

E. zwageri is considered to be Vulnerable in Indonesia by Tantra (1983) and was in a shortlist of Endangered species of the country (Anon., 1978). It is included in a list of vanishing timber species of the Philippines (de Guzman, 1975). The species is considered to be almost extinct in Sabah (Meijer, pers. comm. 1997).

Over 30 years ago, the scarcity of *E. zwageri* in Sarawak was noted by Browne (1955), who pointed out that, "Our surviving supplies of Belian are by no means very large and are undoubtedly dwindling." The main causes given for this are shifting cultivation and wasteful use.

Role of species in the ecosystem

Threats

Over-exploitation and shifting cultivation (Soerianegara & Lemmens, 1993). The introduction of chain saws and extensive road systems by the timber industry (Peluso, 1992).

Utilisation

Belian is used locally in house construction and for water butts. Its commercial uses are for heavy construction, marine work, boat building, printing blocks, industrial flooring, roofing and furniture. Belian has been esteemed by the Chinese as a coffin wood.

Production and trade

Primarily used locally with limited exports recorded by Sabah. In southern Kalimantan this timber is felled by the owners of concession rights and also by local people coordinated by Ulin traders (Partomihardjo, 1987). Kartawinata *et al.* (1981) note that transmigrant settlers in East Kalimantan cut this species for sale to supplement their income from cultivation. In 1987 Sabah exported 3 836 070 m³ of Belian (source: Forestry Department), in 1992 the export was 7350 m³ (Soerianegara & Lemmens, 1993).

IUCN Conservation category

VU A1c,d & 2c,d (Asia Regional Workshop, 1997).

Conservation measures

There are attempts to conserve supplies of this species in Sarawak (Asia Regional Workshop, 1997).

Legislation

Indonesia - Thought to be totally protected by law (Anon., 1978). Indonesian law forbids its export (out of country) and restricts cutting to trees over 60 cm diameter at breast height (Peluso, 1992). The need for control of exploitation and better cutting criteria are pointed out by Partomihardjo (1987).

Sarawak - Under the Forest Rules of Sarawak, export of *E. zwageri* in log, sawn or hewn form is not allowed without special permission. Export controls have been in force since 1950.

Presence in protected areas

Indonesia Kutai National Park, East Kalimantan - has pure stands of *Eusideroxylon zwageri*, Tanjung Puting National Park, Kalimantan, Gunung Penrisen/Gunung Nyiut Game Reserve, Kalimantan, Lempakai Botanical Park, East Kalimantan

Sabah Tabin Wildlife Reserve

Forest management and silviculture

Browne (1955) noted that the patchy distribution, limited extent and inaccessibility of many Belian forests in Sarawak made assessment of remaining stands and sustained yield management very difficult. Poor seedling regeneration in logged forests has been noted (Kartawinata, 1978). Some plantation was carried out in secondary forest in Sumatra (Browne, 1955) and plantation continues on a trial basis both in Sumatra and West Kalimantan. Inadequacies of seed and seedling supply limit more extensive plantation and the need for tissue culture has been suggested by Suselo (1987). In natural forests ulin is usually cut selectively with a diameter limit of 50 cm. Harvesting is usually done manually. Regeneration in logged-over forests is often not sufficient, although ulin may coppice freely and be persistent (Soerianegara & Lemmens, 1993).

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- Suselo, T.B. (1987). Autecology of *E. zwageri* T. & B. (Lauraceae) as applied to forest regeneration. In: *Proc. Symp. Forest Regeneration in South East Asia*. Biotrop Special Publication No. 25 BIOTROP, Bogor.
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Fagus longipetiolata

Fagaceae

Distribution

China, Viet Nam (Sapa and Moc Chau)

Habitat

Subtropical dense broadleaved forest. Found on wet mountain yellow soils at altitude 1000 - 2600m.

Population status and trends

In China this species is quite widespread but nowhere very abundant (FAO, 1996). In Viet Nam this slow-growing tree is only known from Sapa and Moc Chau, where it is sometimes the dominant species in dense subtropical broadleaved forest. Regeneration is thought to be hampered by a thick layer of leaf litter on the forest floor.

Role of species in the ecosystem

Associated with the following tree genera: *Quercus*, *Schima*, *Pasania* and *Castanopsis*.

Threats

Utilisation

The wood is used to make furniture, implements and musical instruments. The tree also provides a useful source of gum, resin and oil.

Trade

No information.

IUCN Conservation category

VU A1cd - Nghia, N.H.

Conservation measures

Forest management and silviculture

References

- Chinh, N. N. *et al.* 1996. Vietnam Forest Trees. Hanoi: Agricultural Publishing House. 1-788.
- FAO Forestry Department. 1986. Databook on endangered tree and shrub species and their provenances. Rome: FAO. 524pp.
- Loc, Phan Ke. 1986. Lists of rare and endangered plant species of Vietnam (1986-1988). unpublished.
- Ministry of Science, Technology and Environment. 1996. Sach do Viet Nam Phan Thuc Vat. Hanoi: Science and Technics Publishing House. 484pp.

Flindersia ifflaiana

Rutaceae

ash, hickory

Distribution

Australia (Atherton District, northern Queensland), Papua New Guinea. In Papua New Guinea it is confined to the Oriomo river area of the Western province.

Habitat

In Papua New Guinea, this tree grows scattered in primary monsoon and gallery forest up to 50m altitude (Eddowes, 1997). In Australia it is found in moist rainforest up to 400 m above sea level (Keating and Bolza, 1982).

Population status and trends

Role of species in ecosystem

In Papua New Guinea it is associated with *Alloxylon*, *Grevillea* and other *Flindersia* spp. The seeds are wind dispersed (Eddowes, 1997).

Threats

The Oriomo river ecosystem of the Western province, where this species occurs, is relatively small, fragile and unique but this region is threatened by logging activities (Eddowes, 1997).

Utilisation

The wood is used for flooring and exterior joinery (Eddowes, 1997). In Australia it has been one of the most important structural timber species of northern Queensland (Keating and Bolza, 1982).

Trade

This species is traded internationally on a minor scale (Eddowes, 1997). Small amounts of *Flindersia* wood are imported into Japan from Papua New Guinea (Sosef, Hong and Prawirohatmodjo, 1998).

IUCN Conservation category

EN A2cd, B1+2c according to Eddowes, P.J. (1997).

The above threat category applies only to the population in Papua New Guinea.

Conservation measures

Conservation measures are nil or negligible (Eddowes, 1997).

Forest management and silviculture

The species is possibly planted on a small scale at the LAE National Botanical Gardens, Papua New Guinea (Eddowes, 1997). It can be grown from seed but trials have shown that this species grows too slowly to be of economic importance (Sosef, Hong and Prawirohatmodjo, 1998).

References

Eddowes, P.J. 1997. Completed data collection forms for New Guinea.

Keating, W.G. and Bolza, E. 1982. *Characteristics, properties and uses of timbers. Volume 1. South-east Asia, Northern Australia and the Pacific*. Inkata Press, Melbourne

Sosef, Hong and Prawirohatmodjo, 1998

Flindersia laevicarpa

Rutaceae

maple, silkwood

Distribution

Australia (Queensland), Indonesia (Irian Jaya), Papua New Guinea.

It is restricted to north Queensland and in Indonesia the species is known only from Misool Island.

Habitat

A large tree scattered in tropical dry and moist, broadleaved, open forest between 50 - 1200m. It is specifically found in monsoon, gallery and hill forest on elevated ground (Eddowes, 1997).

Population status and trends

Role of species in the ecosystem

The seeds are wind dispersed (Eddowes, 1997).

Threats

This large tree is threatened in New Guinea due to exploitation and logging activities (Eddowes, 1997).

Utilisation

The wood is used for high-class joinery, furniture and cabinet work (Eddowes, 1997).

Trade

This species is found in minor international trade (Eddowes, 1997). Small amounts of *Flindersia* wood are imported into Japan from Papua New Guinea (Sosef, Hong and Prawirohatmodjo, 1998).

IUCN Conservation category

VU C1 & C2a according to Eddowes, P.J. (1997).

The above threat category refers to the species' situation in New Guinea.

Conservation measures

Its saving grace may well be its occurrence, albeit sporadic, in the hill forest of the Varirata National Park in the Central province (Eddowes, 1997).

Forest management and silviculture

This species might be cultivated on a small scale (Eddowes, 1997).

References

Eddowes, P.J. 1997. Completed data collection forms for New Guinea.

Sosef, Hong and Prawirohatmodjo, 1998

Flindersia schottiana

Rutaceae
ash, silver

Distribution

Australia (Eastern seaboard), Indonesia (Irian Jaya), Papua New Guinea

Habitat

This species is widespread but scattered in monsoon, hill and lower montane forest between 50 and 1500m. It occurs in tropical, lowland, submontane, dry, moist, non-seasonal, seasonal, broadleaved, mixed, closed forest. It is found in association with *Acacia*, *Alloxylon* and *Grevillea* spp. in monsoon forest.

Population status and trends

Since it occurs in the rugged mountains of the Owen Stanley Range, the species may be spared from further exploitation (Eddowes, 1997).

Role of species in the ecosystem

The seeds are wind dispersed (Eddowes, 1997).

Threats

In Papua New Guinea, this species was subject to exploitation in 2 major logging areas, the Morobe and Western provinces (Eddowes, 1997).

Utilisation

The wood is used for furniture, joinery, boat-building and sporting goods; it is also used as a veneer (Eddowes, 1997).

Trade

Its timber is found in minor international trade (Eddowes, 1997). Small amounts of *Flindersia* wood are imported into Japan from Papua New Guinea (Sosef, Hong and Prawirohatmodjo, 1998).

IUCN Conservation category

LR/nt according to Eddowes, P.J. (1997). The threat category refers to the species' situation in New Guinea.

Conservation measures

Forest management and silviculture

This species is not known in cultivation, however a specimen may be growing in the LAE National Botanic Garden (Eddowes, 1997).

References

Eddowes, P.J. 1997. Completed data collection forms for New Guinea.
Sosef, Hong and Prawirohatmodjo, 1998.

Geijera salicifolia

Rutaceae

satinheart, green

Distribution

This species occurs in Australia (northern New South Wales and Queensland), New Caledonia and Papua New Guinea. In Papua New Guinea the species is all but confined to the Bulolo/Wau area of the Morobe province (Eddowes, 1997).

Habitat

A tree scattered in tropical, submontane, moist, non-seasonal, broadleaved and mixed, closed and open forest between 500 and 1250m. It is primarily found in lower montane forest dominated by *Araucaria hunsteinii*, often on ridges. It is associated with *Pouteria* spp and *Firmiana papuana* (Eddowes, 1997).

Population status and trends

The Bulolo/Wau region of the Morobe province, Papua New Guinea was once heavily exploited, logged and converted into Pine (*Araucaria*) plantations (Eddowes, 1997). It is debatable as to how many mature specimens remain at the edge of its montane habitat (Eddowes, 1997). The species is considered to be vulnerable to genetic erosion (Sosef, Hong and Prawirohatmodjo, 1998).

Role of species in the ecosystem

Threats

Logging and general deforestation

Utilisation

The wood is used as a veneer and is used for furniture, joinery, boat-building and sporting goods (Eddowes, 1997).

Trade

The timber is found in minor international trade (Eddowes, 1997). In 1996 Papua New Guinea exported 160 cu m of timber of this species (Sosef, Hong and Prawirohatmodjo, 1998).

IUCN Conservation category

CR C2a according to Eddowes, P.J. (1997). The evaluation refers to the species' situation in Papua New Guinea only.

Conservation measures

It is not known if there are any conservation measures but if so they are probably negligible (Eddowes, 1997).

Forest management and silviculture

This species is not in cultivation (Eddowes, 1997).

References

Eddowes, P.J. 1997. Completed data collection forms for New Guinea.
Sosef, Hong and Prawirohatmodjo, 1998

Gluta papuana

Anacardiaceae

hekakoro

Distribution

The species is restricted to the Gulf and Western provinces of Papua New Guinea and it is also found in coastal areas Irian Jaya, Indonesia.

Habitat

A tree scattered in seasonally inundated forest along rivers, in fresh-water swamps and on well-drained soils up to 50m. It is sometimes gregarious along river banks (Eddowes, 1997).

Population status and trends

Role of species in the ecosystem

Seeds are dispersed by wind and water and by fruit bats (Eddowes, 1997). It regenerates in primary forest (Eddowes, 1997).

Threats

In Papua New Guinea it is restricted to Gulf and Western provinces which are now subject to heavy logging activities (Eddowes, 1997).

Utilisation

The decorative wood is used for furniture components, turnery and as a veneer (Eddowes, 1997). It has irritant properties which restrict its general availability (Keating and Bolza, 1982).

Trade

The timber is found in national and minor international trade (Eddowes, 1997).

IUCN Conservation category

VU A1cd & 2cd according to Eddowes, P.J., 1997.

The species is sought after for its decorative grain, so it possibly needs upgrading to endangered (Eddowes, 1997).

Conservation measures

There are no conservation measures known (Eddowes, 1997).

Forest management and silviculture

It is not thought to be in cultivation, however there is possibly a single specimen in the LAE National Botanic Gardens, Papua New Guinea (Eddowes, 1997).

References

Eddowes, P.J. 1997. Completed data collection forms for New Guinea.

Keating, W.G. and Bolza, E. 1982. *Characteristics, properties and uses of timbers. Volume 1. South-east Asia, Northern Australia and the Pacific*. Inkata Press, Melbourne

Gmelina arborea

Verbenaceae

gumhar, yemane, Yunnan shizi

Distribution:

Bangladesh, Cambodia, China (Yunnan), India, Laos, Malaysia [int] (Sabah), Myanmar, Pakistan, Philippines [int], Sri Lanka, Thailand, Viet Nam.

Habitat:

Found in both temperate and tropical, moist and dry forest as well as scrub.

Population status and trends:

The species is commonly-planted in South-East Asia and naturally occurring in Indo-China and the Indian subcontinent. There is evidence in many parts of its range that populations are declining through use; during the extensive surveys carried out by the Sri Lankan National Conservation Review, only 3 individuals were found.

Role of species in the ecosystem:

Utilisation:

The entire plant is utilised for medicine. The stem is used for timber in light construction and as pulpwood. Leaves are good cattle fodder.

Trade:

A popular source of medicine and also timber. In Sri Lanka all parts of the tree are used, especially the roots, to obtain medicinal extracts. The medicinal products play a major role in international trade. Malaysia exported 14,000 m³ of this species at 38 \$/m³ in 1995 (ITTO, 1997).

Conservation measures

Forest management and silviculture

Plantation grown throughout the tropics. In the wild this species regenerates naturally only in the open or on the edge of forests. In cultivation, Yemane has a high light requirement and a high sensitivity to competition. Good growth and establishment is ensured by good site preparation e.g weeding or clearance by fire. In order to produce long clear boles pruning is essential. A straight bole is ensured by cutting all the leaves off saplings with exception of the upper 2-3 pairs. Rotations of 6 years are used for those trees destined for pulpwood and of 10 years for those used for sawnwood. The second rotation is produced by coppicing, Stump or seedling planting is employed for a third rotation. During the first two years weeding is carried out 3-4 times. Stands of 10 year rotation are thinned to 50% after 5 and 7 years. It has been shown that in order to maintain sufficient growth of Yemane during the second cycle extensive addition of fertiliser is required

As seedlings demand light there is very little natural regeneration in plantations.

IUCN Conservation category

Lower Risk: least concern – according to WCMC

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- Erfurth, T. & H. Rusche. 1976. The marketing of tropical wood. (unpublished). FO: MISC/76/8.
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- National Environment Protection Bureau. 1987. The list of rare and endangered plants protected in China. Botanical Institute of Chinese Academy of Sciences, Beijing: Academy Press. 96pp.
- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant resources of South-East Asia 5(1). Timber trees: major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.

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

References

- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.
- Whitmore, T.C., I.G.M Tantra, & U. Sutisna (eds.). 1989. Tree flora of Indonesia. Bogor, Indonesia: Forest Research and Development Centre. 429pp.

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 (237%), 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 Khoon 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 chain-saws for felling and cross-cutting and micro-engines for pulling small trucks from log processing/loading yards to the floating wood yard.

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Wong Khoon Meng, Forestry Department, Brunei Darussalam. *In litt.*, September 1989.

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

References

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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

References

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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

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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.

Role of species in the ecosystem

Threats

Utilisation

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

Trade

IUCN Conservation category

VU A1cd – according to WCMC.

Conservation measures

Forest management and silviculture

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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.

Population status and trends

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

Role of species in the ecosystem

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.

Trade

IUCN Conservation category

Conservation measures

Forest management and silviculture

References

- Ng, P.K.L. & Y.C. Wee (eds.). 1994. The Singapore Red Data Book. Singapore: The Nature Society. 343pp.
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Homalium foetidum

Common names

Ternate ironwood, delisem, malas

Local names

Indonesia: gia (general), melmas (Kalimantan), momala (Sulawesi). Malaysia: petaling padang (Peninsular), keruing renkas, bansisian (Sabah). Papua New Guinea: malas (general). Philippines: aranga (general), kamagahai (Bikol), yagau (Cebu Bisaya). Solomon Islands: malasatu (Kwara'ae)

Distribution

Sumatra, Peninsular Malaysia, Borneo, the Philippines, Sulawesi, Moluccas, New Guinea, Bismarck Archipelago and the Solomon Islands.

Habitat

It occurs in thickets in the Philippines and in rain forest elsewhere, often along riverbanks on clayey or sandy, often stoney soil from 20 to 200m. In Papua New Guinea, the species is sometimes common on alluvial flat lands adjacent to rivers.

Population status and trends

H. foetidum is common but scattered in eastern Malaysia. In Papua New Guinea, it is mainly confined to the north-western part of the mainland and New Britain of the Bismarck Archipelago, where it can be relatively common. The species has been recorded as threatened in Indonesia (WCMC, 1991).

Role of species in the ecosystem

Threats

Exploitation for timber and destruction of habitat through logging are the main threats to the species. It is particularly vulnerable due to its occurrence in accessible, lowland, primary rainforest.

Utilisation

It is a fairly important source of malas timber (Lemmens, Soerianegara and Wong, 1995). Produces a hard timber used for house and bridge construction. In Papua New Guinea the timber is exported in log form and as sawn square-edged timber. Its hardness and strength together with its permeability to pressure treatment renders it suitable for bridge and wharf construction, marine piling, posts, poles, decking and exterior joinery (Eddowes, 1977, 1980 & 1995-1997).

Trade

The timber is not thought to occur in European trade (WCMC, 1991). This species makes up approximately 9% of the total log exports of Papua New Guinea (Eddowes, 1997). In 1995, Papua New Guinea exported 326,000 m³ of logs at an average FOB price of 115\$/m³ (ITTO, 1996). Japan is the major importer of malas logs. Australia and New Zealand import sawn timber for decking.

IUCN Conservation category

LR-lc (Asia Regional Workshop, 1997). However, further review is desirable (Asia Regional Workshop, 1997).

Conservation measures

Forest management and silviculture

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Hydnocarpus sumatrana

Distribution

Thailand, Sumatra, Sabah, Sarawak, Kalimantan, south/central Java, Philippines.

Habitat

The species occurs in rainforest on sandy or clay soil in hilly or steep locations between 30 and 200 m.

Population status and trends

This species was formerly common in Java (Asia Regional Workshop, 1997). It has been recorded as threatened in Indonesia (WCMC, 1991).

Role of species in the ecosystem

Threats

Utilisation

Species of *Hydnocarpus* are utilised for the oil extracted from their seeds which is used for curing wounds and eczema. Wood of the genus is used locally for house building and a variety of uses.

Trade

The timber is not thought to occur in European trade (WCMC, 1991). There are no specific records of trade in timber of this genus although it may possibly occur in mixed consignments of medium-weight hardwood (Sosef, Hong and Prawirohatmodjo, 1998).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

Forest management and silviculture

References

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(Sosef, Hong and Prawirohatmodjo, 1998)
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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. bijuga* 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, Calait 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 Forêts, 1993).

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Jackiopsis ornata

Distribution

Indonesia, Peninsular Malaysia, Sabah, Sarawak.

Habitat

Locally frequent although never abundant in Lowland swamp forest and riverine habitats. This species occurs in peat-swamp forest in northern Borneo.

Population status and trends

This species occurs scattered in the forest and is fairly common, it is not thought to be endangered (Sosef, Hong and Prawirohatmodjo, 1998).

Role of species in the ecosystem

Threats

The current burning of peat swamp forests in Borneo is likely to impact severely on this species.

Utilisation

The timber is hard, heavy, reddish brown and fine textured, it is used locally in house building and for implement such as rice pounders and carrying poles (Sosef, Hong and Prawirohatmodjo, 1998).

Trade

The timber is not thought to occur in European trade (WCMC, 1991). The wood is rarely and only locally used (Sosef, Hong and Prawirohatmodjo, 1998).

IUCN Conservation category

The species has been recorded as threatened in Indonesia (WCMC, 1991). The new IUCN categories have not yet been applied.

Conservation measures

Forest management and silviculture

Little is known about the silviculture of this tree, although it is thought more promising as an ornamental than timber species. Prospects for timber production are hard to judge (Sosef, Hong and Prawirohatmodjo, 1998).

References

WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Kalappia celebica

Distribution

Endemic to Sulawesi.

Habitat

This species usually occurs on poor rocky soils of around pH4 in Lowland rainforest forest in vicinity of Malili.

Population status and trends

A species endemic to South Sulawesi where it is one of the tallest trees in the forest. The species has previously been recorded as endangered (old IUCN threat category) in Indonesia (WCMC, 1991).

Role of species in the ecosystem

Very locally it can be one of the dominant species (Sosef, Hong and Prawirohatmodjo, 1998).

Threats

Populations were already seriously depleted by the 1950's as a result of large-scale logging for its valuable timber (Sosef, Hong and Prawirohatmodjo, 1998). This species is highly threatened by a continued timber trade and lack of proper management.

Utilisation

The most common use is as a light construction timber used in building ships, bridges and for various housing construction purposes. A timber form with beautiful grain pattern was once highly sought after for cabinet and other furniture making.

Trade

Up until the beginning of the 1950's considerable amounts of *Kalappia* timber was transported from the surrounding areas of Malili and Wotu (South Sulawesi), where *K. celebica* was common, to be processed in Ujung Pandang. Current supplies are probably very limited, and the wood has become rare and expensive on the local markets, no trade statistics are known. The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

VU D2 - preliminary evaluation by Amy MacKinven, WCMC, on the basis of its limited distribution. The evaluation was agreed to by the Asia Regional Workshop (1997), however it was felt that more research is needed.

Conservation measures

Protection of large areas of forest where it grows is essential for its survival. This protection may also protect *Diospyros celebica*, another superior timber species associated with *K. celebica* (Sosef, Hong and Prawirohatmodjo, 1998).

Forest management and silviculture

Regeneration in closed forest is poor and in some examples non-existent. A forest near Wotu containing approximately 65 trees per Ha displayed no signs of natural regeneration, however natural regeneration was observed in logged over areas. This poor germination may require special forest management techniques. Tests with enrichment planting in logged over areas may be worth considering, any current activities of propagation by seed have not been reported, although it is known to be possible (Sosef, Hong and Prawirohatmodjo, 1998).

There is currently no evidence of attempts at cultivation of this species. Very little research has been carried out on wood properties, propagation, silviculture and forest management of such a valuable timber species.

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Kingiodendron pinnatum

Leguminosae

Distribution

India (Karnataka, Kerala, Tamil Nadu)

Habitat

A large tree sparsely distributed in evergreen hill forest and deciduous forest up to 1000m

Population status and trends

The range of the species extends from South Kanara in Karnataka to the southern tip of the Western Ghats in Tamil Nadu. The population is believed to have declined by 50% in the last 20 years because of overexploitation, injuries caused by resin collection and habitat degradation. Regeneration appears to be very poor.

Role of species in the ecosystem

Threats

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

Utilisation

The species yields useful timber, bark for making varnish and resin for wood polish.

Trade

The timber is traded on a local scale.

IUCN Conservation category

EN A1cd according to CAMP Workshops on Medicinal Plants in India (Molur *et al.*, 1995)

Conservation measures

Forest management and silviculture

The species is cultivated on a small scale.

References

- Molur, S *et al.* (eds.). 1995. Conservation assessment and management plan (CAMP) for selected species of medicinal plants of southern India. 108 pp.
- Nayar, M.P. & A.R.K. Sastry (eds.). 1990. Red Data Book of Indian Plants. Vol. 3. Calcutta: Botanical Survey of India. 271pp.
- Ramesh, B.R. & J.-P. Pascal. 1997. Atlas of endemics of the Western Ghats (India). Distribution of tree species in the evergreen and semi-evergreen forests. Institut Français de Pondichéry. 403 pp.

Kjellbergiodendron celebicum

Distribution

Indonesia (Sulawesi)

Habitat

This species occurs in mountainous areas.

Population status and trends

The species has been recorded as rare in Indonesia (WCMC, 1991).

Role of species in the ecosystem

Threats

Utilisation

Trade

The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

NE

Conservation measures

Forest management and silviculture

References

WCMC. 1991. Provision of data on rare and threatened tropical timber species.
Unpublished report, prepared under contract to the EC.

Kokoona leuoclada

Celastraceae

Distribution

Malaysia (Sabah)

Habitat: tropical lowland, closed forest

Population status and trends

Endemic to Sabah, the species has only been collected once from Ranau and once from Sandakan in lowland forest.

Role of species in the ecosystem

Threats

The species is threatened by the large-scale clearance of the forest.

Utilisation

Trees of the genus are cut for mata ulat timber which is used locally.

Trade

Only very small amounts of mata ulat timber are exported if at all. The trees of the genus are generally too scattered and slow-growing to be of commercial importance. (Lemmens, Soerianegara, and Wong 1995).

IUCN Conservation category

VU D2 – according to WCMC

Conservation measures

Forest management and silviculture

References

- E. Soepadmo and K.M. Wong. 1995. Tree Flora of Sabah and Sarawak. Kuala Lumpur: Ampang Press Sdn. Bhd. 513 pp.
- Lemmens, R.H.M.J., I. Soerianegara, & W.C. Wong (eds.). 1995. Plant Resources of South-East Asia No 5(2). Timber trees: Minor commercial timbers. Leiden: Backhuys Publishers. 655 pp.

Koompassia excelsa

Tualang

Distribution

Southern Thailand, Peninsular Malaysia, north-eastern Sumatra, Borneo and Palawan.

Habitat

Primary tropical rainforest usually along rivers, in valleys and lower slopes of hills, locally abundant (Keßler & Sidiyasa).

Population status and trends

A common but usually not very abundant species. Solitary trees standing alone in the open are encountered comparatively often because they are difficult to cut and because local people harvest honey from the tree crowns (Soerianegara and Lemmens, 1993).

Koompassia timber is currently gaining importance in the trade because of the shortage of heavy hardwood timber (Soerianegara and Lemmens, 1993).

Role of species in the ecosystem

An important species for bees.

Threats

Utilisation

The timber is used as tualang. The wood is sometimes used as firewood. The bark is used medicinally (Soerianegara and Lemmens, 1993).

Trade

In 1995 Malaysia exported 37000 m³ of sawnwood at an average price of 208\$/m³ (ITTO, 1997).

IUCN Conservation category

LR-cd (Asia Regional Workshop, 1997)

Conservation measures

Koompassia excelsa is a protected species under Sarawak's Wildlife Protection Bill, 1990. It is known to occur in protected areas.

Forest management and silviculture

No specific information is available.

References

- Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August 1997
- ITTO. 1997. Annual Review and Assessment of the World Tropical Timber Situation, 1996.
- Soerianegara, I. & Lemmens, R.H.M.J. (Eds.) 1993. *Plant Resources of South-East Asia (PROSEA) 5(1) Timber trees: major commercial timbers*. Pudoc Scientific Publishers, Wageningen.
- Keßler, Paul J. A & Kade Sidiyasa, 1994. Trees of the Balikpapan-Samarinda area, East Kalimantan, Indonesia: a manual of 280 selected species, The Tropenbos Foundation (Tropenbos series ; 7).

Koompassia grandiflora

Leguminosae (Caesalpinioideae)

kempas

Distribution

The species is known only from the Vogelkop peninsula, Irian Jaya, Indonesia and the Morobe, Gulf and Central provinces, Papua New Guinea (Eddowes, 1997).

Habitat

A primary rain forest tree scattered on coastal plain foothills and stony low hills between 10 - 840m (Eddowes, 1997). In addition it is found sclerophyllous habitats (Eddowes, 1997).

Population status and trends

Koompassia grandiflora is highly vulnerable because it occurs in primary rainforest, mostly at low, readily accessible altitudes (Eddowes, 1997).

Role of species in the ecosystem

The species regenerates in primary forest (Eddowes, 1997).
The seeds are dispersed by wind (Eddowes, 1997).

Threats

Observations of active exploitation for the timber of this species in Papua New Guinea were made in the 1960s (Frodin, 1997); the timber continues to be in high demand and is heavily exploited in areas subject to logging (Eddowes, 1997).

Utilisation

The wood is used for heavy construction, beams, flooring, decking and plywood. In addition it is used as veneer (Soerianegara & Lemmens, 1993).

Trade

This species is and will continue to be heavily exploited in Papua New Guinea for both log export and for domestic processing due to its very good bole form, wood quality and market acceptance (Eddowes, 1997b).

IUCN Conservation category

VU A1cd+2cd according to Eddowes, P.J. (1997)

Conservation measures

Conservation measures are negligible (Eddowes, 1997).

Forest management and silviculture

This species is probably not found in cultivation (Eddowes, 1997).

References:

- Eddowes, P.J. 1997. Completed data collection forms for New Guinea.
Eddowes, P.J. 1997b. Letter from Peter Eddowes to Sara Oldfield dated October 13th, 1997.
Frodin, D. *et al.* 1997. Discussion of the working groups at *the Conservation and sustainable management of trees* workshop held in Hanoi, Viet Nam.
Hou, D. 1996. *Caesalpinioideae*. Flora Malesiana. Leiden: Flora Malesiana Foundation.
Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.

Koompassia malaccensis

kempas

Distribution

Thailand, Indonesia (Sumatra), the Riau Archipelago, Bangka, Belitung, Borneo Peninsular Malaysia, Sarawak, Sabah (Soerianegara and Lemmens, 1993).

Habitat

Lowland forest, peat and freshwater swamp, occurring from sea-level up to 600 m.

Population status and trends

In Peninsular Malaysia it is considered to be the third commonest big forest tree (Soerianegara and Lemmens, 1993).

Role of species in the ecosystem

Threats

Utilisation

The timber is used as kempas. The wood is sometimes used as firewood (Soerianegara and Lemmens, 1993).

Trade

Koompassia timber is currently gaining importance in the trade because of the shortage of heavy hardwood timber (Soerianegara and Lemmens, 1993).

In 1995, Malaysia exported 30,000 m³ of sawnwood at an average price of 328\$/m³ (ITTO, 1996). Sabah exported, 29,000 m³ of sawn timber in 1992 (Soerianegara & Lemmens 1993)

Average annual export of sawn timber from Peninsular Malaysia for the period 1982-1987 was 126,000 m³. In 1990 the amount exported was 114,000 m³ and in 1992 49,000 m³. Export destinations were as for *K. excelsa* (Soerianegara & Lemmens)

IUCN Conservation category

LR-cd (Asia Regional Workshop, 1997).

Conservation measures

Koompassia malaccensis is a protected species under Sarawak's Wildlife Protection Bill, 1990.

Forest management and silviculture

No specific information is available (Soerianegara and Lemmens, 1993).

References

- Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August 1997
- ITTO. 1996. Annual Review and Assessment of the World Tropical Timber Situation.
- Soerianegara, I. & Lemmens, R.H.M.J. (Eds.) 1993. *Plant Resources of South-East Asia* (PROSEA) 5(1) *Timber trees: major commercial timbers*. Pudoc Scientific Publishers, Wageningen.

Lagarostrobos franklinii

Podocarpaceae

huon pine

Distribution:

Australia (Tasmania)

Habitat:

tropical, moist, mixed, closed forest

Population status and trends:

Huon pine, one of the longest living trees in the world, is found mostly in small stands in rainforest associated with the river systems of south-west Tasmania. Populations retreated during the Last Glacial and were heavily logged in the more recent past

Role of species in the ecosystem:

Primary Obligative species dependencies: Dioecious; vegetative reproduction is also apparent; availability of light increases reproductive output but only a small proportion of individuals are reproductive in a season - disproportionate number of them being the oldest winged pollen - wind pollinated; seeds disperse by water or gravity and is often poor.

Threats:

burning, .clear-felling/logging of the habitat, .industrial development, .mining/exploration

Utilisation:

timber (minor International trade)

Trade:

IUCN Conservation category:

VU B1+2ce according to the SSC Conifer Specialist Group

Conservation measures:

Whilst most of the range is protected within a World Heritage Site, significant areas are open to the persistent threats of mining, logging, hydroelectric schemes and fire regimes.

Forest management and silviculture:

References:

- Farjon, Aljos, Christopher N. Page, & Nico Schellevis. 1993. A preliminary world list of threatened conifer taxa. *Biodiversity and Conservation* 2: 304-326.
- Quinn, C.J. 1982. The Taxonomy of *Dacrydium* Sol. ex Lamb emend de Laub (*Podocarpaceae*). *Australian Journal of Botany* 30: 311-320.
- Shapcott, A. 1991. Studies in population biology and genetic variation of the Huon pine (*Lagarostrobos franklinii*). Hobart: The National Rainforest Conservation Program and Department of Parks, Wildlife and Heritage, Hobart and Dept. of the Arts, Sports, the Environment and Territories.

Lophopetalum javanicum

Celastraceae

Distribution

Indonesia (Irian Jaya, Java, Kalimantan, Moluccas, Sulawesi, Sumatra), Malaysia (Peninsular Malaysia, Sabah, Sarawak), Papua New Guinea, Philippines, Thailand, Viet Nam

Habitat

Found mainly in lowland rainforest, sometimes in hill and montane forest up to 1400m. Often in periodically inundated areas or peat swamps and on riverbanks. In Sabah and Sarawak, mainly in mixed dipterocarp forest.

Population status and trends

A widespread species which is abundant in various forest types,

Role of species in the ecosystem

The flowers are insect pollinated and the winged seeds are probably wind dispersed.

Threats

Increasing demand for perupok may put this species under threat at least in parts of its range.

Utilisation

The wood is utilised as perupok timber. The bark is used as a poison and the tree also provides fuel wood.

Trade

Trade in perupok, particularly from Kalimantan, has gained in importance over the past ten years. The timber is very popular in Japan (Soerianegara and Lemmens, 1993).

IUCN Conservation category

LR/lc - WCMC

Conservation measures

In East Kalimantan, a project has selected out the "superior mother trees".

Forest management and silviculture

Exploitation of stands of perupok is seldom based on sustainable management. Research is needed to determine management requirements (Soerianegara and Lemmens, 1993).

References

- E. Soepadmo and K.M. Wong. 1995. Tree Flora of Sabah and Sarawak. Kuala Lumpur: Ampang Press Sdn. Bhd. 513 pp.
- Erfurth, T. & H. Rusche. 1976. The marketing of tropical wood. (unpublished). FO: MISC/76/8.
- Loc, Phan Ke. 1992. Annotations to: Conservation status listing for Philippines dated 6 April 1992. 49pp.
- Penafiel, S. 1990. Annotation to list of tropical timbers for the Philippines.
- Said, I.M. & Z. Rozainah. 1992. An updated list of wetland plant species of Peninsular Malaysia, with particular reference to those having socio-economic value. Asian Wetland Bureau. 109pp.
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- van Steenis, C.G.G.J. 1948. Flora Malesiana. Leiden: Flora Malesiana Foundation.

Lophopetalum multinervium

Celastraceae

Distribution

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

Habitat

This tree is found in freshwater and peat swamp forest and very occasionally in submontane forest up to 1500m. It is widely distributed in Sabah and Sarawak.

Population status and trends

Common and locally frequent in various forest types. There is great demand for wood of this genus which is traded as perupok.

Role of species in the ecosystem

The flowers are insect pollinated and the winged seeds are probably wind dispersed.

Threats

Increasing trade demands for timber and burning of the swamp forest habitats in Sumatra and Borneo.

Utilisation

The wood is utilised as perupok timber.

Trade

Trade in perupok, particularly from Kalimantan, has gained in importance over the past ten years. The timber is very popular in Japan (Soerianegara and Lemmens, 1993).

IUCN Conservation category

LR/lc - WCMC

Conservation measures

In East Kalimantan, a project has selected out the "superior mother trees".

Forest management and silviculture

Exploitation of stands of perupok is seldom based on sustainable management. Research is needed to determine management requirements (Soerianegara and Lemmens, 1993).

References

- E. Soepadmo and K.M. Wong. 1995. Tree Flora of Sabah and Sarawak. Kuala Lumpur: Ampang Press Sdn. Bhd. 513 pp.
- Erfurth, T. & H. Rusche. 1976. The marketing of tropical wood. (unpublished). FO: MISC/76/8.
- Ng, P.K.L. & Y.C. Wee (eds.). 1994. The Singapore Red Data Book. Singapore: The Nature Society. 343pp.
- Said, I.M. & Z. Rozainah. 1992. An updated list of wetland plant species of Peninsular Malaysia, with particular reference to those having socio-economic value. Asian Wetland Bureau. 109pp.
- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.
- van Steenis, C.G.G.J. 1948. Flora Malesiana. Leiden: Flora Malesiana Foundation.

Lophopetalum pachyphyllum

Celastraceae

Distribution

Indonesia (Sumatra), Malaysia (Peninsular Malaysia, Sarawak)

Habitat

Dry forest on slopes, ridges and limestone cliffs up to an elevation of 450m

Population status and trends

In Sarawak, the species is only known from two collections from Bako National Park.

Role of species in the ecosystem

The flowers are insect pollinated

Threats

Utilisation

The timber is used as perupok, which is in high demand for the international market.

Trade

Trade in perupok, particularly from Kalimantan, has gained in importance over the past ten years. The timber is very popular in Japan (Soerianegara and Lemmens, 1993). 2000m³ of species of *Lophopetalum*, otherwise known as Perupok, was exported from Peninsular Malaysia in 1995 at \$607 per m³ (ITTO,1997).

IUCN Conservation category

NE

Conservation measures

Forest management and silviculture

Exploitation of stands of perupok is seldom based on sustainable management. Research is needed to determine management requirements (Soerianegara and Lemmens, 1993).

References

- E. Soepadmo and K.M. Wong. 1995. Tree Flora of Sabah and Sarawak. Kuala Lumpur: Ampang Press Sdn. Bhd. 513 pp.
Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.

Lophopetalum rigidum

Celastraceae

Distribution

Brunei, Malaysia (Sabah, Sarawak), Kalimantan

Habitat

The tree occurs in freshwater and peat swamp forest and *kerangas forest up to 2400m.

Population status and trends

Endemic to northern Borneo, the species is locally frequent in Sarawak and recorded from Lahad Datu, Keningau and Ranau in Sabah.

Role of species in the ecosystem

The flowers are insect pollinated.

Threats

Increasing demand for perupok may be a threat to this relatively restricted species and current forest burning is expected to impact negatively on the species.

Utilisation

The wood is in demand as perupok timber.

Trade

Trade in perupok, particularly from Kalimantan, has gained in importance over the past ten years. The timber is very popular in Japan (Soerianegara and Lemmens, 1993).

IUCN Conservation category

NE

Conservation measures

Forest management and silviculture

Exploitation of stands of perupok is seldom based on sustainable management. Research is needed to determine management requirements (Soerianegara and Lemmens, 1993).

References

- E. Soepadmo and K.M. Wong. 1995. Tree Flora of Sabah and Sarawak. Kuala Lumpur: Ampang Press Sdn. Bhd. 513 pp.
- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.
- Whitmore, T.C., I.G.M. Tantra, & U. Sutisna (eds.). 1989. Tree flora of Indonesia. Bogor, Indonesia: Forest Research and Development Centre. 181pp.

Madhuca betis

Sapotaceae

Distribution

Indonesia (Sulawesi and Kalimantan), Philippines

Habitat

A primary lowland forest species at altitudes up to 300m.

Population status and trends

In the Philippines stands have been depleted by logging and shifting agriculture. It has been recorded as ** in the country.

Role of species in the ecosystem

Threats

Logging and shifting agriculture.

Utilisation

A source of bitis timber and also medicinal extracts from the roots and bark.

Trade

Bitis is only obtainable in small quantities and is used domestically.

IUCN Conservation category

VU A1cd – according to WCMC

Conservation measures

Forest management and silviculture

References

- Erfurth, T. & H. Rusche. 1976. The marketing of tropical wood. (unpublished). FO: MISC/76/8.
- Penafiel, S. 1990. Annotation to list of tropical timbers for the Philippines.
- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.

Madhuca boerlageana

Sapotaceae
nyatoh

Distribution

Indonesia (Irian Jaya, Moluccas), Papua New Guinea

Habitat

A tree of primary, lowland, rain forest found between 50 - 600m (Soerianegara & Lemmens, 1995). It is associated with *Terminalia*, *Pometia*, *Planchanella* and *Homalium* spp. (Eddowes, 1997).

Population status and trends

In Papua New Guinea this species is extremely rare and known from a single sterile collection made from the Vanimo area, West Sepik province (Eddowes, 1997). This part of Papua New Guinea is heavily logged and there is grave doubt as to its continuing existence in this country (Eddowes, 1997).

Role of species in the ecosystem

Primary regeneration guild (Eddowes, 1997).

Threats

The main threat to this very rare species is logging of the habitat (Eddowes, 1997).

Utilisation

The wood is used for boat-building, furniture, plywood and as a veneer (Soerianegara & Lemmens, 1995).

Trade

This species is found in minor international trade (Eddowes, 1997).

IUCN Threat category

CR A1cd, C2ab, D1 according to Eddowes, P.J. (1997). The threat category applies to the situation in Papua New Guinea only.

Conservation measures

There are no conservation measures (Eddowes, 1997).

Silviculture and forest management

It is not in cultivation (Eddowes, 1997).

References

- Eddowes, P.J. 1997. Completed data collection forms for New Guinea.
Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). *Timber trees: Major commercial timbers*. Wageningen: Pudoc Scientific Publishers. 610 pp.

Madhuca pasquieri

Sapotaceae

Distribution

China (south-west Guangdong, southern Guangxi, Malipo and Pingbian in Yunnan), Viet Nam (northern provinces)

Habitat

Lowland primary forest up to 1100m

Population status and trends

This large light demanding timber tree species has a scattered distribution.. Populations have been heavily exploited throughout the range and few large trees remain.

Role of species in the ecosystem

No information.

Threats

commercial use, clear-felling/logging of the habitat, expansion of human settlement, extensive agriculture

Utilisation

The seeds are eaten and provide a source of oil. Timber is the main use.

Trade

Minor international trade

IUCN Conservation category

VU A1cd - WCMC

Conservation measures

The species range coincides with protected areas in both countries. In Viet Nam this species is included in the Council of Ministers Decision 18/HDBT (17 January 1992) as a species with high economical value which is subject to over-exploitation. It is also categorised as a priority for genetic conservation.

Forest management and silviculture

References

- Chinh, N. N. *et al.* 1996. Vietnam Forest Trees. Hanoi: Agricultural Publishing House. 1-788.
- Dzung. *et al.* 1997. Conversation with Charlotte Jenkins concerning tree species in Viet Nam also found in Yunnan.
- Fu, Li-kuo & Jian-ming Jin (eds.). 1992. China Plant Red Data Book. Beijing: Science Press. xviii-741.
- Loc, Phan Ke. 1986. Lists of rare and endangered plant species of Vietnam (1986-1988). (unpublished).
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- National Environment Protection Bureau. 1987. The list of rare and endangered plants protected in China. Botanical Institute of Chinese Academy of Sciences, Beijing: Academy Press. 96pp.
- Sun, W. 1997. Completed data collection forms for trees of Yunnan.

Magnolia hodgsonii
Magnoliaceae

Distribution

Bhutan, India and Nepal

Habitat

Warm broadleaved forests.

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

Wood is good for furniture making

Trade

IUCN Conservation Category

Not evaluated

Conservation measures

Forest management and ecosystem

Mangifera decandra

kemang badak (S. Sumatra, Palembang), binjai hutan & belunu hutan (Sabah), asam damaran (Brunei), konyot or konyot besi (Benuaq and Tundjung Dayak: E. Kalimantan), palong besi (Kutai: E. Kalimantan).

Distribution

Borneo (Sabah, Sarawak, Brunei, E. Kalimantan) and Sumatra.

Habitat

This large tree grows in primary lowland evergreen rainforest up to 900 m (once found at 1440 m)(Kostermans and Bompard, 1993); it is sometimes found in freshwater swamp forest and secondary forests (Lemmens et al, 1995).

Population Status and Trends

This species is common but very scattered (Kostermans and Bompard, 1993). It is planted in Dayak home gardens in E. Kalimantan (van Valkenburg, 1997). Under the old IUCN threat categories, this species is recorded as Rare in Sabah and Indeterminate in Kalimantan.

Role of Species in the ecosystem

The fruits are likely to be eaten by animals ie. monkeys, bats and hornbills (Lemmens et al, 1995).

Threats

Utilisation

The fruits are edible and the wood is believed to be used as machang timber; machang is used for light construction or heavy construction under cover and the beautiful streaked heartwood is used for fine furniture (Lemmens et al, 1995).

Being a wild relative of the mango, this species could be useful for breeding purposes (Smith et al, 1992).

Trade

The fruits of this species are found in local markets in E. Kalimantan (van Valkenburg, 1997)

Machang timber is exported from Borneo in fairly large quantities. In 1987, Sabah exported 40,000 m³ of round logs worth US\$2.5 million and in 1992 38,000 m³ were exported as sawn timber and round logs for US\$5.7 million.

IUCN Conservation category

NE

Conservation Measures

Forest management and silviculture

There are no reports of machang being planted for timber. Natural regeneration of species is usually abundant. Machang stones are recalcitrant (Lemmens et al, 1995).

References

- Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.) 1995. *Plant Resources of South-East Asia (PROSEA) 5(2) Timber Trees: Minor commercial timbers*. Backhuys Publishers, Leiden 655pp.
- Smith, N.J.H., Williams J.T., Plucknett, D.L. and J.P. Talbot. 1992. *Tropical Forest and their Crops*. Cornell University Press: Ithaca, U.S.A.
- van Valkenburg, J.L.C.H. 1997. *Non-timber forest products of East Kalimantan. Potentials for sustainable forest use*. Tropenbos Series 16. The Tropenbos Foundation: Wageningen, The Netherlands. pp.61-95.

Mangifera macrocarpa

Indonesia: gompur (Sundanese, Western Java), n'cham busur (East Kalimantan), asem busur (South Kalimantan). Malaysia: machang lawit (Peninsular). Thailand: mamuang-khikwang (Peninsular).

Distribution

Peninsular Thailand, Cambodia, Peninsular Malaysia, Sumatra, Sabah, Kalimantan, Western Java and Borneo.

Habitat

Restricted to primary wet evergreen lowland forest, at altitudes of 0 - 800 m. It occurs scattered in lowland rainforest (Lemmens, Soerianegara and Wong, 1995).

Population status and trends

The species is very scattered. It flowers and fruits rarely but profusely (Kostermans and Bompard, 1993). It is possibly extinct in Java (Kostermans and Bompard, 1993).

Role of species in the ecosystem

Threats

General threats to the forests where this species occurs include conversion for agriculture and logging.

Utilisation

The wood is reputed to be used (Lemmens, Soerianegara and Wong, 1995).

Trade

Machang timber is exported from Borneo in fairly large quantities. In 1987, Sabah exported 40,000 m³ of round logs worth US\$2.5 million and in 1992 38,000 m³ were exported as sawn timber and round logs for US\$5.7 million.

IUCN Conservation category –

VU A1c - preliminary evaluation by Amy MacKinven.

Conservation measures

Forest management and silviculture

There are no reports of machang being planted for timber. Natural regeneration of species is usually abundant. Machang stones are recalcitrant (Lemmens, Soerianegara and Wong, 1995).

References

- Kostermans, A.J.H. and Bompard, J.M. 1993. *The mangoes. Their botany, nomenclature, horticulture and utilization*. IBPGR and Linnean Society. Academic Press.
- Lemmens, R.H.M.J., Soerianegara, I. & Wong, W.C. (Eds.) 1995. *Plant Resources of South-East Asia (PROSEA) 5(2) Timber Trees: Minor commercial timbers*. Backhuys Publishers, Leiden 655pp.

Manglietia aromatica

Magnoliaceae

xiang mulian

Distribution

China (Guangxi, Guizhou, Yunnan), Viet Nam

Habitat

The species is found in monsoon forest on limestone hills between 800 and 1550m.

Population status and trends

Only a few scattered stands of this important timber tree remain in a range stretching from south-west Guangxi to northern Viet Nam. Several subpopulations are reported to have become extinct in both provinces, largely because of overexploitation of the timber. Saplings and seedlings are seldom seen.

Role of species in the ecosystem

Threats

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

Utilisation

The species is regarded as one of the best timber trees in the area. It is also potentially an interesting garden plant.

Trade

IUCN Conservation category

VU A1cd, B1+2cde according to World Conservation Monitoring Centre

Conservation measures

Forest management and silviculture

References

Frodin, D.G. & R. Govaerts. 1996. World checklist and bibliography of Magnoliaceae.

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Manilkara kanosiensis

Sapotaceae

Distribution

Indonesia (Moluccas), Papua New Guinea (Bismarck Archipelago, Papua New Guinea)

Habitat

A medium to large sized tree scattered in primary lowland rainforest between 0 - 500m (Soerianegara & Lemmens, 1993). It is associated with *Canarium*, *Planchonella*, *Pometia*, *Syzygium* and *Terminalia* spp. (Eddowes, 1997).

Population status and trends

A relatively widespread but uncommon species occurring mainly in areas where intense logging is being carried out, such as New Britain and New Ireland in the Bismarck Archipelago and the north-west of Papua New Guinea (Eddowes, 1997).

Role of species in the ecosystem

It regenerates in primary forest (Eddowes, 1997).

Threats

Felling is the main threat to *Manilkara kanosiensis*. As it only occurs in lowland primary forest, exploitation of the species and habitat destruction render it vulnerable (Eddowes, 1997).

Utilisation

The wood is used to build bridge and wharf superstructures; also it is used for flooring, decking, turnery and carving (Soerianegara & Lemmens, 1993).

Trade

The timber is found in minor international trade (Eddowes, 1997). It is reported to be exported to Japan.

IUCN Threat category

EN A1cd+2cd, C2a according to Eddowes, P.J. (1997)

Conservation measures

There are possibly 1-2 specimens planted in LAE National Botanical Gardens, Papua New Guinea and it might occur in Bogor Botanic Gardens, Indonesia, however confirmation would be required (Eddowes, 1997).

Forest management and silviculture

The species is slow-growing. It is not planted.

References

- Eddowes, P.J. 1997. Completed data collection forms for New Guinea.
Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). *Timber trees Major commercial timbers*. Wageningen: Pudoc Scientific Publishers. 610 pp.

Mastixiodendron stoddardii

Rubiaceae

garo-garo

Distribution

This species is restricted to New Britain of the Bismarck Archipelago and the Solomon Islands (Eddowes, 1997).

Habitat

A large timber tree occurring in primary lowland rainforest up to 250m altitude (Eddowes, 1997).

Population status and trends

New Britain is one of the most intensively logged islands in the Bismarck Archipelago, thereby threatening this species with habitat destruction (Eddowes, 1997). The Solomon Islands population is also at risk due to logging activities (Eddowes, 1997).

Role of species in the ecosystem

Threats

The main threat to this species is logging of its habitat (Eddowes, 1997). Expanding human settlements and extensive agriculture are also threats (Eddowes, 1997).

Utilisation

The wood is used for general construction, joinery and flooring; also used as a veneer and a plywood (Eddowes, 1997).

Trade

It is traded international on a minor scale (Eddowes, 1997). Small amounts of *Mastixiodendron* are exported from Papua new Guinea and the Solomon islands, mainly to Japan. The genus is regarded as a commercial hardwood in Papua New Guinea. In 1992 the *Mastixiodendron* timber was ranked in MEP (Minimum Export Price) group 4, fetching a minimum price of US\$ 43/m³ for sawn logs and in 1996 in MEP group 3, when 38,150m³ of logs were exported at a free on-board (FOB) price of US\$ 108/m³ (Sosef, Hong and Prawirohatmodjo, 1998).

The range of applications of *Mastixiodendron* timber will remain of interest to commerce

IUCN Threat categories

VU A1cd+2cd, B1+2abcde according to Eddowes, P.J. (1997).

Conservation measures

Conservation measures are thought to be negligible (Eddowes, 1997).

Silviculture and forest management

There is nothing known about silvicultural aspects making it hard to assess the potential of *Mastixiodendron* for plantation purposes (Sosef, Hong and Prawirohatmodjo, 1998).

References

Eddowes, P.J. 1997. Completed data collection forms for New Guinea.

Merrillia caloxylon

Distribution

South Thailand, Peninsular Malaysia, Sabah, Sumatra.

Habitat

Found along river banks in lowland primary or secondary rain forest. It is able to grow on a variety of well drained soils.

Population status and trends

The species has been recorded as Extinct in Peninsular Malaysia (WCMC 1991) and also appeared on the IUCN list of non-endemic threatened plants of Peninsular Malaysia for 1991. Generally it is more common than originally suspected (Asia Regional Workshop, 1997).

Role of species in the ecosystem

No information

Threats

Exploitation of the timber and general forest loss.

Utilisation

In Peninsular Malaysia, the durable handsome wood, which is yellow with dark brown streaks, has been used to make walking sticks, smoking pipes, *parang* handles and sheaths and other small objects (Soepadmo and Wong, 1995). *Merrillia* has also been used for making furniture and boxes. Medicinal applications for *Merrillia* include an infusion of the wood for stomach ache, and as powder which is rubbed into the skin against aches and pains (Sosef, Hong and Prawirohatmodjo, 1998).

Trade

The timber is not thought to occur in European trade (WCMC, 1991). The wood is rarely and only locally used. Prices are high and it is sold by the piece (Sosef, Hong and Prawirohatmodjo, 1998).

IUCN Conservation category

NE

Conservation measures

With the exception of the few individuals in botanic gardens and those occurring in small villages there are no reports of active ex-situ conservation (Sosef, Hong and Prawirohatmodjo, 1998). This species appeared on the IUCN list of non-endemic threatened plants of Peninsular Malaysia for 1991.

Forest management and silviculture

It is possible to propagate *M. caloxylon* by seed. An experiment in Peninsular Malaysia has shown that approximately 75% of seeds germinate within 23-73 days. The growth rate of this species is probably too low to make it a suitable plantation species (Sosef, Hong and Prawirohatmodjo, 1998).

References

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- WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.
- (Sosef, Hong and Prawirohatmodjo, 1998).

Neesia altissima

Durian

Distribution

Perak, Singapore, Sumatra, Sabah, Java, Thailand, Peninsular Malaysia, Borneo.

Habitat

Neesia is found in primary rainforest, often along streams or in freshwater swamp. This species grows at altitudes of between 100 – 1800m.

Population status and trends

The species has been recorded as threatened in Indonesia although the genus does not seem to be in immediate danger of genetic erosion or extinction. Logging is seldom, even in concession areas (Sosef, Hong and Prawirohatmodjo, 1998).

Role of species in the ecosystem

Threats

Utilisation

This genus produces a light timber and is suitable for light construction, cheap furniture and fittings, flooring, planking, wooden shoes, floats, low grade coffins, sliced veneer and plywood. Dried fruits are hung above doors in Sumatra to ward off spirits. The wall of the fruit, of this species, has been used medicinally against gonorrhoea.

There is no expected increase in the use of *Neesia*.

Trade

This is one of the main *Neesia* species traded with *Durio* and *Coelostegia* spp. as Durian. *Neesia* wood makes up only a small proportion of this trade group. *Neesia* may also be traded in mixed consignments as “red meranti” (Sosef, Hong and Prawirohatmodjo, 1998). The timber is not thought to occur in European trade (WCMC, 1991). Exports of *Durio* spp. from Peninsular Malaysia totalled 16,000m³ in 1995 which was traded at an average 248\$/m³ (ITTO,1997).

IUCN Conservation category

The species has been recorded as threatened in Indonesia (WCMC, 1991), although the genus does not seem to be in immediate danger of genetic erosion or extinction. Logging is seldom, even in concession areas (Sosef, Hong and Prawirohatmodjo, 1998).

Conservation measures

Neesia is not recorded to be conserved ex-situ.

Forest management and silviculture

It is possible to propagate *Neesia* from seeds.

References

- WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC. (Sosef, Hong and Prawirohatmodjo, 1998).
ITTO. 1997. Annual review and assessment of the world tropical timber situation, 1996.

Neesia malayana

Distribution

Peninsular Malaysia, Sumatra, Sabah, Borneo.

Habitat

Fresh water swamp forest.

Population status and trends

The species has been recorded as threatened in Indonesia although the genus does not seem to be in immediate danger of genetic erosion or extinction. Logging is seldom, even in concession areas (Sosef, Hong and Prawirohatmodjo, 1998).

Role of species in the ecosystem

Threats

Utilisation

This genus produces a light timber and is suitable for light construction, cheap furniture and fittings, flooring, planking, wooden shoes, floats, low grade coffins, sliced veneer and plywood. Dried fruits are hung above doors in Sumatra to ward off spirits.

There is no expected increase in the use of *Neesia*.

Trade

This is one of the main *Neesia* species traded with *Durio* and *Coelostegia* spp. as Durian. *Neesia* wood makes up only a small proportion of this trade group. *Neesia* may also be traded in mixed consignments as “red meranti” (Sosef, Hong and Prawirohatmodjo, 1998). The timber is not thought to occur in European trade (WCMC, 1991). Exports of *Durio* spp. from Peninsular Malaysia totalled 16,000m³ in 1995 which was traded at an average 248\$/m³ (ITTO,1997).

Conservation category

Conservation measures

Neesia is not recorded to be conserved ex-situ.

Forest management and silviculture

It is possible to propagate *Neesia* from seeds.

References

- ITTO. 1997. Annual review and assessment of the world tropical timber situation, 1996.
WCMC. 1991. Provision of data on rare and threatened tropical timber species.
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Neobalanocarpus heimii

Common/Trade name

Chengal. Malaysia: chengai, penak. Thailand: takhian-chan, takhian chantamaeo (peninsular), chi-ngamat (Narathiwat).

Distribution

Indonesia (it may be extinct), Peninsular Malaysia, Thailand (south of Pattani).

Habitat

N. heimii grows under a wide range of ecological conditions but appears to grow best on undulating land with a light sandy soil (Thomas, 1953). In Thailand it occurs in Hill Dipterocarp forest along slopes and in valleys, often growing with *Shorea curtisii* (Smitinand *et al.*, 1980).

Population status and trends

Chengal has been one of the most popular hardwoods of Peninsular Malaysia and has been heavily logged throughout the state. The species is the best known and most highly valued timber in the country. By the 1950s Chengal had been exterminated from some accessible areas, particularly in the western regions of Malaya (Thomas, 1953). In Malaysia the species is common but never abundant (Asia Regional Workshop, 1997). The species is listed as Vulnerable in Anon. (1985). FAO (1990) notes that the species has been over-exploited, has poor regeneration and is need of *in situ* conservation.

Inventory data have been used to indicate the depletion of Chengal in Peninsular Malaysia in the period between the First (1971-72) and Second (1981-82) National Forest Inventories. There was a measured decrease in volume/ha and number/ha for trees over 45 cm in diameter in both virgin and logged over forests.

Role of species in the ecosystem

Threats

Logging

Timber properties

The wood of Chengal has pale yellow sapwood and light-brown heartwood which darkens on exposure. It is a heavy, dense resistant wood which is easy to work.

Utilisation

Chengal is used for heavy construction, in bridge-making and for sleepers and telegraph poles. It is also used for boat building and in sea defences.

Trade

For the period 1986 - 1990, Peninsular Malaysia exported an average of 28,500 m³ of sawn wood annually, and the domestic market consumed an average of 69,000 m³ annually. Thailand is the main importer. (Soerianegara & Lemmens, 1993).

IUCN Conservation category

VU A1c,d – according to Lillian Chua

Conservation measures

Legislation

Peninsular Malaysia - The export of Chengal in log form is banned by Peninsular Malaysia.

Thailand - Conserved as a valuable source of Dammar. Prior to the general logging ban, exploitation of Chengal timber could only be carried out by special permission granted by the Ministry of Agriculture.

Presence in protected areas

Peninsular Malaysia Occurs in a number of Virgin Jungle Reserves including those in Ulu Sedili Forest Reserve, Johore, Panti Forest Reserve, Johore, Balah Forest Reserve, Pahang, Lesong Forest Reserve, Pahang, Gunung Besut Forest Reserve, Perak, Sungai Lalang Forest Reserve, Selangor, Angsi Forest Reserve, Negeri Sembilan and Pasoh Forest Reserve; it also occurs in Taman Negara National Park.

Thailand *Neobalanocarpus heimii* does not occur in any protected areas within Thailand (Phengkklai pers. comm., 1989)

Forest management and silviculture

Natural regeneration beneath parent trees is rarely abundant in primary rainforest except on ridges in hill forest. Seedlings need shade for development and some success has been achieved with planting in secondary forests (Soerianegara & Lemmens, 1993). In Malaysia there has been some success in enrichment planting trials in advancing secondary forest (Asia Regional Workshop, 1997).

References

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- Thomas, A.V. 1953. *Malayan timbers Chengai and Balau*. Malayan Forest Service Trade Leaflet No. 20.

Correspondence and personal communications

C. Phengkklai, Royal Forest Department, Bangkok, pers comm., November 1989.

Ochanostachys amentacea

Olacaceae

Indonesia, Malaysia: Petaling. Indonesia: petikal (Sumatra), ampalang, empilung (Kamlimantan). Malaysia: mentalai (Peninsular), imah, petikal (Sarawak), tanggal (Dusun, Sabah), sagad berauth (Murud) and santikal (Iban).

Distribution

Sumatra, Sabah, Sarawak, Bangka, Peninsular Malaysia, Borneo and intervening islands. It is probably erroneously reported from the Nicobar and Andaman Islands (Lemmens, Soerianegara and Wong, 1995).

Habitat

Primary and secondary lowland rain forest, often in mixed Dipterocarp forest in undulating country, on hill sides and ridges up to 950 m. It is found on loamy or sandy and rarely periodically inundated ground. It is scattered or locally frequent (Lemmens, Soerianegara and Wong, 1995).

Population status and trends

A monotypic genus found scattered in the understorey, occasionally reaching the canopy, of primary and secondary lowland rainforest, often mixed dipterocarp forest. Natural regeneration of this shade tolerant species is sparse and scattered, but it can be good under favourable conditions. The tree is slow growing; taking about 150 years to reach a diameter of 50 cm.

Petaling is generally too scarce to be of economic importance as an export timber. Due to its slow growth, it does not have potential as a timber plantation species (Lemmens, Soerianegara and Wong, 1995).

Role of species in the ecosystem

Birds and monkeys eat the fruits.

Threats

Utilisation

Petaling timber is used for house posts and other heavy construction purposes, such as bridge bearers for logging roads and railways, for telephone poles foundation piles, fence posts, flooring and tool handles. Utilisation for pallets, boxes and crates has also been reported. The bark and roots are used medicinally (Lemmens, Soerianegara and Wong, 1995).

Trade

Petaling is most frequently traded together with other medium-weight and heavy woods as mixed hardwood (Lemmens, Soerianegara and Wong, 1995).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

The species has been recorded as threatened in Indonesia (WCMC, 1991).

Conservation measures

Forest management and silviculture

Petaling is useful for underplanting in forest plantations to reduce weed growth (Lemmens, Soerianegara and Wong, 1995).

References

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Octomeles sumatrana

Datiaceae

Binuang

Distribution

Brunei, Indonesia (Irian Jaya, Kalimantan, Sulawesi, Sumatra), Malaysia (Sabah, Sarawak), Papua New Guinea (Bismarck Archipelago, Papua New Guinea), Philippines, Solomon Islands (South Solomon).

Habitat

Evergreen rainforest up to 1000m. Especially common in natural secondary and seral riverine alluvial forest. Colonises bare alluvial soil.

Population status and trends

This monotypic genus is widespread in Malesia. A pioneer species, it regenerates quickly in disturbed habitats such as logged-over forest and areas that were previously cultivated.

Role of species in the ecosystem

Bees prefer to nest in the branches of this species. Flowers are wind pollinated and the seeds are probably wind dispersed.

Threats

No immediate threats to the survival of this species.

Utilisation

The timber is utilised and this species also has medicinal uses. The roots are used as a local source of food and the bark yields gum, resin, oil. In Malaysia and Indonesia, 'bintuang' trees are favoured by local people for the wild bees nesting in the branches.

Trade

This species is one of the major timbers exported from Papua New Guinea, where it is traded under the name 'crima'. It makes up approximately 4% of the total logs exported from Papua New Guinea. Japan is a major importer from PNG.

IUCN Conservation category

LR:least concern – according to WCMC

Forest management and silviculture

Plantations have been established in PNG and the Philippines.

References:

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Palaquium bataanense

Sapotaceae

Distribution

Philippines

Habitat

Primary lowland forest.

Population status and trends

There is no specific information on population trends.

Role of species in the ecosystem

No information

Threats

clear-felling/logging of the habitat, extensive agriculture

Utilisation

A source of red nato timber.

Trade

No details of the trade are available.

IUCN Conservation category

VU A1d - WCMC

Conservation measures

Forest management and silviculture

There is an urgent need for silvicultural research into the genus (Soerianegara and Lemmens, 1993).

References

- Erfurth, T. & H. Rusche. 1976. The marketing of tropical wood. (unpublished). FO: MISC/76/8.
- Penafiel, S. 1990. Annotation to list of tropical timbers for the Philippines.
- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.

Palaquium impressinervium

Sapotaceae

Distribution

Peninsular Malaysia and Thailand

Habitat

Lowland, moist, closed forest and hill forest.

Population status and trends

This species has a scattered distribution in primary forest. It is harvested to supply wood for international trade but the main reason for decline is expansion of human habitations.

Role of species in the ecosystem

Threats

clear-felling/logging of the habitat, expansion of human settlement

Utilisation

Timber

Trade

IUCN Conservation category

VU B1+2a – according to Lillian Chua

Conservation measures

Forest management and silviculture

This species is not in cultivation. There is an urgent need for silvicultural research into the genus (Soerianegara and Lemmens, 1993).

References

- Chua, L. *et al.* 1997. Completed data collection forms for endemic trees of Peninsular Malaysia.
- Ng, F.S.P., C.M. Low, & M.A.N. Sanah. 1990. Endemic trees of the Malay Peninsula. Kuala Lumpur: Forestry Department. 118pp.
- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.

Palaquium maingayi

Sapotaceae

Distribution

Peninsular Malaysia and Thailand

Habitat

Located in lowland and hill forests up to an altitude of 1100m.

Population status and trends

Role of species in the ecosystem

Pollination/dispersal agents are unknown.

Threats

Felling and expansion of human settlement are the chief pressures on the species.

Utilisation

The timber is used as nyatoh. The latex makes gutta-percha of moderate quality (Soerianegara and Lemmens, 1993).

Trade

The timber is traded on an international scale.

IUCN Conservation category

LR/lc – according to Lillian Chua

Conservation measures

The species is conserved within national parks and protective forest in the permanent foest estate.

Forest management and silviculture

The species is not in cultivation.

References

- Chua, L. *et al.* 1997. Completed data collection forms for endemic trees of Peninsular Malaysia.
- Ng, F.S.P., C.M. Low, & M.A.N. Sanah. 1990. Endemic trees of the Malay Peninsula. Kuala Lumpur: Forestry Department. 118pp.
- Soerianegara, I. & R.H.M.J. Lemmens (eds.). 1993. Plant Resources of South-East Asia 5(1). Timber trees: Major commercial timbers. Wageningen: Pudoc Scientific Publishers. 610 pp.

Parinari costata ssp. costata

Distribution

Peninsular Malaysia, Sumatra, Borneo (Sabah, Sarawak, Brunei, Kalimantan), Philippines.

Habitat

Lowland forest, on hillsides and ridges with a maximum altitude of 300 m. Mixed dipterocarp forests on well-drained soils (Soepadmo and Wong, 1995).

Population status and trends

The species has been recorded as threatened in Indonesia (WCMC, 1991). It is uncommon in Sabah and Sarawak (Soepadmo and Wong, 1995).

Role of species in the ecosystem

The trees are shade tolerant and under natural circumstances establish in small numbers and grow up in primary forest (Sosef, Hong and Prawirohatmodjo, 1998).

Threats

Utilisation

Parinari wood is likely to be used for medium to heavy construction undercover, for example packaging for heavy articles, posts, beams, panelling and parquet flooring. It provides a good fuel and charcoal. Treated timber can be used for outdoor use for example wharf decking, transmission posts, railway sleepers, dunnage, salt-water piling and other marine constructions. The edible fruits of various species are not often used and the seed oil is used to lacquer paper umbrellas (Sosef, Hong and Prawirohatmodjo, 1998).

Parinari is difficult to saw, for this reason it's use is likely to be restricted to marine constructions and firewood (Sosef, Hong and Prawirohatmodjo, 1998).

Trade

Species of the genus *Parinari* are likely to be traded in mixed consignments of medium-heavy hardwood, or along with species of *Atuna* and *Maranthes* as 'merbatu'. Supplies are generally limited (Sosef, Hong and Prawirohatmodjo, 1998). The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

With the exception of those specimens incidently cultivated in botanical gardens there is no ex-situ cultivation (Sosef, Hong and Prawirohatmodjo, 1998).

Forest management and silviculture

Propagation from seed is possible.

References

- Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August 1997
- Soepadmo, E. and Wong, K.M. (Eds.) 1995. *Tree Flora of Sabah and Sarawak*. Volume 1. Government of Malaysia, ITTO, ODA.
- WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Parinari oblongifolia

Distribution

Peninsular Malaysia, Sumatra, Borneo (Sabah, Sarawak, Brunei, Kalimantan).

Habitat

Lowland rain forest and beside rivers in valleys extending to 450 m (Soepadmo and Wong, 1995) and occasionally in seasonal swamps (Keßler, Sidiyasa, 1994)

Population status and trends

This species has been recorded as threatened in Indonesia (WCMC, 1991).

Role of species in the ecosystem

The trees are shade tolerant and under natural circumstances establish in small numbers and grow up in primary forest (Sosef, Hong and Prawirohatmodjo, 1998).

Threats

Utilisation

Parinari wood is likely to be used for medium to heavy construction undercover, for example packaging for heavy articles, posts, beams, panelling and parquet flooring. It provides a good fuel and charcoal. Treated timber can be used for outdoor use for example wharf decking, transmission posts, railway sleepers, dunnage, salt-water piling and other marine constructions. The edible fruits of various species are not often used and the seed oil is used to lacquer paper umbrellas (Sosef, Hong and Prawirohatmodjo, 1998)..

Parinari is difficult to saw, for this reason it's use is likely to be restricted to marine constructions and firewood (Sosef, Hong and Prawirohatmodjo, 1998).

Trade

Species of the genus *Parinari* are likely to be traded in mixed consignments of medium-heavy hardwood, or along with species of *Atuna* and *Maranthes* as 'merbatu'. Supplies are generally limited (Sosef, Hong and Prawirohatmodjo, 1998). The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

With the exception of those specimens incidently cultivated in botanical gardens there is no ex-situ cultivation (Sosef, Hong and Prawirohatmodjo, 1998).

Forest management and silviculture

Propagation from seed is possible. The stone of this species has about 70% chance of germination, although this does not occur for 9 months after sowing. The last stones may germinate after more than 3 years (Sosef, Hong and Prawirohatmodjo, 1998).

References

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- WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Pericopsis mooniana

Common/Trade name

kuku, nedun

Local names

kayu laut (Malaysia), nedun (Sri Lanka), kayu kuku, joemoek (Indonesia), makapilit (Philippines).

Distribution

Micronesia, Papua New Guinea, Indonesia (Irian Jaya, Java, Kalimantan, Sulawesi, southern Sumatra, Moluccas), Eastern Borneo (Sabah, East Kalimantan), Philippines (Mindanao), the Moluccas, Sri Lanka, Peninsular Malaysia, Sabah.

Habitat

This species grows primarily scattered in coastal forests, but can be found along river banks, and in periodically inundated lowland semi-deciduous or evergreen forest up to 200(-350) m. In Papua New Guinea it is associated with *Flindersia*, *Syzygium* and *Myristica* spp. (Eddowes, 1997).

Population status and trends

This highly prized wood is disappearing fast owing to logging and land clearing for rubber and oil palm plantations (National Academy of Sciences, 1979).

P. mooniana is considered to be Vulnerable in Indonesia according to Tantra (1983). It is included in a shortlist of Endangered species of the country (Anon., 1978) and this reference noted that it had become exceedingly rare in Kalimantan. Over-exploitation in Sulawesi has resulted in only a few stands of this species remaining there, for example in Lamedae Reserve, south of Kolaka in south-east Sulawesi (Whitten *et al.*, 1987).

The species is considered to be almost extinct in Sabah (Meijer, pers. comm. 1997).

The Papua New Guinea population is restricted to a small area in the Oriomo River region of the Western province (Eddowes, 1997). The Oriomo River region is subject to ongoing logging operations and this species is in danger of becoming extinct in Papua New Guinea if it is not already (Eddowes, 1997b).

In Sri Lanka, demand for the timber has led to *Pericopsis mooniana* becoming very rare (de S. Wijesinghe *et al.*, 1990).

Utilisation

It is eagerly sought after for furniture, cabinet making, panelling, sliced veneer and turnery.

Trade

Supplies of the timber are very limited and exports are negligible. Sawn timber from Indonesia is traded mainly to Japan (Anon., 1978).

IUCN Conservation category

VU A1c,d (Asia Regional Workshop, 1997).

An evaluation of CR C2ab has been assigned for Papua New Guinea (Eddowes, 1997)

Conservation measures

It is cultivated in the LAE National Botanical Gardens, Papua New Guinea (Eddowes, 1997).

Legislation

Sri Lanka - Included in a list of threatened plant species which will replace the schedule of protected plants in the Fauna and Flora Protection Ordinance 1937.

Forest management and silviculture

In Indonesia trees are harvested according to the Indonesian selective felling and planting system, with a diameter limit of 50 cm. Natural regeneration is generally scarce. In cultivation seeds germinate well and the species can also be propagated easily from stem cuttings (Soerianegara & Lemmens, 1993).

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Phoebe macrophylla

Distribution

Indonesia, Peninsular Malaysia, Sabah, Sarawak.

Habitat

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

A Light Hardwood (Wong, 1982).

Trade

The timber is commonly grouped with that of other species of the family and traded as medang. The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

This species has been recorded as threatened in Indonesia (WCMC, 1991).

Conservation measures

Forest management and silviculture

References

WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Phoebe nanmu

Lauraceae

Distribution

Endemic to China (Xizang, Yunnan) It is only recorded from Meitus in south-east Tibet (Xizang).

Habitat In Yunnan the species is known mainly from monsoon forest. It grows at altitudes between 500 - 1500m.

Population status and trends

The species has a scattered distribution. During the last 10 years populations have been declining because of overcutting.

Role of species in the ecosystem

P. nanmu grows with *Semecarpus reticulata* and *Paramichelia bailonii*.

Threats

Exploitation together with clear-felling/logging of the habitat and agriculture. Overcutting for timber is believed to be the greatest threat (Fu, Li-kuo & Jian-ming Jin, 1992).

Utilisation

The timber is excellent for building construction and furniture.

Trade

minor international trade

IUCN Conservation category

EN B1+2ce –according to Weibang Sun

Conservation measures

Some areas of the forest habitat are protected, for example in Menghai Nature Reserve. There is small scale cultivation.

Forest management and silviculture

References

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Pinus amamiana

Pinaceae

Distribution

Japan

Habitat

Lowland, moist, coniferous forest

Population status and trends

This is only known from scattered populations in lowland coniferous woodland on Yakushima and Tanegashima islands. It was formerly exploited and seems slow to regenerate where conditions have become exposed.

Role of species in the ecosystem

Threats

Logging has been the main cause of decline.

Utilisation

This species produces a good quality timber.

Trade

The species is too scarce to be commercially valuable.

IUCN Conservation category

VU D2 – according to the SSC Conifer Specialist Group

Conservation measures

The habitat of this species is included in a national park on Yakushima.

Forest management and silviculture

Not in cultivation

References

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- Mill, Robert R. 1994. Annotations to Conifers - taxa listed on BG-BASE - status report as of 2 February 1994. 43pp.

Pinus merkusii

Pinaceae

Distribution

Indonesia (Sumatra woodlands - around Lake Toba following the mountains north-east), Philippines

Habitat

Open pine woodland with grassland growing up to altitudes of 2000m.

Population status and trends

This species has been reported to be abundant where it occurs but high levels of exploitation have resulted in populations being reduced to very low levels in the Philippines. In Sumatra the timber continues to be extracted. The effects on the population here are yet to be confirmed but are not thought to be as severe.

Role of species in the ecosystem

Threats

In addition to felling, grazing and burning are threats.

Utilisation

An important timber tree. It is also a source of fuel for local use and resin.

Trade

minor international trade

IUCN Conservation category

VU B1+2ce - SSC Conifer Specialist Group

Conservation measures

Forest management and silviculture

A light-demanding pioneer species, natural regeneration is only possible where a relatively large amount of sunlight reaches the ground. This species is plantation grown (Lamprecht, 1989).

References

- Cooling, E.N.G. 1968. *Pinus merkusii* - fast growing timber trees of the tropics.
Farjon, Aljos, Christopher N. Page, & Nico Schellevis. 1993. A preliminary world list of threatened conifer taxa. *Biodiversity and Conservation* 2: 304-326.
Lamprecht, H. (1989) *Silviculture in the Tropics*. GTZ, Germany.

Pinus pentaphylla

Pinaceae

Distribution

Japan, South Korea

Habitat

Found in mixed stands on hilltops and rocky outcrops in the deciduous broad-leaved zone and in the sub-alpine conifer zone growing at altitudes 60 - 2500m.

Population status and trends

This pine grows in small groups on hilltops and on rocky outcrops. Logging operations and forest clearance are causing a decline in parts of the species range, especially the northern and south-eastern areas.

Role of species in the ecosystem

Threats

Logging operations and cutting of the natural forest.

Utilisation

It produces a good construction timber. The species is widely used as an ornamental including bonsai cultivation.

Trade

IUCN Conservation category

LR/nt - according to WCMC

Conservation measures

Cultivated on a small scale. Populations are protected in Japanese national parks.

Forest management and silviculture

References

- FAO Forestry Department. 1986. Databook on endangered tree and shrub species and their provenances. Rome: FAO. 524pp.
- Hayashi, Y. 1952. The Natural Distribution of Important Trees Indigenous to Japan.
- Lee, Y.N. 1984. Annotations to: List of threatened plants of South Korea.
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Pithecellobium splendens

Distribution

Peninsular Malaysia, Sabah, Sarawak, Thailand, Sumatra, Borneo.

Habitat

In Malaysia it is found scattered in lowlands to 800 m throughout the country but is never gregarious.

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

This is the only species in the genus large enough to be considered as a timber species (Wong, 1982).

Trade

The timber is not thought to occur in European trade (WCMC, 1991).

Conservation category

The species has been recorded as threatened in Indonesia (WCMC, 1991).

Conservation measures

Forest management and silviculture

References

WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Planchonia valida

Putat

Distribution

Malaysia, Sumatra, Sabah, Borneo, Java, Lesser Sunda Islands, Sulawesi.

Habitat

In Malaysia it is usually found at low altitudes in open spaces and forest. In Kalimantan it is also reported from lowland forest, usually along rivers or on hillsides.

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

The wood is easy to work, but not very durable. It provides a good source of firewood and the young leaves are eaten as lalab (raw vegetables).

Trade

The main species traded as putat. The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

The species has been recorded as threatened in Indonesia.

Conservation measures

Forest management and silviculture

References

- Kessler, P.J.A and Sidiyasa, K. 1994. Trees of the Balikpapan Samarinda area, East Kalimantan, Indonesia. A Manual to 280 selected species. Tropenbos Series 7. Tropenbos, Wageningen.
- WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC

Podocarpus annamiensis

Podocarpaceae

hainan luohansong

Distribution

China (Guangdong - Hainan), Myanmar, Viet Nam

Habitat

A tree scattered in rainforest areas on hillsides and ridges at medium altitudes up to 1699m.

Population status and trends

Populations confined to the mountains of southern Hainan Island in China are constantly subject to exploitation and have declined. Populations elsewhere are also subject to heavy logging.

Role of species in the ecosystem

Threats

Clear-felling/logging of the habitat

Utilisation

The species produces a good wood for carving and making musical instruments. It also has some horticultural value.

IUCN Conservation category

DD according to SSC Conifer Specialist Group

Conservation measures

Populations should be protected in the Jianfeng and Diaoluo Mts. A few individuals are present in the arboretum of the Hainan Institute of Forestry.

Forest management and silviculture

References

- Farjon, Aljos, Christopher N. Page, & Nico Schellevis. 1993. A preliminary world list of threatened conifer taxa. *Biodiversity and Conservation* 2: 304-326.
- Loc, Phan Ke. 1992. Annotations to: Conservation status listing for Vietnam dated 25 March 1992. (unpublished). 49pp.
- Loc, Phan Ke. 1986. Lists of rare and endangered plant species of Vietnam (1986-1988). (unpublished).
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Pterocarpus dalbergioides

Andaman padauk, Andaman redwood

Distribution

Andaman Islands. Planted from India to Indonesia and in Madagascar.

Habitat

Deciduous and semi-moist deciduous forest, usually near river banks, on well-drained sites, at altitudes of up to 100 m.

Population status and trends

Role of species in the ecosystem

Threats

No information is available about the proper management of narra in natural stands. The trees often occur scattered in dipterocarp forest where the cutting is governed by diameter limits (usually 60 cm).

Utilisation

The timber is used as narra (Soerianegara & Lemmens, 1993). The wood yields a red dye and it is also used medicinally (WWF and IUCN, 1994-1995).

Trade

IUCN Conservation category

DD – according to the Viet Nam Regional Workshop

Conservation measures

Forest management and silviculture

This species regenerates well naturally. It is well-suited for planting in stand gaps, for enrichment line planting, and for agroforestry systems. It is mainly cultivated in India and Myanmar (Lamprecht, 1989).

References

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Pterocarpus indicus

Trade name

narra, amboyna, padauk, rosewood

Local name

red sandalwood (English), amboine, santal rouge (French). Brunei: angšana. Indonesia: linggoa, sonokembang (general), angšana (Java). Malaysia: angšana (general), sena (Peninsular). Papua New Guinea: Papua New Guinea rosewood,. Philippines: apalit (general), vitali (Zamboanga). Myanmar: sena, padouk, ansanah. Laos: chan deng. Thailand: pradu (general), pradu-ban (central), sano (Malay, peninsular). Viet Nam: gi[as]ng h[uw][ow]ng. Fiji: cibicibi. Vanuatu: nananara. Solomon Islands: liki.

Distribution

Southern Burma, Philippines, Peninsular Malaysia, Indonesia, Sabah, Singapore, India, Myanmar, Thailand, Indochina, the Malay Archipelago, Papua New Guinea, Bismarck Archipelago, Bougainville, the Solomon Islands and the Pacific Islands.

Habitat

The species is found at low to medium altitudes (up to 750m) in primary and secondary forest, mainly along tidal creeks or at the edge of swamps. In addition, it is found in beach forest, on coral sand and on rocky shores. It may grow at higher altitudes when planted (Soerianegara & Lemmens, 1993).

Population status and trends

This species has a widespread distribution and is widely cultivated e.g. it is the most common street tree in Singapore. This species has been recorded as Vulnerable in the Philippines and threatened in Indonesia (WCMC, 1991). It is probably now extinct in Peninsular Malaysia because of exploitation of its few known stands (Soerianegara and Lemmens, 1993). It has been known for 300 years that this species is extinct in the wild in Viet Nam (Asia Regional Workshop, 1997). The species has been heavily exploited in Irian Jaya and Papua New Guinea having the largest remaining supplies (Asia Regional Workshop, 1997). In India this species is endangered (Asia Regional Workshop, 1997).

Role of species in the ecosystem

Threats

Exploitation for timber, including illegal felling, and shifting cultivation (Soerianegara and Lemmens, 1993). The sustainability of timber extraction should remain of concern. As narra wood is in great demand for top-class furniture, trees of less than 60 cm diameter are sometimes cut illegally, particularly in the Philippines (Soerianegara & Lemmens, 1993)

Utilisation

The narra timber is used for high class furniture and cabinets, decorative sliced veneer, interior wall paneling, feature flooring (including strip and parquet), musical instruments, gun stocks, rifle butts, turned articles, knife handles, boat building and specialised joinery (Eddowes 1977, 1995-1997)

Trade

In the Philippines export of narra wood was 3 million kg in 1985, declining to 2.3 kg in 1986 (57% processed) and 430,000 kg in 1987 (all processed). From that time export has been negligible and at present there is a total cutting ban on the species (Soerianegara and Lemmens, 1993).

In Papua New Guinea, narra is an important timber which fetches high prices. The export of logs is banned and only processed wood is exported (Soerianegara and Lemmens, 1993).

Thailand exported 5.8 million kg of sawn *Pterocarpus* (*P. indicus* and *P. macrocarpus*) in 1990. Thailand also imports this timber, 11000 m³ in 1990, mainly from Myanmar but also in small amounts from Laos, Cambodia and Viet Nam (Soerianegara and Lemmens, 1993).

IUCN Conservation category

VU A1d – according to WCMC

Conservation measures

In Viet Nam this species is included in the Council of Ministers Decision 18/HDBT (17 January 1992) as a species with high economical value which is subject to over-exploitation.

Forest management and silviculture

Narra is easily propagated by seed. Stump cuttings taken from seedlings or wildlings can also be used as planting material and narra can be propagated successfully by tissue culture. It is cultivated in Africa, India, Sri Lanka, Taiwan, Okinawa, Hawaii and Central America (Soerianegara and Lemmens, 1993). It is also cultivated in Singapore and Papua New Guinea (Asia Regional Workshop, 1997).

No information is available about the proper management of narra in natural stands. In the Philippines, the trees often occur scattered in dipterocarp forest where diameter felling limits apply. The high value of the wood has led to illegal felling of trees in contravention of the felling limits particularly in the Philippines (Soerianegara and Lemmens, 1993).

References

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- WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Pterocarpus macrocarpus

Distribution

Laos, Myanmar, Thailand, Viet Nam

Habitat

In Viet Nam the species occurs in open semi-deciduous dipterocarp forest on well-drained soils.

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

Classified as a first class timber in Viet Nam, used in construction, cabinet-work, furniture and fine art articles. The resin is used as a red dye (Vu Van Dung, 1996).

Trade

Thailand exported 5.8 million kg of sawn *Pterocarpus* (*P. indicus* and *P. macrocarpus*) in 1990. Thailand also imports this timber, 11000 m³ in 1990, mainly from Myanmar but also in small amounts from Laos, Cambodia and Viet Nam (Soerianegara and Lemmens, 1993). Myanmar exported 37000 m³ of logs at an average price of 429\$/m³ and 1000 m³ of sawnwood at an average price of 237\$/m³ in 1995. In 1995 Thailand exported 5000 m³ of sawnwood at an average price of 1761\$/m³.

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

Forest management and silviculture

References

- Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August, 1997
- Soerianegara, I. & Lemmens, R.H.M.J. (Eds.) 1993. *Plant Resources of South-East Asia (PROSEA) 5(1) Timber trees: major commercial timbers*. Pudoc Scientific Publishers, Wageningen.
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Pterocarpus santalinus

Redsanders, Red Sandal Wood

Local names

lalchandani, raktachand (Beng. & Hindi); ratanjali (Guj.); agaru, honne (Kan.); patrangam, tilaparnni (Mal.); atti, sivappu chandanam (Tam.); agarugandhamu, raktagandhamu (Tel.).

Distribution

This species occurs mainly in the southern eastern Ghats states of Peninsular India (Andhra Pradesh, Karnataka, Tamil Nadu) and sporadically in other states (Anon., 1997).

Habitat

Found between 150 - 900 m altitude, this species is restricted to dry, hilly, often rocky, ground in dry deciduous forest and is sometimes found on wetter hillsides.

Population Status and Trends

The total range of this tree is < 5,000 km² and the area of occupancy is < 1,000 km² (Molur et al, 1995). Regeneration of the species is confined to the dry hilly regions of central India (Anon., 1997). No populations have been reported for Kerala, Karnataka and Tamil Nadu (Molur et al, 1995).

Role of Species in the ecosystem

Threats

A slow growing species over-exploited for its timber and for the extraction of dye, cosmetics and medicine.

Utilisation

Nationally Raktachandan is used as a quality timber (Anon., 1997). The wood, particularly the 'wavey grain' timber, is valued for making highly prized furniture and musical instruments. A red dye called 'santalin' is produced from this species which is used to mark castes amongst the Hindu community. It also has traditional medicinal uses in India. Leaves are used as cattle fodder.

Trade

Export of red sandalwood for textile dyeing started in the 17th century and continued until 1900; the major importer being UK. Export figures in the 1880s average around 3000 tonnes per annum. In the 1930s Japan imported the wood for making traditional 'shamisen' musical instruments. The market continues today with several hundred tonnes of red sandalwood being exported every year. Europe has for a long time imported red sandalwood extract as a red colourant, mainly for use in fish processing but recent interest has been shown in examining other applications (Green, 1995).

Large quantities of wood chips (1988/89: 135.4 tonnes; 1989/90: 144.567 tonnes; 1990/91: 23.7 tonnes; 1991/92: 36.191 tonnes; 1992/93: 24.97 tonnes) and powder (1990/91: 56.41 tonnes; 1991/92: 56.8 tonnes) are exported regularly mainly for the extraction of dye, medicine and cosmetics (Anon., 1997). The major importers of red sandalwood powder have Japan, Taiwan and Western Europe. Illegal trade has been reported (Anon., 1997).

IUCN Conservation category

EN B1+2d,e by Molur *et al*, 1995 which was confirmed at the Asia Regional Workshop (1997).

Conservation Measures

It is on the prohibited list of exports which bans export in any form.

Pterocarpus santalinus is listed on Appendix II of CITES.

Currently efforts are being made to regenerate this species and introduce it to different Botanic Gardens and National Parks (Anon., 1997).

Forest management and silviculture

Plantations are being established (Molur et al, 1995). The tree regenerates well from coppicing but growth is slow and a 40 year coppice rotation is practised in India (Green, 1995).

References

Anonymous. 1997. Proposal to include *Pterocarpus santalinus* in Appendix II of CITES.

Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August, 1997

Molur, S., Ved, D.K., Tandon, V., Namboodiri, N. and S. Walker (Eds.). 1995.

Conservation Assessment and Management Plan (C.A.M.P.) for selected species of medicinal plants of southern India. Produced by participants of the Southern Indian Medicinal Plants Conservation Assessment and Management Plan Workshop held 23-25 February at Bangalore pp. 108.

Pterocymbium beccarii

Amberoi

Distribution

Indonesia (Irian Jaya and Kai Islands), Papua New Guinea, Bismarck Archipelago, and the North Solomons (Bougainville).

Habitat

A tree generally found at low altitudes, occasionally found up to 750m, in rainforest on well drained flats and foothills, mostly on ridges. It sometimes on alluvial or swampy soils on the inner edge of mangroves (Eddowes, 1995-1997).

Population status and trends

Somewhat scattered but sometimes locally common, *Pterocymbium beccarii* is relatively widespread throughout the region. In Papua New Guinea this species has been heavily exploited for many years in commercial style logging operations on the islands of New Britain and New Ireland in the Bismarck Archipelago (Eddowes 1995-1997). The species is not, however, considered to be in immediate danger in Papua New Guinea. The species has been recorded as Rare in Indonesia (WCMC, 1991).

Role of species in the ecosystem

It plays a relatively important role in the eco-system through its ability to regenerate after logging and its status as a pioneer species.

Threats

The species is threatened by exploitation for timber, shifting cultivation and agricultural expansion.

Utilisation

A soft, lightweight, pale (cream to straw) coloured timber. Mainly sought after for veneer and plywood manufacture due to its well-formed cylindrical bole which is often large in diameter (Eddowes, 1995-1997).

Trade

The timber is not thought to occur in European trade (WCMC, 1991). It is one of the major commercial timbers of Papua New Guinea and accounts for 2-3% of logs exported annually (Eddowes, 1997). In 1993, it attained an average FOB price of US\$ 70/m³.

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

There are no known conservation measures of any significance.

Forest management and silviculture

There is very little specific information available for this species, but in general Lemmens et al (1995) record that natural regeneration is generally good. It often suckers vigorously from cut stumps. Being a pioneer, the species needs plenty of light, especially in the seedling stage. Plantations need to be weeded during the first 1-3 years and should be thinned 5 and 10 years after planting. The rotation of *Pterocymbium* plantations is 30 years or less.

References

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- WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Pterocymbium tinctorium

Distribution

Myanmar, Thailand, Indo-china, Peninsular Malaysia, Indonesia, Philippines, Sabah.

Habitat

This species is most common on alluvial flats, and is also found in evergreen, deciduous or open forest in periodically dry locations up to 1000m.

Population status and trends

The species has been recorded as Vulnerable in the Philippines and Rare in Indonesia, according to the old IUCN threat categories (WCMC, 1991).

Role of species in the ecosystem

Threats

Utilisation

The timber is known as amberoi. The bark is used to improve black dyeing of cotton cloth and locally to make rope.

Trade

Amberoi timber is traded domestically in Thailand. The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

Forest management and silviculture

References

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Pterocymbium tubulatum

Various vernacular names are recorded for Sumatra, Peninsular Malaysia and Kalimantan.

Distribution

Malaysia, Sumatra, Borneo.

Habitat

This species usually occurs in lowland forests, at the foot of hills, in valleys or along rivers. It grows at altitudes up to 1000 m (Lemmens, Soeriangara and Wong, 1995).

Population status and trends

This species occurs locally, often in small groups or as scattered individuals. It is much less common and widespread than other species in the genus (Lemmens, Soeriangara and Wong, 1995). The species has been recorded as Rare in Indonesia (WCMC, 1991).

Role of species in the ecosystem

Threats

Utilisation

The timber is used as amberoi, a light hardwood. Amberoi is used for veneer, plywood, mouldings, furniture and other general purposes.

Trade

Amberoi is exported from Sabah, but details of trade in this species are not known. The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

This species has not been evaluated with the 1994 IUCN Red List categories.

Conservation measures

Forest management and silviculture

Natural regeneration is naturally good for species of this genus and some species are reported to have potential for planting in logged over forest (Lemmens, Soeriangara and Wong, 1995).

References

WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Santalum album

Sandalwood

Distribution

This species is widely scattered in China, India, Indonesia (Timor, Sumba and Flores and planted in Java and Bali), the Lesser Sunda Islands, the Philippines and Australia. Once the tree was thought to have originated from India, but most botanists now believe that sandalwood was taken from Indonesia to India (Monk, de Fretes and Reksodiharjo-Lilley, 1997).

Habitat

In India, *S. album* occurs between the elevations of 0-700 m and in rainfall zones of 300-3000 mm. It is found mainly in dry deciduous forests (USDA, 1990).

Population status and trends

In India, Sandalwood is regenerating when in favourable conditions and its distribution is extending (USDA, 1990). Northern Australia has only a small patch of *S. album* in basalt region in the Hughendon-Cloncurry area (Statham, 1990). Almost all sandalwood oil in India is produced from wild sources. The methods of extraction are destructive, entailing the uprooting of trees. Only mature trees of between 30 and 50 years form heartwood and younger trees are not harvested. It is believed that spike disease poses a more serious threat in India than overexploitation (Green, 1995). In Indonesia continuous harvesting combined with very little regeneration because of fires, shifting cultivation and cattle grazing, has led to serious declines in wild populations (Green, 1995).

Regeneration

S. album regenerates vegetatively with root suckers and by coppicing when the plant is juvenile (USDA, 1990). It begins to flower at 3 years of age and starts producing viable seeds at about 5 years.

Role of species in the ecosystem

Sandalwood is a hemi root parasitic tree and requires a host plant (can parasitise over 300 species including itself) for nitrogen, phosphorous and potassium (USDA, 1990). Birds are necessary for efficient seed dispersal (USDA, 1990).

Threats

Fire and grazing are threats because they have a detrimental affect on regeneration (USDA, 1990). There is much concern regarding over-exploitation due to smuggling for trade.

Utilisation

The timber is used for fine furniture, carving and turnery. Oil is extracted from the heartwood and is in high demand for incense, perfumery and medicines. It is also valuable as a fixative for other fragrances.

Trade

The price of Sandalwood in India increased from RS 20,000 per tonne in 1980 to RS 200,000 per tonne in 1990. "Smuggling has assumed alarming proportions." The total annual production in India is about 1800 tonnes (Chadha, 1989).

India uses all *S. album* domestically and export is prohibited (USDA, 1990). Major exporters of top quality logs are Hawai'i, Fiji, Indonesia and Western Australia. The main world supplier of sandalwood chips and powder for incense is Australia, limited quantities are exported from India (USDA, 1990). Good quality logs in India sold domestically went for an average price of US\$4,590/tonne in 1987 and US\$9,410/tonne in 1990 (USDA, 1990). Under the Indonesian Government, sandalwood was exported during the first and second Five Year Plans. Since then, sandalwood oil and handicrafts have become more important. In 1994 an export tax was imposed on sandalwood chips, powder and roots to encourage local sandalwood handicrafts (Monk, de Fretes and Reksodiharjo-Lilley, 1997). Smuggling of sandalwood into East Timor has been reported (Monk, de Fretes and Reksodiharjo-Lilley, 1997).

Demand for sandalwood oil fell in the 1970s as a result of high prices and competition from synthetic substances. This mostly affected the cheaper-grade formulations and the natural oil has retained its price. Demand is now influenced mostly by supply.

USA and France are the two largest importers of Indian sandalwood oil. The market in the Soviet Union has collapsed and imports into the Middle East are increasing.

IUCN Conservation category

VU A1d (Asia Regional Workshop, 1997). The Indian population is considered LR-nt (Asia Regional Workshop, 1997).

Conservation measures

Export of timber from India is totally banned except for handicraft pieces of sandalwood up to 50g weight. FAO, 1984 notes that it is a priority species for in situ conservation.

In East Nusa Tenggara felling of trees under 50 cm dbh is not permitted (Monk, de Fretes and Reksodiharjo-Lilley, 1997).

Forest management and silviculture

Sandalwood is light-demanding and can be easily suppressed by faster-growing species. Cultivation techniques now involve the use of *Capsicum* and *Acacia villosa* as host plants. In Indonesia, a 15 year programme of planting 30,000 ha of sandalwood was scheduled to start in 1990 through Perum Perhutani (HTIs), the Forestry Service, and social forestry programmes (Monk, de Fretes and Reksodiharjo-Lilley, 1997). Cultivation of sandal in India has had limited success. Sandal trees freely produce seed and natural regeneration occurs both via seedlings and through root suckers after trees have been uprooted and the stump removed from the ground (Green, 1995). Trees of 100cm girth are reported to yield between 84 and 240kg of heartwood. Yield of oil is highest from the roots and lowest from wood chips.

The cultivation or planting of sandal as a short- or medium-term source of income is unattractive because the oil is only obtained from the heartwood of mature trees and the tree is slow growing (Green, 1995).

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Santalum macgregorii

Santalaceae
sandalwood

Distribution

This small tree or shrub occurs only in the eastern part of the Central and Gulf provinces and the Western province of Papua New Guinea (Eddowes, 1997). Its distributions might extend into south-east Irian Jaya, although confirmation of this is required (Eddowes, 1997).

Habitat

A parasitic or semi-parasitic species scattered in open savannah vegetation and in savannah forest in gullies up to 250m (Eddowes, 1997). Also it is found in anthropic landscapes (Eddowes, 1997).

Population status and trends

In Papua New Guinea the exploitation began at the turn of the last century; now the resource is greatly depleted as there are no longer any more mature tree or virgin stands (Eddowes, 1997).

Role of species in the ecosystem

This species is parasitic or semi-parasitic.

Threats

As with all other sources of sandalwood, this species is over-exploited for its scented wood for commercial use (Eddowes, 1997). The future of this species is very much dependent on strict guidelines being adopted and implemented (Eddowes, 1997).

Utilisation

Sandalwood is used for incense, joss sticks, perfume, essential oil and carving (Eddowes, 1997).

Trade

It is found in major international trade (Eddowes, 1997).

IUCN Conservation category

EN A1cd, C1 according to Eddowes, P.J. (1997).

Conservation measures

Some attempts have been made to cultivate this species in the past but no large scale or on-going conservation practices have been undertaken or adhered to (Eddowes, 1997). A small, insignificant number of plantings were made and may still be in around but this is very doubtful (Eddowes, 1997).

Silviculture and forest management

Very little in the way of silvicultural practices are carried out (Eddowes, 1997).

References

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Santiria laevigata

Burseraceae

Distribution

Indonesia (Sulawesi, Sumatra), Malaysia (Peninsular Malaysia, Sabah, Sarawak), Philippines, Singapore

Habitat

This species is found in mixed dipterocarp, mixed peat swamp and kerangas forests up to 1500 m.

Population status and trends

A widespread but scattered, early pioneer species which regenerates well in logged-over forest and has been found to become the dominant species five years after logging.

Role of species in the ecosystem

The fruit is eaten by many vertebrates.

Threats

There are no specific threats to this species which recovers relatively well from logging activities.

Utilisation

This species is one of the main sources of kedondong timber; the wood is used for planks, posts, furniture and handles. The fruit is edible.

Trade

This species is sold in mixed consignments of timbers from trees of the Burseraceae family. Minor international trade.

IUCN Conservation category

LR/lc – according to WCMC

Conservation measures

Forest management and silviculture

References

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Scaphium longiflorum

Sterculiaceae

Distribution

Endemic to Peninsular Malaysia occurring in the states of Kedah, Penang, Perak, Selangor, and Johore.

Habitat

Occurs in lowland swampy or semi-swampy rainforest.

Population status and trends

A scattered primary forest tree which has declined due to expansion of settlement and logging activities.

Role of species in the ecosystem

No information.

Threats

The largest threats to this species are the expansion of human habitations and logging activities.

Utilisation

This tree is exploited as timber for major international trade and as a medicine for minor international trade. The timber is known as kembang semangkok.

Trade

The timber is exported mainly to East Asian countries.

IUCN Conservation category

VU B1+2c – according to Lillian Chua

Conservation measures

This species is not in cultivation.

Forest management and silviculture

References

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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.

References

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Correspondence and personal communications

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Sindora beccariana

Indonesia: sasundur, merd-jang, anggi (Kalimantan). Malaysia: tampar hantoe (Sabah, Sarawak).

Distribution

Borneo, Kalimantan, Sabah, Sarawak

Habitat

Scattered in lowland dipterocarp forest on sandy loam or clay soils (Soerianegara and Lemmens, 1993).

Population status and trends

Most *Sindora* spp are uncommon and scattered (Soerianegara and Lemmens, 1993).

Role of species in the ecosystem

Threats

Large-scale of exploitation of forest may seriously threaten these species, except when the felling cycle is sufficiently long to allow new trees to reach maturity in sustainably managed forest (Soerianegara and Lemmens, 1993).

Utilisation

The timber is used as sepetir.

Trade

Borneo is the main exporter of sepetir.

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

Forest management and silviculture

References

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Sindora inermis

Philippines: kaya galu (Magindanao), nito-nitong puti (Bikol), sinsud (Sulu).

Distribution

Philippines from south Luzon to Mindora and the Sulu Archipelago.

Habitat

Forested sea shores and in forests of low to medium altitudes.

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

Oil from the trunk has a long-lasting odour and has been exported in the past to Singapore. The timber is used as sepetir, especially for high-grade furniture and interior work, musical instruments and fancy boxes (Soerianegara and Lemmens, 1993).

Trade

The supply of the timber is very limited (Soerianegara and Lemmens, 1993). The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

VU A1d - preliminary evaluation by WCMC confirmed at the Asia Regional Workshop (1997).

Conservation measures

Forest management and silviculture

References

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Sindora supa

Philippines: supa (Bikol, Tagalog), baloyong (Batangas), manapo (Tayabas).

Distribution

Philippines (Luzon, Mindoro).

Habitat

Forest of low to medium altitude on limestone ridges. Appears to be confined to a limited portion of these regions which have distinct dry seasons.

Population status and trends

The species was recorded as Endangered in the Philippines, according to the old IUCN categories (WCMC, 1991).

Role of species in the ecosystem

Threats

Utilisation

The wood of this species is locally fairly important and used for high-grade furniture and interior work, musical instruments and flooring. It is often substituted for the more valuable *Intsia bijuga*. The wood-oil also has various local uses.

Trade

IUCN Conservation category

VU A1d - preliminary evaluation by WCMC confirmed at the Asia Regional Workshop (1997).

Conservation measures

In the Philippines the DENR Administrative Order No. 78 Series of 1987, Interim Guidelines on the Cutting/Gathering of Narra and other Premium Hardwoods, imposes restrictions on the felling of this species.

Forest management and silviculture

References

Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August 1997.

WCMC. 1991. Provision of data on rare and threatened tropical timber species. Unpublished report, prepared under contract to the EC.

Strombosia javanica

Belian landak (Sarawak)

Distribution

Myanmar, Sumatra, Thailand, Peninsular Malaysia, West Java, Borneo (Sarawak, Brunei and Kalimantan).

Habitat

Lowland rain forest, secondary forest and mixed Dipterocarp forest up to c 600 m on caly-rich fertile soils (Soepadmo and Wong, 1995). Scattered though locally common.

Population status and trends

This species has been recorded as Rare in Indonesia, according to the old IUCn categories (WCMC, 1991).

Role of species in the ecosystem

Threats

Utilisation

Produces a moderately hard, durable, light yellowish timber, used locally for house construction (Soepadmo and Wong, 1995).

Trade

The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

Forest management and silviculture

References

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Taiwania cryptomerioides

Taxodiaceae

Distribution

China (Guizhou, Hubei, Sichuan, Yunnan), Myanmar, Taiwan

Population status and trends

A large slow-growing tree from a monotypic genus, although the Chinese/Myanmar populations are frequently referred to as *T. flousiana*. It is widely scattered as an emergent in mid to high elevation forest, usually with *Chamaecyparis* species. Population declines have occurred because of forest clearance and logging, exacerbated by poor regeneration.

Habitat

This species grows in mid to high elevation forest, at altitudes of 500 - 2700m usually with *Chamaecyparis* species. It prefers red soil, yellow mountain soil or brown forest soil. In China it grows in valley forests in subtropical monsoon and humid regions.

Role of species in the ecosystem

Threats

This species is threatened by overexploitation and clear-felling of the habitat.

Utilisation

Timber and ornamental

Trade

IUCN Conservation category

VU A1d – according to SSC Conifer Specialist Group

Conservation measures

Forest management and silviculture

Plantations are now established.

References

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Taxus wallichiana

Taxaceae

Himalayan yew, ximalaya hongdoushan

Distribution

Afghanistan, Bhutan, China (Xizang), India (Arunachal Pradesh, Assam, Himachal Pradesh, Jammu-Kashmir, Manipur, Sikkim, Uttar Pradesh), Nepal, Pakistan

Habitat

The species occurs in temperate moist forest between 1500m and 3500m.

Population status and trends

In China the population is at a critical low, confined to Gyirong, Xizang, where it is threatened by logging (Fu, 1992). The Indian populations are scattered and cover a range of less than 2000km². They have declined by over 90% in recent decades (Molur & Walker, 1998). Exploitation of the various plant parts for medicinal use frequently leads to the destruction or felling of trees.

Role of species in the ecosystem

Threats

Clear felling/ logging of the habitat, local use.

Utilisation

For several centuries the young shoots, leaves and bark have been used for their medicinal properties. More recently huge quantities of leaves have been collected for medicinal extracts which have anti-cancer properties. The timber is also sought-after and traded at domestic level.

Trade

Numerous companies in India are involved in the processing or export of the species for medicinal use. Since 1992 substantial quantities of leaves and roots have been exported. For instance 495.137mt tonnes were exported from Madras/Cochin and 53.75mt tonnes through Delhi. 170,710kg of dried leaves were exported from Arunachal Pradesh in one month (Molur & Walker, 1998). The export from India is now banned.

IUCN Conservation category

LR/cd according to the SSC Conifer Specialist Group (Farjon, 1998).

Conservation measures

Various laws and programmes are in place in an effort to monitor and regulate both the exploitation and the trade. The species is listed in CITES Appendix II.

Cultivating the species is moderately difficult in natural conditions.

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***Tectona grandis* L.**

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.

Role of species in the ecosystem

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. **Madhya 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).

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Tectona hamiltoniana

Dahat (Myanmar)

Distribution

Endemic to Myanmar, occurring in the dry zone (Prome District and Upper Burma). The area of distribution is about 150 by 80 km (FAO, 1986). The distribution range rarely overlaps with that of *Tectona grandis*.

Habitat

Dry, open scrub forest, often growing on poor, stony soil (FAO, 1986).

Population status and trends

This species has a small area of distribution and is in need of conservation attention (Soerianegara and Lemmens, 1993). According to FAO, 1986, the species is in need of further study but is likely to be endangered.

Role of species in the ecosystem

Threats

Annual forest fires are a threat to this species and local use has caused declines (FAO, 1986).

Utilisation

The wood is used locally for fuel and construction. The bark is also used medicinally. *Tectona hamiltoniana* is not an important timber species but has potential value for plantations on dry sites.

Trade

Not thought to be in international trade.

IUCN Conservation category

VU B1 2a+c – according to WCMC on the basis of limited range (less than 20,000 sq km) and reported threats.

Conservation measures

Rarely planted; the potential for teak breeding should be investigated

Forest management and silviculture

Trees have been grown from seed on an experimental basis.

References

FAO, 1986

Soerianegara and Lemmens

Tectona philippinensis

Philippines: Philippine teak (general), bunglas (Panay Bisaya), malapangit.

Distribution

Endemic to Philippines (Mindoro, Luzon and province Batagas).

Habitat

Thickets and secondary forest at low altitudes (Soerianegara and Lemmens, 1993). It is restricted to a special substrate (Asia Regional Workshop, 1997).

Population status and trends

A scattered early pioneer species, the natural distribution is restricted and conservation measures are needed (Soerianegara and Lemmens, 1993).

Role of species in the ecosystem

Insects act as pollinators and the fruit is dispersed by wind.

Threats

commercial use, clear-felling of the habitat

Utilisation

The hardwood is used for heavy construction (Soerianegara and Lemmens, 1993); also used as firewood (Asia Regional Workshop, 1997).

Trade

IUCN Conservation category

EN B1&2a,b,c (Asia Regional Workshop, 1997).

Might qualify for Critically Endangered category subject to more information regarding the situation in Mindoro (Asia Regional Workshop, 1997).

Conservation measures

There is no state protection of this species (Asia Regional Workshop, 1997).

Forest management and silviculture

Unlike *T. grandis* this species is rarely planted and its potential for teak breeding is in need of investigation.

References

- Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August 1997
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Terminalia archipelagi

Combretaceae

terminalia, red-brown

Distribution

A large, well-formed tree occurring only on the islands of the Bismarck Archipelago, Papua New Guinea.

Habitat

It is found mainly in lowland primary rainforest where it can be locally dominant (Eddowes, 1997).

Population status and trends

Role of species in the ecosystem

The flowers are pollinated by insects and the seeds are wind dispersed. It regenerates in primary forest (Eddowes, 1997).

Threats

It has been and still is heavily exploited through intensive logging practices; habitat destruction is another threat to this species (Eddowes, 1997).

Uses

The wood is used for plywood, furniture and as a veneer (Eddowes, 1997).

Trade

It is very much sought after for log export as it is favoured for plywood manufacture (Eddowes, 1997). It occurs in major international trade. In 1995 102,000m³ of *Terminalia* logs were exported from Papua New Guinea at, on average, 135 \$/m³ (ITTO, 1997).

IUCN Conservation category

EN A1cd+2cd, C2a according to Eddowes, P.J. (1997).

Conservation measures

Conservation measures are not known but there may be 1-2 plantings of this species in LAE National Botanical Gardens, Papua New Guinea (Eddowes, 1997).

Silviculture and forest management

References

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Terminalia rerei

Combretaceae

terminalia, red-brown

Distribution

A species restricted to San Cristobal and Guadalcanal of the South Solomon Islands.

Habitat

Terminalia rerei is scattered in tropical lowland rainforest.

Population status and trends

Role of species in the ecosystem

The flowers are pollinated by insects and the seeds are wind dispersed. It regenerates in primary forest (Eddowes, 1997).

Threats

This timber species is subject to over-exploitation; it is further threatened by habitat loss due to indiscriminate logging practices (Eddowes, 1997).

Utilisation

The wood is used as plywood, veneer and to make furniture (Eddowes, 1997).

Trade

The timber is found in minor international trade (Eddowes, 1997).

IUCN Conservation category

VU B1+2abcde according to Eddowes, P.J. (1997).

Conservation measures

There are no conservation measures.

Silviculture and forest management

References

Eddowes, P.J. 1997. Completed data collection forms for New Guinea.
Womersley, J.S. & E.E. Henty (eds.). 1978. Handbooks of the flora of Papua New Guinea. Melbourne Uni. Press.

Toona calantas

Philippines: kalantas (general), danupra (Iloko).

Distribution

Thailand, Indonesia, Philippines.

Habitat

Population status and trends

The species has been recorded as Vulnerable in the Philippines (Tan, Fernando and Rojo 1986).

Role of species in the ecosystem

Threats

The stands have been depleted by logging and shifting cultivation (Lemmens, Soerianegara and Wong, 1995).

Utilisation

The timber is used as surian, especially for furniture, musical instruments, cigar boxes and plywood. The wood is suitable for shiitake mushroom culture and may be applied as an aromatic wood for its pleasant smell. The bark and flowers are used medicinally (Lemmens, Soerianegara and Wong, 1995).

Trade

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

Conservation measures

Forest management and silviculture

References

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Triomma malaccensis

Burseraceae

Distribution

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

Habitat

Primary lowland rainforest and rarely in secondary forest in well-drained areas; in Sabah and Sarawak it is found in mixed dipterocarp forest on yellow sandy clay soils. In south Sumatra this species grows well on red-yellow podsolic soils in wet areas.
Altitude: 0 - 1000m

Population status and trends

A large, emergent tree, up to 60 m in height, found scattered in the primary lowland rainforests of western Malesia. It is common in Sabah and uncommon (2 collections only) in Sarawak. Signs of regeneration are very scarce, perhaps due to low fruit setting and seedlings seem to be affected by competition. The species regenerates badly in logged over forest. This is a monotypic genus that is considered an ancient relic because of the primitive dry dehiscent fruits.

Role of species in the ecosystem

Found in association with *Castanopsis*, *Diospyros*, *Litsea*, *Lophopetalum*, *Koompassia*, *Palaquium*, *Shorea* and *Syzygium*.

Threats

poor regeneration, burning

Utilisation

Trees are cut and traded as kedondong timber, especially in Malaysia, but it is not cut selectively on a large scale. The lightweight wood has many uses.

Trade

Timber is traded domestically.

IUCN Conservation category

NE

Conservation measures

Forest management and silviculture

References

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Ulmus wallichiana

Ulmaceae

Distribution

Afghanistan, India (Jammu-Kashmir), Nepal, Pakistan

Habitat

A tree of temperate oak and mixed coniferous forest and of the *Cedrus deodara* forest zone of the Western Himalayas.

Population status and trends

A scattered species which has suffered from large-scale lopping its high quality livestock fodder. Once the tree has been severely hewed it can no longer reproduce because the resulting coppice-sprouts do not produce flowers. Only trees growing in inaccessible areas and protected areas have survived.

Role of species in the ecosystem

Threats

Overexploitation and grazing.

Utilisation

Animal fodder and timber. This species exhibits some degree of resistance to dutch elm disease as a result is being used in elm breeding programmes for city and landscape use in temperate climates (FAO, 1986).

Trade

IUCN Conservation category

VU A1c – according to WCMC.

Conservation measures

The example of flourishing trees, and completion of regeneration of this species in Dachigam Game reserve near Srinagar, Kashmir, suggests that protection from cattle may suffice to save this species. The inclusion of elms and elm habitats in the setting up of future game and forest reserves in Himalaya, should be considered. The plantings should consist of specimens from local origin to provide the possibility for cross pollination. The positioning of small elm stands near wardens/ foresters homes where they are protected from lopping will make their protection status clear to all (FAO, 1986).

Forest management and silviculture

Plants can be easily grown from seeds and various methods of vegetative propagation are effective, for example grafting, layering and rooted cuttings under mist in the summer. Seeds are not available where trees are regularly lopped (FAO, 1986). Cultivation occurs on a small scale.

References

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Vavaea bantamensis

Distribution

Indonesia (Java)

Habitat

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

Trade

The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

The species has been recorded as threatened in Indonesia (WCMC, 1991).

Conservation measures

Forest management and silviculture

References

Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August, 1997.

Hommel, P.W.F.M. 1987. Landscape ecology of Ujung Kulon (West Java, Indonesia). Wageningen: Privately published doctoral thesis. 206pp.

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Vitex parviflora

Indonesia: kayu kula, fuli kaa (Timor). Philippines: molave, amugauan, sagat (general) (Lemmens, Soerianegara and Wong, 1995).

Distribution

Philippines, Sulawesi, Timor, the Moluccas; possibly also Sabah and Java; planted in Central America (Lemmens, Soerianegara and Wong, 1995).

Habitat

Low altitudes and along sea coasts. In the Philippines this species is the dominant in 'Molave' forest. This is a monsoon forest type which occurs on well-drained limestone soils.

Population status and trends

Logging for this species has caused the disappearance of Molave forests in most of the Philippines.

Role of species in the ecosystem

Threats

It has been depleted due to logging and shifting cultivation (Lemmens, Soerianegara and Wong, 1995).

Utilisation

The timber is used in the Philippines for house building, ship building and carving. The bark and wood are used medicinally and the leaves are used as a fodder (Lemmens, Soerianegara and Wong, 1995).

Trade

The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

The species has been recorded as Vulnerable (old IUCN threat category) in the Philippines (WCMC, 1991).

Conservation measures

Subject to special felling controls in the Philippines.

Forest management and silviculture

This species is suggested for the Philippines as a tall tree in shelterbelts. Some plantation in reforestation schemes in the country.

References

- Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August, 1997.
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Wallaceodendron celebicum

Distribution

Indonesia, Philippines.

Habitat

Along sea coasts.

Population status and trends

Role of species in the ecosystem

Threats

Utilisation

Trade

The timber is not thought to occur in European trade (WCMC, 1991).

IUCN Conservation category

DD (Asia Regional Workshop, 1997).

The species has been recorded as Vulnerable (old IUCN threat category) in the Philippines and Threatened in Indonesia (WCMC, 1991).

Conservation measures

Forest management and silviculture

References

Asia Regional Workshop, 1997. *Conservation and sustainable management of trees* project workshop held in Hanoi, VietNam, August, 1997.

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