CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Sixteenth meeting of the Plants Committee
Lima (Peru), 3-8 July 2006

Tree species

PROPOSALS TO AMEND THE APPENDICES FOR TREE SPECIES

1. This document has been prepared by the Scientific Authority of the Netherlands.

Background

2. In 1998, the Management Authority of the Netherlands published the *Contribution to an evaluation of tree species using the new CITES listing criteria*, compiled by UNEP-WCMC. This study reviewed the conservation and trade status of tree species, and the potential role of CITES. Subsequent activities aimed to identifying timber tree species that would benefit from inclusion in the CITES Appendices are summarized in document PC13 Doc. 14.2 (Rev. 1). In particular the Netherlands reported in this document on a workshop in Cambridge in April 2003 that reached the following conclusions:

    a) *The eventual preparation of proposals requires an integrated and basal approach towards the conservation of tree species.*

    b) *A variety of stakeholders should participate in a transparent communication process to explore options for the best conservation policy for tree species.*

    c) *Problems in conservation and possible solutions, the tools needed and actions required would probably most effectively be identified on a regional basis. Potential tools should be feasible and effective, and could be either local, national, regional or global, and involve either a non-CITES approach or a CITES approach.*

    d) *There is a clear need to raise awareness of the benefits and the various applications of CITES regulations, in particular for Appendix II and III.*

    e) *Improvement of the implementation of CITES for species already listed should have a high priority.*

    f) *As a first step, regional workshops are to be organized to address items a)-e), in Africa, Asia, Central and South America and the Caribbean, Europe, and North America.*

3. The Plants Committee congratulated the Netherlands on its work on this subject and asked it to report on progress at the 14th meeting of the Plants Committee. At PC14 the Netherlands reported on work undertaken by the Netherlands, in collaboration with UNEP-WCMC, to hold four regional workshops on tree conservation between 2004 and 2006. In its reports for the 13th meeting of the Conference of the Parties (CoP13, Bangkok, October 2004) the Chairman of the Plants Committee

stressed that the Plants Committee supported the recommendation by the Netherlands to organize regional workshops on tree conservation and management, and noted that the first regional workshop was to be organized by UNEP-WCMC and range States by the end of 2004, with further workshops to be held in 2005 and 2006, pending further funding.

4. The Parties subsequently agreed to replace Decision 12.10,

> *'The Plants Committee shall, during the period between the 12th and 13th meetings of the Conference of the Parties, develop proposals to amend the Appendices on the basis of the Contribution to an evaluation of tree species using the new CITES Listing Criteria, published by the Management Authority of the Netherlands in 1998'*,

by Decision 13.54 as follows:

> *'The Plants Committee shall, during the period between the 13th and 14th meetings of the Conference of the Parties, consider the opportunity to develop proposals to amend the Appendices on the basis of the Contribution to an Evaluation of Tree Species using the new CITES-listing criteria, and the results of regional workshops on sustainable management of timber species in 2005 and 2006'.*

5. The Netherlands reported at the 15th meeting of the Plants Committee on the first workshop for Mesoamerica, held in Nicaragua in 2005. On the basis of recommendations from this workshop, the Plants Committee selected *Balmea stormiae* for its periodic review of plant species included in the CITES Appendices, and agreed to consider reviewing the listing of an additional three species, *Cedrela odorata*, *Dalbergia retusa* and *Dalbergia stevensonii* following at its meeting, based on a document to be provided by the Netherlands.

6. The Plants Committee congratulated the Netherlands for its efforts in developing strategies to ensure sustainable use and management of tree species subject to international trade, and thanked UNEP-WCMC for its collaboration in this regard. It recommended that regional representatives be kept informed about future regional workshops that were expected to be organized in the temperate Nordic region, Southeast Asia and West Africa.

Activities since PC15

7. A report on the Mesoamerican workshop, including three annexes, has been completed by UNEP-WCMC, in collaboration with the Netherlands. The report is presented as document PC16 Inf. 4 and is also available (in English) at http://www.unep-wcmc.org/forest/timber/index.htm.

8. The Netherlands together with UNEP-WCMC, has prepared documentation regarding the potential inclusion in CITES Appendix II of *Cedrela odorata*, *Dalbergia retusa* and *Dalbergia stevensonii* (see Annexes 1, 2 and 3 to this document respectively). The Plants Committee is requested to consider these proposals and provide advice.

9. UNEP-WCMC, in discussion with the Netherlands, submitted in November 2005 a joint five-year proposal, together with the Forest Stewardship Council, to the European Commission Programme on Tropical Forests and other Forests in Developing Countries. This will implement, *inter alia*, further regional workshops in Southeast Asia, South America, Pacific, West Africa and Central Africa.

REVIEW OF *CEDRELA ODORATA*: INFORMATION ON DISTRIBUTION, STATUS AND TRADE FOR CONSIDERATION BY THE CITES PLANTS COMMITTEE

1. Taxonomy

1.1 Class: Magnoliopsida

1.2 Order: Sapindales

1.3 Family: Meliaceae

1.4 Genus, species or subspecies, including author and year: *Cedrela odorata* L. (1759)

1.5 Scientific synonyms: See Annex 1. Taxonomic note: some authors have considered *C. odorata* only to include those trees originating from the West Indies and others to be of the species *C. mexicana*. In the revision of *Cedrela* by Smith (1960) *C. mexicana* was recognized as a synonym of *C. odorata*. This is the widely accepted convention used here, however, where *C. mexicana* is the synonym used in country information, this has been noted.

1.6 Common names:

English: cedar, Barbados cedar, cigar-box cedar, Central American cedar, Honduran cedar, Mexican cedar, Nicaraguan cedar, red cedar, Spanish cedar, West Indian cedar

French: acajou rouge, acajou-bois, cédrat, cèdre acajou, cèdre des barbares, cèdre rouge

Spanish: cedro amargo, cedro cebolla, cedro cubano, cedro hembro cedro macho, cedro real, cedro rojo

German: Zigarrenkitschenholz, westindische Zeder

See Pennington (1981) for an extensive list of local names.

1.7 Code numbers: ---

2. Overview

The native range of *Cedrela odorata* is in seasonally dry forests of Central and South America. Once a common tree, *C. odorata* has had a long history of over-exploitation for its valuable timber. Combined with extensive loss of habitat through deforestation (Section 4.1), this is a serious threat to the future of the species. The timber is valued locally for its resistance against rotting and insects and internationally as a quality wood (Section 6.1). As a result, it has been selectively cut for at least 250 years, both for domestic use and for export (Section 6.1). Cutting has continued such that many countries throughout its native range report that numbers have been reduced, some to the extent that it is threatened (Section 4.5). In many places, populations have been reduced to inaccessible areas (Section 4.4). Large, well-formed trees are now particularly uncommon. The species is intolerant of shade and natural regeneration is scarce following logging (Section 3.3). Logging of *C. odorata* from natural forests is not sustainable, particularly as the potential habitat available for the species has been greatly reduced by deforestation. The species has been listed in CITES Appendix III by Colombia and Peru since 2001. CITES trade reports provide evidence of international trade in the wood from Range States. Plantations of *C. odorata* have been established both within and outside of the native range (Section 8.4). These provide a source of timber that may otherwise be sought from the wild. This document suggests that *C. odorata* meets the criteria for inclusion in Appendix II of CITES in accordance with Annex 2 a, paragraph B, i.e. "It is known, or can be inferred or projected, that regulation of trade in the species is required to ensure that the harvest of specimens from the wild is not reducing the wild population to a level at which its survival might be threatened by continued harvesting or other influences".

3. Species characteristics

3.1 Distribution

The natural range is obscured by exploitation, forestry plantings, and escapes from cultivation (Pennington, 1981). *Cedrela odorata* grows throughout lowland Central America and South America to northern Argentina and most Caribbean islands within a latitudinal range of 26°N and 28°S (Pennington, 1981; Cintron, 1990). The distribution is fragmented due to extensive deforestation in the neotropical region.

Within the native range: **Antigua and Barbuda**: Reported to occur in Antigua (Grisebach, 1864). **Argentina:** Reduced localities (Zapater *et al*., 2004). The southern limit of the species (Lamb, 1968). **Bahamas**: Found in coppices in Eleuthera and New Providence (Correll and Correll, 1982). **Barbados**: Formerly common and widespread, but becoming rare (Gooding *et al.*, 1965). **Belize**: Occurs scattered in primary rainforest but has a greater distribution in secondary rainforest (Stevenson, 1927). **Bermuda**: Occurrence reported (Britton, 1918). **Bolivia**: Specimen reported from Beni (Smith, 1960). **Brazil**: Specimens reported from the States of Acre, Amazonas and Pará (Smith, 1960). **Cayman Islands**: Found in Grand Cayman and Cayman Brac (Proctor, 1984). **Colombia**: Present in warm lowlands and Valle de Magdalena (Cortés, circa 1900). Not listed in the national Red List (Calderon, 2003). **Costa Rica**: a widely distributed species (INBio, 1999). **Cuba**: A prominent element of the upper canopy layer in semi-deciduous mesophytic forests (Borhidi, 1991). Found in all provinces (*C. mexicana*; Sauget and Liogier, 1951). **Curaçao (Netherlands Antilles):** Specimens reported from Cas Cora (Smith, 1960). **Dominica**: Found on the West coast of Dominica at 30 m; specimen from Pointe Michel: may be cultivated (Nicholson, 1991). **Dominican Republic**: The species was included in lists of threatened plants in the Dominican Republic (Jiménez, 1978). **Ecuador**: Specimen reported from Esmeraldas (Smith, 1960). Introduced to Galápagos Islands, where the risk of problems with invasion of the species has been identified (Brockie *et al*., 1988). **El Salvador**: Specimen reported from San Martin (Smith, 1960). **French Guiana**: Specimen reported from Carel Francois (Smith, 1960). **Grenada**: Specimen reported from Saint Georges (Smith, 1960). **Guadeloupe**: Specimen reported from Basse Terre (Smith, 1960). Local uses described (Questel, 1951). **Guatemala**: Common throughout most of the lowlands, in some places forming a substantial part of the forest (*C. mexicana*; Standley and Steyermark, 1946). **Guyana**: Rare to occasional in mora forest, seasonal forest and mixed forest on poorly drained soils throughout the country (Polak, 1992). **Haiti**: Specimens reported from Tortue Island, Morne Pedegral, Morne Fourrise, Saint Marc and Puerto Rata (Smith, 1960). **Honduras**: Specimens reported from El Paraiso, Zamorano, El Jacarito, Chahuite, Comayagua (Smith, 1960). **Jamaica**: Common in places where probably planted, especially pastures and roadsides (Adams, 1972). Common in the plains and lower hills (Grisebach, 1984). One of the most valuable timber trees of the island (Fawcett and Rendle, 1920). **Martinique (France):** Specimen reported from Rivière Pilot (Smith, 1960). **Mexico**: Found along the Pacific coast from the State of Sinaloa to Guerrero and Chiapas and on the subtropical Atlantic coast from Tamaulipas to Yucatán (Pennington, 1981). The pacific slopes form the most northerly limit of the distribution (Lamb, 1968). **Montserrat**: Specimens reported from Roches (Smith, 1960). **Nicaragua**: Specimens reported from Jinotega and Chinandega (Smith, 1960). **Panama**: The species is restricted to the Pacific side of the isthmus, and is nowhere common although it can be found regularly in secondary forests around Panama City (Condit & Pérez, 2002). **Peru**: One of the most valuable mountain woods (Weberbauer, 1945). Some *Cedrela* species are cultivated. **Puerto Rico**: the native trees have been reduced to scattered remote areas, chiefly in moist limestone and lower Cordillera forest regions. In the Cordillera, restricted to steep rocky areas with soils in the Mucara group or in associated well-drained soils (Little and Wadsworth, 1964). **Saint Kitts and Nevis**: Occurrence reported (Americas Regional Workshop, 1998; WCMC, 1999). **Saint Lucia**: Specimen reported from La Perle (Smith, 1960). **Suriname**: Occurs in the rainforest regions (FAO, 2004)**. Trinidad and Tobago**: a fairly wide distribution, but confined to better soils (*C. mexicana*; Marshall, 1934). Found on hillsides, roadsides and cultivated land (*C. mexicana*; Williams, 1928). Widely distributed both in rainforest and drier, semi-deciduous types, but nowhere common (Marshall, 1939). **Venezuela**: Frequent in warm lowlands (Schnee, 1960).

The species has been widely introduced in: **American Samoa, Cook Islands, Fiji**, **Federated States of Micronesia, New Caledonia**, **Samoa**, **South Africa, Tonga, United States of America** (PIER, 2005) and in plantations elsewhere: **Australia** (Griffiths *et al*., 2001); **Côte d'Ivoire**

(Dupuy, 1995), **Ghana** (Atuahene, 2001), **Madagascar**, **Malaysia**, **Singapore**, **South Africa**, the **Philippines, Ugandathe United Republic of Tanzania** and **Western Samoa** (Lemmens *et al*., 1995). **Indonesia** (Rachmatsjah and Wylie, 2001), **Solomon Islands** (Ngoro, 2001), **Sri Lanka** (Tilakaratna, 2001) and small or trial plantations in **Malaysia** (Khoo, 2001), **Papua New Guinea** (Dobunaba and Kosi, 2001) and **Thailand** (Eungwijarnpanya, 1997).

3.2 Habitat

C. odorata needs a plentiful supply of nutrients and is very intolerant of waterlogging (Cintron, 1990; Marshall, 1939; Lamb, 1968). It is most successful in drier closed forest conditions, which generally have good aeration and an accumulation of bases in soils (Lamb, 1968). *C. odorata* is deciduous (Cintron, 1990). It is rare in evergreen forest types and prefers sites with a marked dry season (Lamb, 1968). Early failures in plantations have been attributed to overly wet and unsuitable soil types in experimental sites (Cintron, 1990). However, high mortality rates in trial plantations in dry forests of **Costa Rica** were attributed to susceptibility to long periods of drought during establishment (Piotto *et al.*, 2004).

C. odorata is very light-demanding and will grow in a climate with an annual rainfall between 1,200-2,500 mm at altitudes between 0-1,500 m above sea level (Webb *et al*., 1984). The temperature ranges are a mean maximum temperate of 27-36ºC during the hottest month and a mean minimum temperature of 11-22ºC in the coldest month, with a mean annual temperature of 20-32ºC (Webb *et al*., 1984).

3.3 Biological characteristics

C. odorata trees are moderately long-lived. Lamb (1968) gives an example of a tree in **Belize** with 110 rings and Marshall (1939) reports that trees with a girth of 13-14" have an average age of 125 years.

C. odorata is a fast growing and light demanding monoecious species that is insect-pollinated and has wind-dispersed seeds (Cavers *et al.*, 2004). Early growth of up to 2.3 m/year is possible in favourable conditions (Lamb, 1968). Trees bear fruit from the age of 10 years according to Lamb (1968) or 15 years according to Lamprecht (1989). Flowers appear early in the rainy season and fruits mature during the dry season when the leaves become deciduous. Seeds are samaroid from a dehiscent capsule and are wind-dispersed (James *et al.*, 1998).

The flowers show features associated with entomophily; bees and moths are believed to be the chief pollinators (Styles and Khosla, 1976). Allozymes on seedlings germinated from wild-collected seed used to produce outcrossing estimates for *C. odorata* revealed no evidence of self-fertilization (James *et al.*, 1998).

In spite of plentiful production of seedlings, natural regeneration of *C. odorata* was reported by Marshall (1939) to be "extremely scarce" in rainforest conditions, though better in semi-deciduous forest. Marshall considered poor regeneration to be due to a combination of heavy shade, drips from branches in heavy rains and waterlogging of the soil preventing root establishment, leading to a very low survival rate of *C. odorata* seedlings. Opening of canopies by felling led to weeds and vines quickly taking over and hindering seedling establishment. Good regeneration followed two incidents where the canopy had been opened considerably – a forest fire in 1912 and a cyclonic storm in 1933 (Marshall, 1939).

3.4 Morphological characteristics

C. odorata varies considerably in size and form, reaching 30 m or more in height (Anon., 2004; Rendle, 1969; Ricker & Daly, 1997) and has a diameter of about 2.5 m (Anon., 2004). The bark is yellowish or grey-yellowish (Anon., 2004). The size varies according to locality of growth, and it exhibits a wide variation in its general character due to the age and conditions of growth of individual trees (Farmer, 1972). The branchlets, bark and immature fruits of most trees smell offensively of garlic when broken or crushed and the flowers have an unpleasant smell (Pennington, 1981).

The timber has a pleasant smell, similar to cedar, and varies considerably according to origin and growth conditions (Titmuss and Patterson, 1988). The colour ranges from pale to medium red-brown but darkens on exposure (Rendle, 1969). The timber of vigorous growth tends to be paler and lighter in weight than that from more slowly growing trees (Rendle, 1969). The grain may be either straight or irregular (Titmuss, 1971). The texture was described by Titmuss (1971) as being moderately coarse and uneven and by Echenique-Marique & Plumptre (1990) as being fine to medium. Growth rings are distinct, marked by differences in pore size and initial parenchyma (Lemmens *et al*., 1995). The heartwood is durable with termite resistance, but the sapwood is non-durable and prone to staining and powder-post beetles (Lemmens *et al*., 1995).

3.5 Role of the species in its ecosystem

C. odorata was reported by Cho (pers. comm.) to be a dominant component of various dry forest types. *C. odorata* is often associated with other Meliaceae (*Swietenia* and *Guarea* sp.) and leguminous trees (Pennington, 1981). Seeds are wind-dispersed (Cintron, 1990). The seeds of *C. odorata* are generally ignored by parrots, in spite of appearing ideally suited for predation. Janzen (1983) speculates that this may be due to chemical defences in the seeds. Macaws, however, which specialize in eating unripe seeds and fruits avoided by or toxic to other animals (Renton, 1990) are known to eat the seeds of *C. odorata* (Matuzak and Dear, 2003).

It is strongly light demanding and frequently appears as a fast-growing pioneer species in secondary forest (Pennington, 1981). It is a source of pollen and nectar for bees (Sandker, and Totaro, L. no date), though it is considered to be without significant ecological value (Mostacedo & Fredericksen, 1999).

4. Status and trends

4.1 Habitat trends

C. odorata colonizes secondary forest, abandoned pastures and agricultural land (INBio, 1999). It occurs in humid or dry tropical and subtropical forest (Anon., 2004), preferring well-drained soils, up to an altitude of 1,200 m (Pennington, 1981). Of these habitat types, tropical dry forests have suffered an enormous decline in area, particularly during the 20th century. Once the most common forest type along the Pacific coast of Central America, now less than 2 % of the original forest remains intact (Janzen, 1986). Deforestation is also a problem generally in Central and South America (Laurance, 1999; Mayaux *et al.*, 2005; Myers, 1994 for example).

Habitat loss alone will underestimate the loss of natural populations due to selective logging. Although the greatest threat to natural forests in the Central American region is conversion of the land to other uses, selective harvesting of timber is particularly threatening native species including *C. odorata* and *Swietenia macrophylla* (UNEP, 2003).

Exploitation of the timber by selective logging causes an increased risk of forest fires as the slash is left on the ground and the forest canopy is opened, warming and drying the slash (Uhl and Viera, 1989). *C. odorata* has no fire tolerance (USDA, no date).

4.2 Population size

Estimates of current total population are not available. *Cedrela odorata* is reported to occur in abundance, most notably in Central America (Americas Regional Workshop, 1998; Arce Benavides, 1998). However, Navarro *et al.*, (2004) reported that although widespread, *C. odorata* was not common throughout moist tropical American forests and that its numbers continued to be reduced by exploitation without successful regeneration. The species is included in the IUCN Red List of threatened species in 1998 under the category VU A1cd + 2cd (Americas Regional Workshop, 1998).

4.3 Population structure

Cavers *et al.*, (2004) used a combination of genetic markers (chloroplast sequence and Amplified Fragment Length Polymorphism, AFLP) and morphological characters to describe variation in *C. odorata* throughout Mesoamerica. They found three separate units: **Mexico**,

Belize and **Guatemala**; **Honduras** and **Nicaragua**; **Costa Rica** and **Panama**. Variation can be further divided at the country level. Molecular genetic markers (Random amplified polymorphic DNA, RAPDs) found a high level of genetic differentiation between populations of *C. odorata* from northern and southern regions of **Costa Rica** (Gillies *et al*., 1997).

Population density varies considerably. Rio San Juan, **Nicaragua**, has a density of 1 *C. odorata* tree per 100 ha (Paniagua, no date). A density of 2.9 stems of cedar per 100 ha was estimated in the Bladen Reserve of **Belize** (Johnson and Woods, 1976, cited by Newman, 2004). In **Guatemala**, average densities of 7.9 trees per 100 ha were recorded in the Multiple Use area of the Peten Biosphere Reserve (Szejner, 2005). However in some regions, almost pure stands are to be found, such as in successional forests on intermediate-age river terraces of the Manu National Park, **Peru** (Gentry, no date).

The age distributions of some *C. odorata* populations have been skewed by logging of the largest trees (Bird, 1998; Marshall, 1939) and there have been reports of trees being felled before they reach maturity (Americas Regional Workshop, 1998).

Selective logging in natural forests destroys those trees with the best growth form (dysgenic selection), leaving behind a population depleted in the most favoured genotypes (Mejía, 2001). Maintenance of genetic variation is essential for ensuring a future supply of the wood. However, *Cedrela* species have suffered substantial genetic degradation, particularly in the dry zone (Mejía, 2001).

4.4 Population trends

Although *C. odorata* is widespread, it is seldom common in moist tropical forests and its numbers are being reduced by exploitation without successful regeneration (Cintron, 1990). Exploitation of *C. odorata* for timber has had a long history. In 1756, Browne described the tree as one of the largest timber trees in the woods of Jamaica and reported that the tree "was very common and still continues to grow in many parts of the island." This was taken by Smith (1960) to imply that even by 1756, populations of *C. odorata* had already suffered from over-exploitation.

Marshall (1939) described *C. odorata* as having been heavily cut down, large trees being only found in the more inaccessible regions. They were once, however, fairly common and Marshall continued that the large stumps "bear evidence of the past magnificence of these species".

Smith (1960) reported a reduction in the volume of timber being cut in the West Indian islands owing to the heavy cutting of accessible forest, particularly in **Cuba**. Smith (1960) also reported selective cutting of *C. odorata* in **Panama** and **Venezuela** and heavy logging in **Mexico**, with small trees having been harvested before they had even produced a full seed crop. In **Brazil**, Brune and Melchior (1976) reported strong selective cutting for *Cedrela odorata* in the várzea (seasonally flooded lowland by the rivers) of the Amazon.

Due to significant over-exploitation, genetic erosion of this species has already occurred throughout its natural distribution and trees of good form are now rarely found except in isolated areas (Cavers *et al*., 2004).

4.5 Geographic trends

Within its native range, *C. odorata* has suffered large declines due to logging and a reduction in habitat availability. The species was included in a list of threatened plants by the FAO (1986). There are genetically distinct units throughout Mesoamerica (Section 4.3).

It has been severely extracted in natural forests and is considered endangered in Mesoamerica (Navarro *et al*., 2004). A trend towards rarity has been reported in several countries, including **Argentina**, **Barbados** and **Puerto Rico** (Section 3.1). Populations of *C. odorata* remain in **Peru**, and many of the Protected Areas in the country contain individuals of the species. However, some populations are drastically being reduced (Reynel, 1988). It is threatened in **Costa Rica** where it is heavily exploited (INBio, 1999).

In **Belize** it is threatened by illegal exploitation, over-harvesting and some habitat loss (Cho, pers. comm.).

In **Bolivia**, the species' rarity has resulted in trees only being cut opportunistically while mahogany, *Amburana* and *Machaerium* are sought actively (Americas Regional Workshop, 1998; Killeen, 1997).

By 1946, numbers in **Guatemala** had been greatly reduced by intensive lumbering operations (Standley and Steyermark, 1946). Standley and Steyermark (1946) warned that about 10 million board feet of the wood are used in the United States every year, but nowhere had any significant attempt been made to replace the supply, which was being rapidly exhausted. It is still present in some national parks in the country (Section 8.5).

In **Nicaragua**, it is threatened by unsuitable procedures and, especially, uncontrolled forest fires (Pommier, no date).

In **Panama**, most trees are less than 50 cm in diameter with only small buttresses. It is rare in the Canal area (Condit & Pérez, 2002). This species may have been once more common on the Pacific slope but large individuals probably would have been harvested (Condit & Pérez, 2002). It is included in lists of threatened plants in **Panama** (Asociación Nacional para la Conservación de la Naturaleza, 1990).

C. odorata has been extensively introduced outside of its native range (Section 3.1). Cultivation in plantations has been undertaken in trials over a wide geographical range (Floyd and Hauxwell, 2001; Section 8.4). *C. odorata* is sometimes an invasive species, for example in **South Africa** (PIER, 2005).

5. Threats

Cedrela odorata has been of great commercial interest for over 200 years and in this time its distribution has been diminished by excessive exploitation over its entire range to the extent that large trees of good form and size are now rarely found (Pennington, 1981).

Inefficient timber processing and logging cause much of the potential timber harvest to be wasted. Chainsaw cutting is particularly wasteful and, in spite of being banned, it is common in El Sira, **Peru**, (Parkswatch, 2003c) and Pilón Lajas, **Bolivia** (Pauquet, 2005b). Inefficient sawmills have been identified as common in **Belize** (Newman, 2004), **Panama** (Parker *et al.*, 2004) and **Trinidad and Tobago** (Applewhite and Billings, 2000) and it is likely that inefficient sawmills are also prevalent in the other range States.

Populations have been reduced on private and lease lands surrounding communities. The demand for *C. odorata* timber on the local market is still high and depletion of mature trees represents a threat to the existing population (Cho, pers. comm.).

Natural regeneration of the species following logging is scarce (Section 3.3) and selective removal of *C. odorata* has left the forest in some parts of the neotropics with insufficient stock of seed trees (Cintron, 1990). Attack by the shoot boring moth *Hypsipyla* sp. has severely restricted reforestation programmes with *C. odorata* (Watt *et al.*, 2001 and references therein).

Illegal logging further threatens the remaining stocks of the species and has been reported in National Parks in several countries (Section 8.5).

C. odorata is vulnerable to the isolating effects of habitat fragmentation and reduction in population density. In a study of the influence of reproductive isolation and fragmentation on progeny growth rates in **Costa Rica**, isolated mother trees were found to produce inferior progeny when compared to trees from continuous forests and pastures (Navarro, 2002).

Deforestation and the associated habitat loss threaten the species. In Latin America, this is driven by a number of factors, including: migration, road building, land speculation, settlement, government policy and a lack of support for parks and reserves (Mahar and Schneider, 1994).

6. Utilization and trade

6.1 National utilization

Considered to be of high economic value (Mostacedo & Fredericksen, 1999), *C. odorata* produces the most valuable timber within the genus. The wood is aromatic, weather-resistant and durable. By virtue of its durability, excellent working qualities and appearance, it was reported to be perhaps the most important local timber for domestic use in tropical America (Rendle, 1969). The wood is also in high demand in the American tropics because of its natural resistance to termites and rot (Cintron, 1990).

It has been used for all kinds of building work, with the exception of heavy construction, and in joinery and cabinet work (Rendle, 1969). The wood is suitable for making non-structural elements for exteriors and interiors, quality furniture and novelty and craft items (Anon., 2004; Echenique-Marique & Plumptre, 1990). Used for cigar-boxes, insect-resistant chests and wardrobes (Little and Wadsworth, 1964; Titmuss, 1971), roofing shingles, canoes, pencils (Titmuss, 1971), and musical instruments (Ricker & Daly, 1997) particularly guitars (INBio, 1999). In **Jamaica**, it is recommended for wainscoting rooms, chests, the inside work of clothes presses and drawers and shingles to cover houses (Fawcett and Rendle, 1920).

The bark is used as a febrifuge and tonic in some localities in **Guatemala** and as an infusion to treat eruptions in the mouth (Standley and Steyermark, 1946). The plant is used in traditional medicine in **Sao Tome and Principe** mainly for treatment of malaria as well as a febrifuge and against diabetes (Martins *et al*., 2003). Anti-malarial activity has been found in extracts from *C. odorata* wood (MacKinnon *et al*., 1997) and has been found to be effective in *in vivo* trials (Omar *et al*., 2003).

C. odorata is a honey plant (Little and Wadsworth, 1964). It is a primary source of pollen and a secondary source of nectar. Pollen collection by several species of bees has been reported and it is an important nectar source for the honey bee (*Apis mellifera*; Sandker and Totaro (no date) and references therein) and has been part of a reforestation programme by Proyecto de Manejo de Abejas y del Bosque (PROMABOS) for the purpose of beekeeping.

It has been used as a shade tree in coffee and cacao plantations (Cintron, 1990; FAO, 1986; Little and Wadsworth, 1964; Pennington, 1981). In **Papua New Guinea**, the bark has been used for twines (Lemmens *et al*., 1995).

On the Yucatan Peninsula, **Mexico**, individual mature trees of *Cedrela odorata* are often observed outside private houses; the owners consider that the tree represents a type of 'savings' account for the future (Valera, 1997).

6.2 Legal trade

The timber is usually considered second in value in the New World after mahogany *Swietenia mahagoni* (Condit and Pérez, 2002). Throughout the species range, Spanish cedar has played a major role in the timber trade (WCMC, 1999). Trade in *C. odorata* and *Cedrela* sp. reported to CITES between 2000-2004 is shown in Tables 1-3 in Annex 2.

Between 1986 and 1987, three species, one of which was *C. odorata*, accounted for 58 % of the sawn wood produced in **Belize** (Harcourt & Sayer, 1996). Export trade from **Belize** is difficult to quantify since it is usually classified along with mahogany (*Swietenia macrophylla*). However, the majority of local production is destined for the local market (Cho and Quiroz, 2005). In 1994, **Brazil** exported 97,000 m³ of *Cedrela* sp., selling at an average price of USD 260.00/m³. It was one of the most exploited woods in northern **Costa Rica** (Harcourt & Sayer, 1996) and although it remained one of the most valuable trees in the **Costa Rican** market, it was traded only on the domestic market (Arce Benavides, 1998). In 1995, **Ecuador** was reported to have exported 6000 m³ of *C. odorata* sawn wood at an average price of USD 584/m³. **Guatemala** authorised extraction of 3,248.66 m³ from forests in the Peten in 2003 and in 2005, 35.45 m³ of sawn wood were exported (Szejner, 2005). In **Honduras,** *C. odorata* is used mainly for local construction, but also for sale (Mejía, 2001 and references therein). In spite of the high value of *C. odorata* on the international market, carpenters from communities in **Honduras** receive a very

low price that does not vary greatly with species (Mejía, 2001). Based on information in the management plan for the Atlantic forest region of **Honduras**, the potential annual productivity of this species in this region is 342 m³ (Anon., 2004). Records from 1994 indicate that **Honduras** exported logs, sawn wood, plywood and veneer sheets of *C. odorata* and that **Peru** and **Colombia** were exporting sawn wood (ITTO, 1995). For **Mexico**, the ITTO (2004) trends show an expected 200 % increase in trade in high commercial value tropical timber species (*C. odorata*, *S. macrophylla*, etc.) from the next decade onwards. **United States of America** imported a total of 23,000 m³ *Cedrela* sp. plywood at US$474/m³ in 1995 (ITTO, 1997). **Peru** and **Trinidad and Tobago** exported sawn wood (ITTO, 1997). There is currently no commercial harvest in **Panama** (Condit & Pérez, 2002).

In South-East Asia, plantations of *C. odorata* are of small-scale and most of the timber is consumed locally. International trade in specimens of the species from these countries is of no significance (Lemmens *et al.*, 1995).

6.3 Parts and derivatives in trade

Cedrela odorata is valued for its timber, which is traded internationally.

6.4 Illegal trade

A recent report revealed that the National Institute of Natural Resources of Puno seized, among other species, 3,035 board feet of Spanish cedar at the inter-oceanic highway in southern **Peru**, which were supported by fake documents. The trucks were confiscated and charges are to be pressed against the companies and personnel involved (ITTO, 2006).

There are many reports of illegal logging, even within protected areas (Section 8.5). Globally, it is difficult to quantify, however Griffiths (2005) refers to a recent estimate suggesting that 90 % of timber extraction in the Peruvian Amazon is illegal and that most Peruvian hardwood timber is exported to Belgium, Canada, Mexico and to the United States of America. Del Gatto (2004) cites an estimate that 75-85 % of broadleaf timber extracted from **Honduras** (including *C.odorata*) is removed illegally. Most logging in **Nicaragua** is either partly or totally illegal (Pommier, no date). Illegal logging of *C. odorata* in **Guatemala** has also been reported (WRM, 2000). Illegal logging has been reported from protected areas in several of the range States (Section 8.5).

6.5 Actual or potential trade impacts

Given the extent of habitat loss and the effect of the long history of over-exploitation, steps must be taken to ensure that trade is limited to sustainable levels. Since unsustainable logging is promoted by international trade, the requirements of CITES Appendix II could be used to achieve sustainability.

7. Legal instruments

7.1 National

C. odorata has been included in CITES Appendix III at the request of **Colombia** (29/10/01) and **Peru** (12/06/01). Both listings have the annotation: Designates logs, sawn wood and veneer sheets. In **Peru**, forestry law since 2001 aims to promote sustainable timber harvesting [though Griffiths (2005) claims this is flawed legislation]. The species has been protected in **Nicaragua** since 1997 by Decree No. 30-97, however Nicaragua's forestry law has been criticized for discouraging small landowners from allowing cedars to regenerate naturally on their farms, due to the bureaucracy involved to gain permission to cut them at a later stage (Mendoza Vidaurre, 2002). The species is present in protected areas in **Bolivia**, **Costa Rica**, **Guatemala**, **Mexico**, **Peru** and **Venezuela** (Section 8.5).

7.2 International

C. odorata is listed in the IUCN category VU A1cd + 2cd (assessed by the Americas Regional Workshop, Conservation and Sustainable Management of Trees Project in 1998). No national

export quotas for this species have been reported to CITES. The FAO Panel of Experts on Forest Gene Resources listed *Cedrela* species as a high priority for genetic conservation in priority lists elaborated by the Panel in 1985, 1990 and 1994 (Valera, 1997).

8. Species management

8.1 Management measures

Much attention has been paid to management of *C. odorata* in **Belize**; there have been some un-evaluated attempts at plantations (Cho, pers. comm.). There are currently no felling restrictions in **Belize** on this species, except for the minimum girth limit of 72 inches (Cho, pers. comm.).

Regeneration was reported to be problematic in **Bolivia** due to poor or irregular seed production and a lack of large clearings with adequate light availability (Mostacedo & Fredericksen, 1999). Evidence from nurseries suggests that more than 80 % regeneration can be achieved (INBio, 1999). Although knowledge is available on how to establish regeneration, available techniques are costly or otherwise difficult to implement (Mostacedo & Fredericksen, 1999).

In Pará, **Brazil**, CEMEX (Comercial Madeiras Exportação, S.A.) began two reforestation/forest enrichment projects in 1989. 71,875 *C. odorata* seedlings were planted every year and 200 ha were planted with a mixture of valuable timber trees by the end of 1992 (Smith *et al.*, 1995).

The species has existed in plots established for genetic improvement in **Costa Rica** since 1991 (Piotto *et al*., 2004). CATIE are developing micropropagation technologies with *C. odorata* for multiplication, conservation and genetic improvement programmes (CATIE, no date).

In response to the genetic degradation of dry zone tree species in **Honduras**, CONSEFORH (Conservation and Silviculture of Honduran Dry Forest Species; a bilateral project between the Governments of **Honduras** and the **United Kingdom**) has established a process of evaluation and seed orchards to conserve genetic material that could be used in future reforestation activities.

Worldwide, 19 enterprises producing *C. odorata* have been granted with forest management certificates from the Forest Stewardship Council (FSC, 2006).

A study of the neutral genetic variation of the species identified conservation units within Mesoamerica for each of which a conservation strategy should be devised (Cavers *et al*., 2004).

8.2 Population monitoring

No population monitoring reports have been published for this species.

8.3 Control measures

8.3.1 International

Trade must be reported according to CITES Appendix III.

8.3.2 Domestic

No information.

8.4 Captive breeding and artificial propagation

Although plantations of *C. odorata* have had mixed success, with careful management they have the potential to meet at least some of the demand that would otherwise be met from wild specimens.

The species has been planted in various countries in pure plantation trials but results have not always been satisfactory (Navarro *et al*., 2004). Plantations are difficult to establish because of the severe attack of the shoot borer *Hypsipyla grandella* on the apical buds of seedlings (Navarro *et al*., 2004; Cintron, 1990) and it is for this reason the species is not grown in pure

stands. Some success has been achieved in Manu, **Peru**, where seedlings are planted at a distance from one another (Americas Regional Workshop, 1998). More recently, agroforestry systems using *C. odorata* as shade for coffee have been shown to be an economical option for conservation of endangered populations of this species (Navarro *et al*., 2004). In trials in dry tropical region in **Costa Rica**, it was considered a slow-growing species that had the lowest survival rates (11-12 % survival) of seven native species planted, due to drought susceptibility and attacks of *H. grandella* (Piotto *et al*., 2004). It exhibited good growth in mixed plantations but poor growth in pure stand plantations (Piotto *et al*., 2004). Due to the wide distribution and the morphological variability of this species, specimens from wild-growing stock that are more resistant to the attack of the shoot borer can be obtained (Navarro *et al*., 2004). Navarro *et al*., (2004) found that provenances from dry areas presented lower growth but also lower frequency of attack than those from wet areas.

C. odorata has been widely introduced into plantations throughout the world (Cintron, 1990). Webb *et al*., (1984) report that *C. odorata* plantations worldwide produce yields of 11-22 m^3/ha/an. Yields in 40-year-old plantations in Africa of 455 m^3/ha and 150 to 270 m^3/ha in **Surinam** are far greater than annual yields of 0.004 m^3/ha in natural forests in **Mexico**, which reflect the low stocking of the tree in natural forests, partly due to past exploitation and lack of regeneration (Cintron 1990; Lemmens *et al*., 1995 and references therein). Forestry plantations of *C. odorata* in **Mexico** yield between 15 and 20 m^3/ha/yr (Fernandez *et al*., 2002). By optimising growth parameters, the average height growth after 17 months was increased 2.7-fold, from 55 to 147 cm (Ricker *et al*., 2000). During the first nine years of trial plantations in **Java**, yields of 17 m^3/ha/an were observed at 650 m altitude and 28 m^3/ha/an at 800 m altitude (Lemmens *et al*., 1995 and references therein).

This species is shade intolerant (Mostacedo & Fredericksen, 1999). One study in Veracruz, **Mexico**, found that *C. odorata* grew best under maximum canopy openness, and so is most suitable for reforestation in the open (Ricker *et al*., 2000).

Plantation experiments in **Puerto Rico** using native seeds were not promising, although seeds from Continental America (of *C. mexicana*, "formerly regarded as a distinct species") had mixed results: most trees died, though a few grew rapidly (Little and Wadsworth, 1964). Plantations of *Cedrela odorata* have been established in the States of Campeche and Yucatan, **Mexico**, totalling close to 3,500ha (Valera, 1997). *Cedrela odorata* is included in plantation schemes in Antioquia, **Colombia** (ITTO, 2004).

Outside of the native range, it is one of the most important plantation species in the **Solomon Islands** (Ngoro, 2001). However, it has not gained popularity since its introduction into plantations in **Sri Lanka** (Tilakaratna, 2001).

8.5 Habitat conservation

Cedrela odorata is present in protected areas of several countries. However, the protection provided for the species is often threatened by illegal activities, as outlined in some examples below.

In **Peru**, commercial logging is prohibited within National Reserves by Supreme Decree No. 038-2001-AG. *C. odorata* is present in Tambopata National Reserve but illegal logging, agriculture and land conversion are pressing problems (Parkswatch, 2002a). All valuable wood, including *C. odorata*, has already been extracted in accessible places of Alto Mayo Protection Forest (Parkswatch, 2003a). The species is considered to be vulnerable in Machu Picchu Historic Sanctuary (Parkswatch, 2004a). It is one of the most prominent species in Alto Purús Reserved Zone, where illegal logging is increasing (Parkswatch, 2003b). Excessive logging in El Sira Communal Reserve has meant that *C. odorata* is no longer easily found in accessible areas (Parkswatch, 2003c).

In **Bolivia**, in spite of a total logging ban, extraction of valuable timber including *C. odorata* is a great threat in Amboró National Park (Pauquet *et al*., 2005). Extraction of *C. odorata* continues in Madidi National Park and large volumes of timber are illegally extracted (Pauquet, 2005a). In Pilón Lajas Biosphere Reserve, *C. odorata* remains only in poorly accessible areas. Chainsaw logging has diminished due to exhaustion of supply but illegal logging threatens the remaining

stands (Pauquet, 2005b). Illegal settlements, land invasions, agriculture and illegal timber extraction are serious threats in the Carrasco National Park, which has important reservoirs of commercially valuable species such as *C. odorata* (Lilienfeld and Pauquet, 2005).

In **Costa Rica,** *C. odorata* is found in the following conservation areas: Amistad Caribe, Amistad Pacifico, Huetar Norte, Arenal, Cordillera Volcanica Central, Guanacaste (including Santa Rosa and Guanacaste National Parks), Osa (including the Golfo Dulce Forest Reserve), Pacífico Central (including the El Rodeo protected zone, and the Carara Biological Reserve), Tempisque (including the Palo Verde National Park and the Lomas de Barbudal Biological Reserve), and Tortuguero and it probably occurs in other areas of conservation (INBio, 1999).

In **Guatemala**, large numbers of *C. odorata* are present at the San Miguel la Palotada Protected Biotope, however the area is threatened with forest fires, illegal extraction of forestry products and road construction (Parkswatch, 2002b). *C. odorata* is favoured by illegal extractors in the Cerro Cahuí Protected Biotope (Parkswatch 2003d). It is found in the San Miguel la Palotada Protected Biotope, though some logging continues (Parkswatch 2002c). It is common in Ceibal Cultural Monument, although illegal deforestation threatens this area (Parkswatch 2002d).

In **Venezuela**, there are reports of illegal trafficking of *Cedrela* sp. for commercial purposes in the Guatopo National Park (Parkswatch, 2004b).

In **Mexico**, *C. odorata* is protected from logging in the Montes Azules Biosphere Reserve. The biggest threats here include forest fires, deforestation and land invasions (Parkswatch 2004c).

8.6 Safeguards

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9. Information on similar species

Swietenia macrophylla, *S. mahogani* and *S. humilis* are all included in CITES Appendix II. The wood of *C. odorata* may be confused with *S. macrophylla*; distinguishing characteristics are the absence of fragrance, greater hardness and finer texture in the latter. Microscopy can reveal septate fibres, which distinguish *S. macrophylla* from *C. odorata* (Baas and van Heuven, 2002).

Record and Mell (1924) found it impossible to distinguish between the woods of the different species within the genus *Cedrela*.

Titmuss (1971) reported that it should not be confused with the Honduras cedar, which sometimes reaches the market under the description of West Indian cedar.

10. Consultations

Assistance is sought to resolve the following queries.

A reference is made in Parkswatch (2004b) that *C. odorata* is a threatened species, listed on Venezuela's Red List. The reference given is Llamozas, S., Duno de, Stefano R., Meier, R. Riina, F., Stauffer, G., Aymard, O., Huber y R. Ortiz. 2003. Libro rojo de la flora venezolana. PROVITA. Fundación Polar. Access to this original document would be appreciated.

Reference to the occurrence of *C. odorata* in Saint Kitts and Nevis is sought.

"A recent study by CIAT/PNUMA (1998) shows that 84 per cent of deforestation in Latin America is due to expansion of the agricultural sector, 12.5 per cent is due to logging and 3.5 per cent is due to the construction of infrastructure." – GEO, 2000 - CIAT/PNUMA (1998). Atlas de Indicadores Ambientales y de Sustentabilidad para América Latina y el Caribe. Version 1. CIAT/PNUMA, Cali, Colombia – available at http://www.ciat.cgiar.org/indicators/indicadores/atlascd.htm. This reference is requested.

11. Additional remarks

As *Swietenia macrophylla* and *C. odorata* were often felled together, the effect of protection of the former on *C. odorata* deserves to be investigated. The inclusion of neotropical populations of *S. macrophylla* to CITES Appendix II occurred on 13/2/03, with effect from 15/11/03. While exports of *S. macrophylla* from Peru dropped from 42,406 m^3 to 30,785 m^3, the same period saw a dramatic rise in exports of *C. odorata*, from 11,588 m^3 to 29,391 m^3. Although too much should not be concluded from a single data point, it may be that *C. odorata* populations are being increasingly exploited to compensate for the reduction in *S. macrophylla* and further investigation would be worthwhile.

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Annex 1

SCIENTIFIC SYNONYMS OF *CEDRELA ODORATA*

Cedrela adenophylla Martius, 1878;

Cedrela brachystachya (C. de Candolle) C. de Candolle, 1907;

Cedrela brownii Loefl. 1891;

Cedrela ciliolata S.F. Blake, 1921;

Cedrela cubensis Bisse, 1974.

Cedrela dugesii Wastron, 1882-1883;

Cedrela glaziovii C. de Candolle, 1878;

Cedrela guianensis Adr. Jussieu, 1830;

Cedrela hassleri (C. de Candolle) C. de Candolle, 1907;

Cedrela longipes S.F. Blake, 1922;

Cedrela longipetiolulata Harms, 1927;

Cedrela mexicana M.J. Roemer, 1846;

Cedrela mourae C. de Candolle, 1907;

Cedrela occidentalis C. de Candolle & Rose, 1905;

Cedrela palustris Handro, 1962;

Cedrela paraguariensis Martius, 1837;

Cedrela rotunda S.F. Blake, 1920;

Cedrela sintenisii C. de Candolle, 1907;

Cedrela velloziana M.J. Roemer, 1846;

Cedrela whitfordii S.F. Blake, 1920;

Cedrela yucatana S.F. Blake, 1920;

Surenus brownii (Loefling ex O. Kuntze) Kuntze, 1891;

Surenus glaziovii (C. de Candolle) Kuntze *[DATE?]*

Surenus guianensis (Adr. Jussieu) Kuntze, 1891;

Surenus mexicana (M.J. Roemer) Kuntze, 1891;

Surenus velloziana (M.J. Roemer) Kuntze, 1891.

Annex 2

TRADE DATA FOR *CEDRELA ODORATA*

Table 1: Trade in *Cedrela odorata* reported to CITES, 2000-2004[1].

Exporter	Unit/term	Data reported by:	1999	2000	2001	2002	2003	2004	Total
Range States									
Bolivia	m^3	exporter			1,372			14,159	15,531
		importer				62	38	16	116
	m^2	exporter							0
		importer					8		8
Brazil	m^3	exporter							0
		importer				739	1,195		1,934
	kg	exporter							0
		importer					25,800		25,800
	sawn wood no units	exporter							0
		importer					1,408		1,408
Colombia	g	exporter							0
		importer				100			100
Ecuador	m^3	exporter						134	134
		importer				81			81
Nicaragua	m^3	exporter					108		108
		importer				5			5
Peru	m^3	exporter	3,675	1,473	2,936	8,680	11,627		28,392
		importer			308	4,581	10,363		15,251
	(carvings)	exporter				4	226		230
		importer							0
Suriname	m^3	exporter						29,391	29,391
		importer						24,067	24,067
Venezuela	m^3	exporter						185	185
		importer						21	21
Non-Range States									
Canada	m^3	exporter						12	12
		importer						1,697	1,697
France	(carvings)	exporter							0
		importer				2			2
United Kingdom	(carvings)	exporter				1			1
		importer							0
United States	m^3	exporter			15	49		2	66
		importer			13	21	39		73

[1] *Cedrela odorata* was not listed in CITES Appendix III until 2001 but that **Peru** reported exports in 2000.

Table 2: Trade in *Cedrela* sp. reported to CITES, 2001-2003.

Exporter	Data reported by:	2001	Grand Total
Bolivia	exporter	51673.28	51673.28[#]
	importer		

[#] Units not specified

Table 3: Exports of *Cedrela* sp. from Brazil, 1993-1995 (Source: IBAMA, 1996).

Year	Sawnwood		Veneer	
	Tonnes	US$FOB[#]	Tonnes	US$FOB
1993	37.197	21,609	1.098	807
1994	32.598	22,165	833	616
1995	22.125	16,510	416	655

[#] FOB – Free On Board – includes cost of delivery to specified point

REVIEW OF *DALBERGIA RETUSA*: INFORMATION ON DISTRIBUTION, STATUS AND TRADE FOR CONSIDERATION BY THE CITES PLANTS COMMITTEE

1. Taxonomy

1.1 Class: Magnoliopsida

1.2 Order: Fabales

1.3 Family: Leguminosae (Fabaceae) Juss. 1789

1.4 Genus, species or subspecies, including author and year: *Dalbergia retusa* Hemsley

Taxonomic categorization of the genus is difficult and estimates of the total number of species vary between 100 and 200 (CITES, 1992).

1.5 Scientific synonyms: *Amerimnon lineatum* (Pittier) Standl.

Dalbergia hypoleuca Pittier

Dalbergia lineata Pittier

Amerimnon retusum (Hemsl.) Standl.

Dalbergia retusa Baill. is a synonym of *Dalbergia obtusa* Lecomte; Rudd (1995) combined *D. hypoleuca*, *D. lineata*, *D. pacifica* and *Amerimnon cuscatlanicum* as varieties of D. *retusa.*

1.6 Common names:
English: Black rosewood, Nicaraguan rosewood, Red foxwood, Rosewood, Yellow rosewood
French: palissandre cocobolo
Spanish: cocobola, cocobolo, cocobolo ñambar, cocobolo negro, cocobolo prieto, funera, franadillo, granadillo, granadillo de Chontales, manarizoby, namba, nambar, nambar de Agui, nambar legitimo, nambaro, palisandro, palo negro, palo de rosa, prieto
German: Cocoboloholz, Foseholz

In trade, *Dalbergia retusa* has the same common names as *D. granadillo* and other *Dalbergia* spp. (Schmidt, 2006).

1.7 Code numbers: ---

2. Overview

Dalbergia retusa is a hardwood leguminous species, principally of tropical dry forests (Section 3.2). This endangered ecosystem has been heavily exploited, with most of the land having been converted to other uses (Section 4.1). In addition to this pressure, *D. retusa* has been extensively felled, like many of the other tree species in the genus, to harvest the beautiful, dense and durable wood, which is prized for a wide range of uses (Section 6.1). There appears to be a high wastage of wood as the sapwood is of low value and there is a premium on the most highly patterned heartwood pieces (Section 6.3). The wood is used for carvings and presumably exported as personal items in the tourist trade (Section 6.1). The wood is also reported in trade outside the range States, particularly in the United States of America, where it appears to be imported as timber and then sold on as timber or small, high-value products such as pen blanks and gun handles (Section 6.1). Some plantations of the species exist at various stages of maturity, and more are planned to attempt to fulfil demand for the timber (Section 8.4) although destructive harvest from the wild continues (Section 6.1). Little

information is available on current abundance, but there are reports of heavy exploitation in the past, particularly in **Costa Rica** and **Panama** (Section 4.2). Reported difficulties in sourcing the wood (Section 4.2) suggest that it may already be commercially extinct in some wild areas.

Given the increasing importance of tourism in the region, the prominence of carvings in the tourist trade, the continuing demand for the wood for a range of uses internationally and the high level of wastage, the total trade may represent utilization of a great many trees.

3. Species characteristics

3.1 Distribution

Dalbergia retusa occurs from **Mexico** to **Panama** (INBio, 2006) mainly in dry tropical forest. The distribution is likely to be highly fragmented due to the massive loss of this ecosystem (Section 4.1). The type location is Paraiso in **Panama** (INBio, 2006).

D. retusa has been reported from northwestern **Colombia** (Record, 1942; TROPICOS, 2006). In **Costa Rica**, it occurs throughout the Nicoya Peninsula, and in the vicinity of Pozón-Orotina, San Pablo and San Pedroe de Turrabares and the city of Colón, but is very scarce in the northern zone of Los Chiles (INBio, 2006). Representative specimens have been reported from **El Salvador** (MOBOT, 2006). Included in a list of principal forest species of **Guatemala** (INAB, 2006). Reported from western **Honduras** (Record, 1942). Grows in southwestern (Record, 1942) and southeastern (ILDIS, 2005) **Mexico.** It is frequent in **Nicaragua** from the Pacific to the Atlantic coasts (Stevens *et al*., 2001). In **Panama**, it is only found in the drier, southern parts of the isthmus, but is never common (Condit and Pérez, 2002).

3.2 Habitat

D. retusa is a species of dry forest, woodland and scrub along central American Pacific coastal lowlands and slopes, occurring in wooded areas as well as rocky ground and pasture-land (Jiménez Madrigal, 1993). In **Nicaragua**, the species is found in a range of habitats, including dry forests, humid forests, gallery forests and savannas (Stevens *et al.*, 2001).

D. retusa is found on flatlands or moderate slopes in tropical dry forests with an annual rainfall under 2000 mm and a temperature range of 24 - 30ºC (Marín and Flores, 2003). It grows in soils of varying pH, texture, drainage and fertility, with a typical elevation range of 50 - 300 m (INBio, 1999; Marín and Flores, 2003) and up to 800 m in **Nicaragua** (Stevens *et al*., 2001).

The species responds well to fire (Section 3.3). It is slow-growing (Americas Regional Workshop, 1998) but has shown a high rate of survival, for example in **Costa Rica**, in a tropical dry site (Piotto *et al.*, 2004) and on acid soils in a tropical humid site (Tilki & Fisher, 1998).

3.3 Biological characteristics

The trees flower between January and May after 4 to 5 years, with a second flush in August and September (INBio, 1999; Marín and Flores, 2003 and references therein). Flowers are insect-pollinated and seeds with intact fruits are wind-dispersed (Bawa and Webb, 1984). Flowers are arranged in racemes, clustered towards branching tips, appearing as terminal or axillary panicles; the pod is an indehiscent, one-seeded samara.

D. retusa appears to be self-incompatible and shows high levels of seed abortion. In a pollination study by Bawa and Webb (1984), only 8 % of 560 open-pollinated flowers developed mature fruits, none of the 184 self-pollinated flowers set fruits and 64 % of the 137 cross-pollinated flowers set fruits. Pollen is dispersed by bees (Frankie *et al.*, 2002) and seeds are dispersed by wind and water (Marín & Flores, 2003). Seeds are orthodox and remain viable for up to 5 years with 60 % germination if stored at 6 - 8 % moisture at 5 ºC (Marín & Flores, 2003). Up to 80 % germination has been observed in nurseries (INBio, 1999).

Natural regeneration of the species is scarce, however saplings and juveniles are numerous in areas periodically exposed to fire (Jiménez Madrigal, 1993; Marín & Flores, 2003).

3.4 Morphological characteristics

The species grows to about 20 m (Ricker & Daly, 1997) with a diameter of 40 cm (INBio, 1999). The heartwood is surrounded by white sapwood. The sapwood, which is as dense as the heartwood, will vary in amount depending on the age of the tree and the conditions of its habitat. The poorly formed stems yield the most uniquely figured and highly prized wood (Cocobolo, 2006).

The wood is hard, heavy and lustrous in colour (Condit & Pérez, 2002). It has a basic specific gravity (oven-dry weight/green volume) from 0.80 to 0.98 and the air-dry density is between 750-1000 kg/m^3 (Marín & Flores, 2003). The heartwood varies from yellow to dark reddish-brown in colour, with a figuring of darker irregular markings. It is faintly fragrant (Titmuss and Patterson, 1988) with no distinctive taste (SCMRE, 2002). The amount of figure and contrasting colour varies widely from tree to tree. (Cocobolo, 2006). It has a fine to medium texture and a straight to irregular grain (Echenique-Marique & Plumptre, 1990). The wood has a natural cold feel like marble (Titmuss & Patterson, 1988), with a high oil content and a high natural polish (Marín and Flores, 2003). Because of the oil content, it is easy to work and polish and is highly durable (Record, 1942). The oils offer a waterproofing property, which gives it an esteemed position in the cutlery trade (SCMRE, 2002). Dust from working the material may produce a rash or dermatitis resembling ivy poisoning (Record & Hess, 1943).

Numerous photographs of the wood are available on the Web (Hobbithouseinc, 2006).

3.5 Role of the species in its ecosystem

The species is associated with *Tabebuia ochracea*, *Astronium graveolens*, *Tabebuia impetiginosa*, *Sideroxylon capiri* and *Swietenia macrophylla* (Jiménez Madrigal, 1993).

D. retusa is a highly attractive bee plant in **Costa Rica**, where up to 60 species of bees visit the flowers (Frankie *et al*., 2002). *Dalbergia* species form nitrogen-fixing nodules and therefore have an important role in enhancing soil fertility (Rasolomampianina *et al.*, 2005). Cutting of *D. retusa* trees for timber could mean that they will no longer provide these ecosystem functions.

4. Status and trends

IUCN Global threat status: VU A1acd (assessed by Americas Regional Workshop, Conservation and sustainable management of trees project in 1998).

4.1 Habitat trends

The tropical dry forests of Central America, the main habitat for *D. retusa*, have been subject to human influences such as hunting and modification of the vegetation cover for a long as 11,000 years (Murphy and Lugo, 1995). Relatively high population densities have subjected dry forest ecosystems to massive disturbances, so that most, if not all, of the surviving forest has at least been affected by the harvesting of trees, as well as by grazing in the understory (Murphy and Lugo, 1995).

Conversion of tropical dry forest to agriculture and pasture is occurring at alarming rates (Manuel Maass, 1995) and it is considered to be the most endangered major tropical ecosystem, with less that 2 % remaining intact (Janzen, 1988). Less than 0.1 % of the original dry forest has conservation status in Pacific Mesoamerica (Manuel Maass, 1995).

In general, the rate and extent of deforestation in the range States is very high. FAO report that the annual rates of forest cover changed between -0.4 % (**Colombia**) and -4.6 % (**El Salvador**) for the range states between 1990 and 2000 (Table 1; FAO 2005).

Table 1: Forest cover change in *D. retusa* Range States, according to FAO (2005)

Country	Forest cover change 1990-2000	
	Annual ('000 ha)	Annual rate (%)
Colombia	-190	-0.4
Costa Rica	-16	-0.8
El Salvador	-7	-4.6
Guatemala	-54	-1.7
Mexico	-631	-1.1
Honduras	-59	-1.0
Nicaragua	-117	-3.0
Panama	-52	-1.6
Belize[1]	*-36*	*-2.3*

[1] Information is needed to confirm if Belize is a range State.

Large-scale dry forest restoration studies have been undertaken in Guanacaste, **Costa Rica**, with the goal of re-establishing 70,000 ha of dry forest and associated habitats (Murphy & Lugo, 1995).

4.2 Population size

In 1979, *Dalbergia* was described as scarce, all accessible stands of the genus having long since been logged out (NAS). Much of the habitat that should be available to *D. retusa* has been destroyed or heavily exploited (Section 4.1). Some areas where the species was formerly widespread now hold populations which are almost completely exhausted (Americas Regional Workshop, 1998). This is most notable in **Costa Rica** (Americas Regional Workshop, 1998; Jiménez Madrigal, 1993). Continuing habitat destruction, the growth of cattle ranching and increasing fires have all contributed to the decline in the species (Americas Regional Workshop, 1998).

Cocobolo is so rare that very little of it reaches the world market; it has been heavily exploited and is now mainly harvested from private fincas (farms) where 80 to 100 year old trees have been able to mature (Cocobolo, 2006).

4.3 Population structure

Little information is available on the current status of population structure for the species. However, it is likely that many populations are of lower density than in the absence of logging and that mature trees will have been preferentially felled for their greater amount of heartwood. The flowers of *D. retusa* are self-incompatible and dependent on pollination by bees (Section 3.3). It is therefore likely that a minimum population density is required for regeneration of the species and that this is at risk from excessive logging.

4.4 Population trends

The combination of habitat loss (Section 4.1) and cutting (Section 4.2) has resulted in a decline in the populations of the species. Exploitation as a timber is intense and areas where the species was formerly widespread are almost completely exhausted; this is most notable in **Costa Rica**. Continuing reductions are caused through cattle ranching and burning (Americas Regional Workshop, 1998). Intensive commercial harvest of the timber for at least 100 years, combined with artisanal harvest and its distribution is thought to have made it a scarce resource in **Panama** (Velásquez Runk *et al.*, 2004).

4.5 Geographic trends

The species is threatened in **Costa Rica** and has a high risk of becoming endangered due to the drastic decrease in its populations (INBio, 2006). Prohibition of cutting standing trees of this species has been proposed (Varela Jiménez and Rodríguez Coffre, 2005). Populations of a

reasonable size remain in **Mexico** (Americas Regional Workshop, 1998). In **Nicaragua**, it was recently described as 'frequent' (Stevens *et al.*, 2001) and is considered a low-priority species in the Forestry Action Plan of Nicaragua (Ampié and Ravensbeck, 1994). Once considered plentiful in some parts of **Panama** (Standley, 1928), it is now endangered in the country (Melgarejo, 2005).

5. Threats

Felling of mature, reproducing individuals and the corresponding reduction in population size and population density threaten the capacity of *D. retusa* populations to regenerate (Section 4.3). Additionally, the habitat is under continuing pressure, particularly from increasing agriculture, cattle ranching and burning (Americas Regional Workshop, 1998; Section 4.1).

6. Utilization and trade

6.1 National utilization

Only the heartwood of *Dalbergia* timber species yields quality timber; the sapwood is of little value. The trees are slow in forming heartwood, so even large logs lose much of their volume when the sapwood is removed (NAS, 1979). Because of its scarcity and high value, *D. retusa* is used for its rare beauty rather than for its extreme strength or durability (Cocobolo, 2006). Most internationally traded timber now comes from plantations (Section 8.4), although historically large volumes of the wood were extracted from the wild. Standing trees are felled for artisanal use, with at least 50 % of cocobolo extraction for commercial carving being via destructive harvest in Darién, **Panama** (Velásquez Runk *et al.*, 2004).

D. retusa is exceptionally good for marine use. The timber secretes compounds toxic to bacteria, fungi, algae, termites, mosquito larvae, confused flour beetles and marine borers (NAS, 1979).

The wood is used for inlay work, musical and scientific instruments, tool and cutlery handles and other crafts (Americas Regional Workshop, 1998; Echenique-Marique and Plumptre, 1990; Flynn, 1994; Ricker and Daly, 1997; SCMRE, 2002). For brush backs, butts of billiard cues (SCMRE, 2002), decorative and figured veneers, parquet floors, hunting bows, automobile dashboards (Cocobolo, 2006), jewellery boxes, canes, buttons and chessmen (Kline, 1978).

A search on eBay (United States of America) for 'cocobolo' (http://search.ebay.com, 13 February 2006) listed 944 relatively small, high quality wood items. It is a popular material for pens; Internet suppliers include:

http://www.jeswoodcrafting.com
http://www.amazonexotichardwoods.com
http://jdominik.rearviewmirror.org/wood/cocobolo.html

D. retusa is used for making woodwind instruments such as professional quality clarinets. Although most professional quality clarinets are made of African Blackwood (*D. melanoxylon*), *D. retusa* is said to produce a softer tone. Due to the stresses placed on woodwind instruments, a professional instrument has a lifespan of approximately six years. This means that even with a consistent number of players, there is a steady demand for the wood (Jenkins *et al.*, 2002). Guitar suppliers recommending cocobolo as a substitute for Brazilian rosewood include:

www.cbguitars.com
www.benjaminguitars.co.uk
www.alliedlutherie.com

The Wounaan and Emberá indigenous peoples of Darién, **Panama** have carved cocobolo commercially for about 30 years, although they have a longer tradition of carving the wood for personal household items (Velásquez Runk *et al.*, 2004). The shavings and sawdust create colour ranging from light brown to black (Velásquez Runk *et al.*, 2004), and the wood is used to produce a dye for local use in Ipeti and Nurna, **Panama** (Dalle & Potvin, 2004) and in Darién province, **Panama** (Velásquez Runk *et al.*, 2004).

6.2 Legal trade

Only small quantities of timber reach the world markets (Titmuss & Patterson, 1988). This limit to supplies has led to high prices on the international market (Flynn, 1994). Cocobolo is so precious that it is often sold by the pound (TATF, no date).

Trade on eBay (www.ebay.com) demonstrates that the United States of America imports this species. A manufacturer in the USA of wooden handgun grips states that most of the cocobolo wood they use comes from **Nicaragua**. Suppliers on the Internet (January to February 2006), trading variously in lumber and finished products, include:

www.anexotichardwood.com
www.cocobolo.net
www.cocoboloinc.com
www.cocoboloking.com
www.cookwoods.com
www.gilmerwood.com
www.maderasbarber.com
www.southernlumber.com
www.woodgrips.com
www.woodshopcala.com
www.yukonlumber.com

Internet suppliers of seeds and seedlings include:

www.sunshine-seeds.de
www.agroforester.com

ITTO (2004) does not report any export trade in *Dalbergia retusa*, although five of the range States (Colombia, Guatemala, Honduras, Mexico and Panama) are ITTO members. Similarly, ITTO does not report any import trade despite the evidence (see 6.1) of trade in the species in the United States of America, which is an ITTO member, but not a range State.

6.3 Parts and derivatives in trade

The heartwood is traded, but the sapwood is of little value (NAS, 1979). The species is traded as sawn-wood and as finished items manufactured from timber in the range States. Usage is highly selective for the best-patterned pieces, with reports of only 2 % being used (http://www.esmeralda.cc).

6.4 Illegal trade

D. retusa is poorly protected, with few of the range States including special legislation on the species (Section 7). It follows that trade in the species is neither monitored nor regulated.

6.5 Actual or potential trade impacts

Dalbergia retusa is used for its beautiful high-value wood to make luxury items. There is some local use, but given that the range States are all developing countries it seems likely that most timber or products made from timber of this species are traded internationally. International trade is therefore likely to be promoting exploitation of the species for timber.

7. Legal instruments

7.1 National

Populations are contained within protected areas in **Costa Rica**, **El Salvador**, **Guatemala**, **Honduras** and **Nicaragua** (Section 8.5). *D. retusa* is included (without category) in the national Red List of threatened plants of **Guatemala** (Szejner, 2005) and has been protected in **Costa Rica** since 2001 (Exp. No. 14.356). It is included on the list of species for which felling should be prohibited in **Costa Rica** (Varela Jiménez & Rodríguez Coffre, 2005).

7.2 International

Dalbergia retusa is not protected under any international legal instruments.

[NB *Dalbergia nigra* was included in CITES Appendix I in 1992].

8. Species management

8.1 Management measures

Extraction in **Guatemala** is regulated through management plans that comply with technical requirements and national legislation that guarantee the survival of the species (Szejner, 2005). The species has been investigated for reforestation in **Panama** (Wishnie *et al.*, 2002). It was included in a 10-year reforestation programme, commencing in 2003, for 4,000 ha of former pastures in **Nicaragua** (Anon, 2005).

8.2 Population monitoring

There are no population monitoring reports published for this species in any of the range States.

8.3 Control measures

8.3.1 International

8.3.2 Domestic

8.4 Captive breeding and artificial propagation

Dalbergia trees are slow-growing, but due to the value of their timber, NAS (1979) recommends that efforts be made to extend their cultivation. During trials in a dry tropical region in **Costa Rica**, they exhibited good growth in height and good productivity when compared to six other native slow-growing species that were also planted in pure and mixed plantations (Piotto *et al.*, 2004). The good form of this species and its high timber value could compensate for the relatively low annual increments in volume, especially if grown in mixed plantations (Piotto *et al.*, 2004). However, in Central America the overwhelming majority of plantations are of teak, with only 10 % of plantations in **Costa Rica** consisting of native species (Schmincke, 2000).

The Forest Stewardship Council lists two organizations that maintain plantations including *D. retusa* holding their certificate in forest management, in **Costa Rica** and **Nicaragua** (FSC, 2006).

Most of the cocobolo available today is not cut from the natural rainforest, but from privately-owned fincas with trees planted 80 to 100 years ago (Cocolobo, 2006). Tropical American Tree Farms offers to grow precious hardwoods, including *D. retusa* trees in **Costa Rica**, for its customers. Due to the exceptionally high value of the timber they claim this will serve as a high-yielding long-term investment (TATF, no date).

One supplier claims that most of their cocobolo is salvaged from trees which fell during Hurricane Mitch, and that they have planted 50,000 trees on former cattle farms to ensure a future supply (www.cocoboloking.com). Another supplier (www.cocoboloinc.com) claims to source their wood from hydroelectric dam sites and government-controlled reforestation schemes.

The Wounaan Indians now living at Gamboa in the **Panama** Canal Zone, who produce wooden carvings from Cocobolo harvested in the Darien, are planting *D. retusa* seedlings locally on their reserve at Gamboa for future use (Gillett, H. pers. comm. 2006). It has been planted for lumber around Hacienda Barú, **Costa Rica** (Costa Rica Link, no date).

Dalbergia retusa was included in plantation trials of native precious wood species in **Costa Rica**, which started in 1992 (Fonseca & Chinchilla, 2002; Fonseca *et al*., 2002), and is noted as a second-choice native species for reforestation in the central Pacific zone of **Costa Rica** (Gustavo Torres & Ricardo Luján 2002). In managed plantations, trees may reach 13 cm diameter breast height and 8 m in height after 17 years (Marín and Flores, 2003 and references therein). They have been found to grow at a rate of 1.1 m/year (Knowles and Leopold, 1997).

Seeds of *D. retusa* are available from the CATIE forest seed bank (CATIE, 2006) and commercial suppliers (Section 6.2).

Guatemala reports the plantation of 58 ha of *D. retusa* between 1998-2004 (INAB, 2004).

8.5 Habitat conservation

Less than 0.1 % of dry tropical forest of Pacific Mesoamerica, the most important ecosystem for *D. retusa*, has conservation status (Section 4.1). However, the species does occur in some protected areas. The size of the protected areas is greater than the habitat available to the species, as they often cover a range of habitat types.

D. retusa occurs in several conservation areas of **Costa Rica**: Huetar Norte, Guanacaste (including Santa Rosa (49,515 ha) and Guanacaste (84,000 ha) National Parks), Pacifico Central (including Vida Silvestre Curú Refuge), and Tempisque [including Palo Verde National Park (13,058 ha), Lomas Barbudal Biological Reserve (2,279 ha)] (INBio, 1999). It is present in the Parque Nacional Marino Las Baulas (445 ha, mainly of mangroves and coastline; Guia Costa Rica, no date).

It is frequent in the Domitila Private Wildlife Reserve in **Nicaragua** (Lezama-Lopez and Grijalva, 1999), which is composed of 230 ha of dry forest, the last patch of dry tropical forest at the shores of Great Nicaragua Lake (Mejía, pers. comm. 2006).

Found in the tri-national protected area of Montecristo (1,973 ha), which spans **Honduras**, **Guatemala** and **El Salvador** (Komar *et al.*, 2005).

8.6 Safeguards

Not relevant.

9. Information on similar species

Dalbergia hypoleuca, *D. lineata* and *D. granadillo* timber is not distinguishable from that of *D. retusa* (Record and Hess, 1943). *D. hypoleuca* and *D. lineata* have been considered synonyms of *D. retusa* since Rudd (1995). However, *D. granadillo* is a separate species, which has the common name 'granadillo', but is often traded under the name 'cocobolo'.

D. retusa wood is denser and stronger than Brazilian rosewood *Dalbergia nigra* (SCMRE, 2002).

A table listing other *Dalbergia* tree species of Central America is included in the Annex.

10. Consultations

Assistance is requested with the following queries:

a) Is *Dalbergia retusa* found in Belize?

11. Additional remarks

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Annex

DALBERGIA TREE/SHRUB SPECIES OF MESOAMERICA

Species	Common names	Notes	Threat status	BZ	CR	SV	GT	HN	MX	NI	PA	Habit
D. brownei (Jacq.) Urb.	Coin vine; Brown's Indian rosewood (a confusing name - the species is confined to American continent).	Occurrence reported in Caribbean, Mesomerica, North America, South America and the United States [9] [13]. *D. brownii* and *D. brownei* (Jacq.) Schinz are synonyms of *D. brownei* [6]. **Possibly in international trade** [12].		x	x	x	x	x	x	x	x	Woody vine/shrub [13].
D. calderonii Standl.		Occurrence reported in Mesoamerica only [9]. Species with two varieties, var. *calderonii* and var. *molinae*. The var. *molinae* occur in Honduras and Nicaragua [10][13]. **No evidence of international trade.**				x		x	x	x		Tree [13].
D. calycina Benth	Granadillo [9]; cahuirica (Mexico), calyxlike rosewood, palissandre à faux calice [15].	Occurrence reported in Mesoamerica only [9][13]. **No evidence of international trade.**			x	x	x	x	x	x		Tree [13].
D. chontalensis Standl. & L.O. Williams		Occurrence reported in Mesoamerica only [9][13].			x	x	x	x		x		Shrub [13].
D. congestiflora Pittier	Camatillo rosewood, campinchirán [17].	Occurrence reported in Mesomerica only [9][13]. **In international trade** [11][12][1].	In danger of extinction [24]						x			Tree [13].
D. cubilquitzensis (Donn. Sm.) Pittier	Granadillo [9].	Occurrence reported in Mesoamerica only [9][13]. **In internatonal trade** [11].			x				x	x		Tree [13].
D. cuscatlanicum Standl.	Cuscatlán retuse rosewood, palissandre rétus de Cuscatlán [15].	Occurrence reported in Mesoamerica only [9]. Other author regard this as *D. retusa* var. *cuscatlanica* (Standley) Rudd [10].			x		x		x		x	Tree [9].
D. ecastaphyllum (L.) Taub.	Bejuco de peseta, bugi, clous , maraimaray, maray-maray, marmeleiro-da-praia, marmelo, palo de pollo [9]. For more common names refer to [15].	Widespread species that occur in Africa, Asia, Caribbean, North America, Mesoamerica, South America and India [9][13]. **No evidence in international trade.**	Not threatened [9].	x	x		x	x	x	x	x	Woody vine/shrub [13].
D. frutescens (Vell.) Britton	Brazilian tulipwood, kingwood, tulip wood, bois de rose, bahia rozehout, violet wood, pinkwood, pau rosa [16].	Mainly S. America [14]. **In international trade** [1] [12].			x							Woody vine/shrub [13].
D. funera Standl.	Funera rosewood, palissandre funera, ébano, funera (El Salvador) [15].	Occurrence reported in Mesoamerica only [9].The wood is of wide importance in carpentry and construction [4]. Threatened by agriculture, logging, land conversion and invasive species [4].	Endangered GT [2] and SV [3], DD [4].			x	x					Tree [9].

Species	Common names	Notes	Threat status	BZ	CR	SV	GT	HN	MX	NI	PA	Habit
D. glabra (Mill.) Standl.	Logwoodbrush rosewood, logwood brush (Belize), palissandre glabre, mayagua (Guatemala), cibix (Maya, Belize and Guatemala), ixcipix, muc (Maya, Guatemala), muk (Maya, Belize) [15].	Occurrence reported in Mesoamerica only [9][13]. **No evidence of international trade.**		x	x	x	x	x	x	x		Woody vine/shrub [13].
D. glomerata Hemsl.	Glomerate rosewood; palissandre à glomérules [15].	Occurrence reported in Mesoamerica only [9][13].	VU A1c [4].				x	x	x			Tree [13].
D. granadillo Pittier	Granadillo [5].	Occurrence reported in Mesoamerica only [9][13]. **In international trade** [18][19][11].	Threatened [5]. Species in danger of extinction [24]			x			x			Tree [13].
D. intibucana Standl. & L.O. Williams		Occurrence reported in Mesoamerica only [9][13].	CR C2a [4].					x				Tree [13].
D. melanocardium Pittier	Blackheart rosewood, palissandre à coeur noir; chapulaltapa; ebano [15].	Occurrence reported in Mesoamerica only [9][13].			x	x	x	x	x			Tree [13].
D. monetaria L.f.	Bejuco de Peseta, clous, membrillo, money bush, palo de brasilete [13].	Occurrence reported in the Carribean, Mesoamerica and South America [9][13].		x	x		x	x	x	x	x	Woody vine/shrub [13].
D. palo-escrito Rzed.	Palo escrito [20].	Occurrence reported in Mesoamerica only [9][13]. **In international trade** [20].							x			Tree [13].
D. retusa Hemsl.	See *D. retusa* proposal.	See *D. retusa* proposal.	VU A1acd [4].	x	x	x	x	x	x	x	x	Tree [13].
D. stevensonii Standl.	See *D. stevensonii* proposal.	See *D. stevensonii* proposal.		x			x		x			Tree [13].
D. tilarana N. Zamora	Tilarán rosewood, palissandre de Tilarán [15].	Occurrence reported in Mesoamerica only [12][13].			x					x	x	Tree [13].
D. tucurensis Donn. Sm.	Granadillo [21][22][23].	Occurrence reported in Mesoamerica only [9][13]. Certified wood available in Nicaragua [7]. **In international trade** [21][22][23].		x	x	x	x	x	x			Tree [13].

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REVIEW OF *DALBERGIA STEVENSONII*: INFORMATION ON DISTRIBUTION, STATUS AND TRADE FOR CONSIDERATION BY THE CITES PLANTS COMMITTEE

1. Taxonomy

1.1 Class: Magnoliopsida

1.2 Order: Fabales

1.3 Family: Leguminosae (Fabaceae) Juss. 1789

1.4 Genus, species or subspecies, including author and year: *Dalbergia stevensonii* Standley 1927

Taxonomic categorization of the genus is difficult and estimates of the total number of species vary between 100 and 200 (CITES, 1992).

1.5 Scientific synonyms: No synonyms

1.6 Common names: English: Honduras rosewood, rosewood, nogaed, nagaed
French: Palissandre du Honduras
Spanish: Palisandro de Honduras, Rosul
German: Honduras Ronsenholz

1.7 Code numbers: ---

2. Overview

D. stevensonii is a species of rosewood restricted in distribution to broadleaf evergreen swamp forests of southern Belize and nearby regions of Guatemala and Mexico (Sections 3.1 and 3.2). The species is threatened by increasing deforestation in the region (Section 4.1). It is of limited availability in trade, although it is very much sought after, particularly as a tonewood for musical instruments. As it is not available from plantations, it follows that timber must be sourced from wild populations. In spite of its rarity, there are reports of high levels of wastage, up to 80 % (Section 6.3), as only logs of the straightest grain are used to make marimba bars. Large volumes are also lost when the low-value sapwood is removed. Increased accessibility to its habitat and declining stocks of other rosewoods may lead to growing pressure to turn to this species to meet demand.

3. Species characteristics

3.1 Distribution

D. stevensonii occurs in broadleaf evergreen swamp forests of southern **Belize** and neighbouring regions of **Guatemala** and **Mexico**. It is restricted to the southern part of **Belize** between latitudes 16-17° N (WCMC, 1999). The type specimen was collected along the San Antonio Road near Westmoreland, Punta Gorda (Standley, 1927). It is reported mostly between Sarstoon and Monkey Rivers, sometimes in fairly large patches (Chudnoff, 1984) along rivers but also on inter-riverine and drier areas (Cho & Quiroz, 2005). The New York Botanic Garden (2006) records one specimen collected from **Belize** in 1994. MOBOT (2006) records the following specimens with coordinates from **Belize**:

- Cayo: New Maria Camp, 550 m, 16.49.38N 089.01W, 4 May 1995.
- Toledo: Columbia, 16.20N 088.59W, 13 Jun 1950.
- Toledo: Moho River, 16.07N 088.52W, 4 Jun 1949.
- Toledo: 16.20N 88.45W, 22 Sep 1944.
- Toledo: 16.20N 88.45W, 22 Sep 1944.

A wood sample in the Economic Botany collection at Kew (Royal Botanic Gardens, Kew, 2006) is reported as coming from "**Honduras**". According to the Economic Botany collection manager it is possible that this may refer to **Belize** (previously British Honduras) (Steele, pers. comm. March 2006).

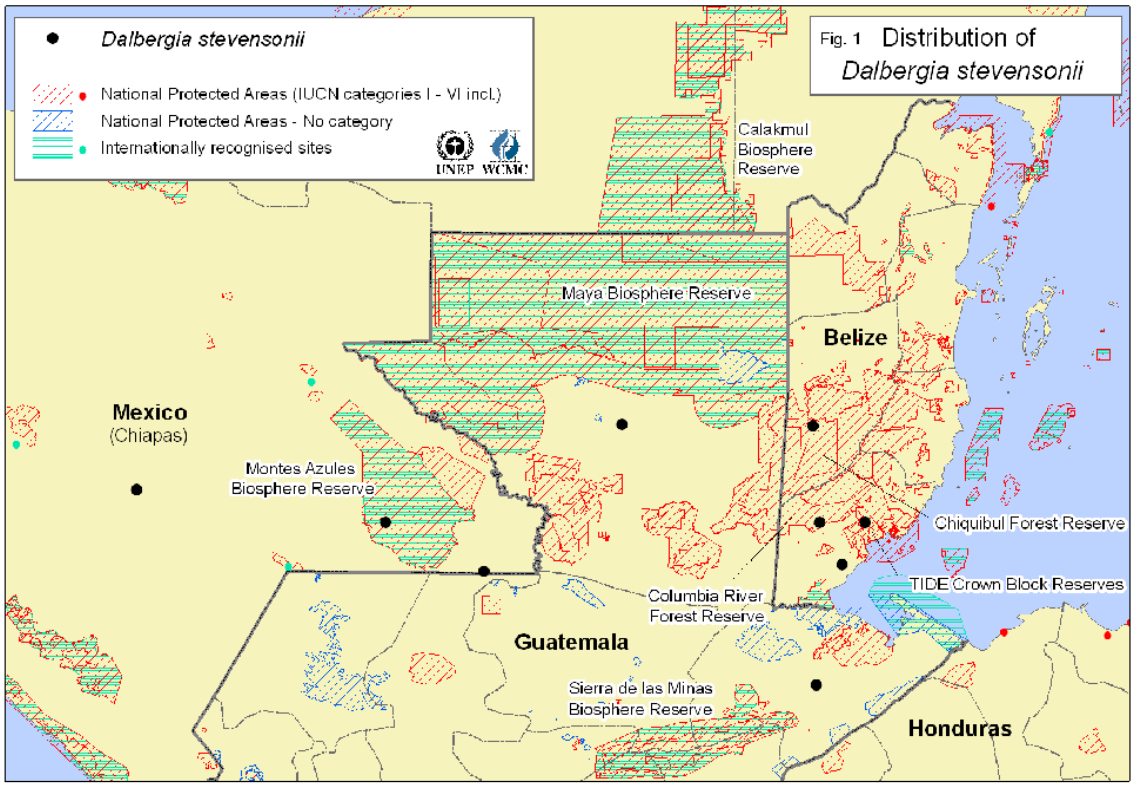
D. stevensonii is included on the list of principal forest species of **Guatemala** (INAB, 2006). MOBOT (2006) records the following specimens with coordinates from **Guatemala**:

- Izabal: Puerto Mendez, 15.30N 89.00W, 15 Jun 1970.
- Izabal: Puerto Mendez, 15.30N 89.00W, 15 Jun 1970.
- Peten: La Cumbre, 16.50N 90.00W, 15 Aug 1969.

The species is reported to occur in **Mexico** (Dávila Aranda and Tejeda Godinez, 2005). MOBOT (2006) records the following specimens with coordinates from **Mexico**:

- Chiapas: 130 m, 16.04.48N 090.42.36W, 10 Jan 1986.
- Chiapas: 360 m, 16.20N 091.13W, 20 Aug 1993.
- Chiapas: 220 m, 16.30N 92.30W, 20 Apr 1986.

Figure 1 illustrates these specimens in the context of the legally gazetted protected areas of each country.



3.2 Habitat

D. stevensonii is present in intermediate forests of **Belize** (Stevenson, 1928). It is found in seasonally and permanently waterlogged tropical evergreen broadleaf lowland swamp forest (Meerman *et al.*, 2003). These habitats are scattered throughout the Toledo district of **Belize**. Specimens reported from **Guatemala** and **Mexico** come from a very small geographical range within the countries.

Due to habitat specificity and restricted distribution, habitat availability can be considered to be a limiting factor for the species.

3.3 Biological characteristics

Information on the breeding system of *D. stevensonii* is not available. However, some aspects of the reproductive biology of the congeneric species *D. miscolobium* (Gibbs & Sassaki, 1998), *D. nigra* (Ribiero *et al.*, 2005), *D. sissoo* (Mohana *et al.*, 2001), *D. retusa* (Bawa, 1974; Bawa and Webb, 1984; Frankie *et al.*, 2002; Marín & Flores, 2003) and *D. tucurensis* (Bawa *et al.*, 1985) have been studied. These studies show some common features for the genus. Mass flowering but relatively few mature fruits have been observed in *D. miscolobium* and high levels of seed abortion have also been observed in *D. retusa* and *D. sissoo*. *D. retusa*, *D. sissoo* and *D. miscolobium* have been found to be outbreeding. Pollen is dispersed by bees in *D. tucurensis*, *D. retusa*, *D. sissoo* and *D. nigra* and seeds are dispersed by wind in *D. nigra* and *D. sissoo*, by wind and water in *D. retusa*.

It is likely that the above characteristics are shared by *D. stevensonii*, the yellow flowers of which appear in the first two weeks of July and the unripe fruits hang in thick clusters from August, probably ripening and falling in late September or November (Stevenson, 1927). The stumps sprout freely (Stevenson, 1927). Examination of a large number of unripe fruits revealed the presence of caterpillars or pupae in all cases, which may reduce regeneration (Stevenson, 1927).

3.4 Morphological characteristics

D. stevensonii is a medium-sized tree, with a height of 15-30 m. The bole is often fluted and forks at about 6-8 m from the ground (Farmer, 1972). The bark is papery and disordered, with a scaly outer portion varying in colour from pale brownish-grey to a dull yellow-brownish grey (Stevenson, 1927). Trees grow to around 3' (91 cm) in diameter (Forest Products Research Laboratory, 1955).

The wood is heavy and very durable, averaging 960 kg/m^3 when dry (Titmuss and Patterson, 1988). It has a medium to coarse texture and a straight or roe figure grain (Echenique-Marique and Plumptre, 1990). The sapwood and heartwood are sharply delimited: the sapwood is greyish (Titmuss and Patterson, 1988) and the heartwood is pinkish or purplish-brown with alternating dark and light zones (Echenique-Marique and Plumptre, 1990; Farmer, 1972; Titmuss and Patterson, 1988). The wood has no taste, but has a mild and distinctive smell (Titmuss and Patterson, 1988). The rose-like odour generally dissipates with age (Longwood, 1962).

3.5 Role of the species in its ecosystem

Protection of the species from unsustainable logging will allow the trees to continue their ecological functions. In **Belize**, *D. stevensonii* is a dominant component of southern forest types (Cho & Quiroz, 2005). *Dalbergia* species form nitrogen-fixing nodules and therefore have an important role in improving soil fertility (Rasolomampianina *et al.*, 2005). Bees are the typical pollination mechanism for the genus (Section 3.3). Logging is likely to disturb the habitat, with the related consequences of road and trail building to transport the trees (Newman, 2004).

4. Status and trends

4.1 Habitat trends

Deforestation is occurring throughout the range of *D. stevensonii*. Major threats to the environment of **Belize** are deforestation, pollution from poor agricultural practices and a small but growing human population that is mostly poor (Beletsky, 1999). Southern **Belize** has escaped from major deforestation for a long time due to its inaccessibility and distance from population centres (Newman, 2004). However, the area is becoming inundated with colonists practising slash-and-burn agriculture and is vulnerable to road construction opening the area to allow access for logging and other purposes (Newman, 2004). 70,000 hectares of forest are disappearing each year in Chiapas, **Mexico** (Flakus, 2002). Izabal and Peten, **Guatemala**, have suffered from extensive deforestation (Section 5).

4.2 Population size

Information is lacking on the population size of *D. stevensonii*, though it is likely to be small. In 1979, *Dalbergia* was described as scarce, all accessible stands of the genus having long since been logged out (NAS).

Anecdotal evidence from suppliers suggests that it is rare: "this premier wood for orchestral marimbas is rare and expensive" (www.randbmarimbas.com); "Limited quantities … can, however, be obtained at high prices from importers" (http://www.exotichardwoods-southamerica.com); "generally believed to be fairly scarce" (www.woodwriteltd.com); "difficult to obtain" (www.lmii.com).

Although confined to a small area, in **Belize** *D. stevensonii* has been reported to occur in fairly large patches within its habitat (Chudnoff, 1984). Little is known of the population size of this species, or the genus, in **Guatemala** (Sjezner, 2005). No information is available for the population size of the species in **Mexico**.

4.3 Population structure

No information is available on the population structure of *D. stevensonii.*

4.4 Population trends

Reports of timber extraction and habitat loss indicate that populations of *D. stevensonii* are declining. In the early 20th century, logging was the major economic activity in **Belize** (Beletsky, 1999). For example, maximum timber extraction from the forests of Columbia River Forest Reserve occurred between 1925 and 1960 and most *D. stevensonii* had been extracted when inventories were undertaken in 1978 (Meerman and Matola, 2003). The species may once have been locally common, as it was described as "available only in British Honduras[2], where large volumes await utilization" (Longwood, 1962).

Changes in population size can be inferred from changes in habitat availability. High rates of deforestation in the range States imply that the population is likely to be decreasing and selective logging will worsen the problem for valuable species such as *D. stevensonii*.

In 1927, Stevenson reported that the forests of **Belize** covered 87 % of the total area. In 2000, forest was reported to cover only 59.1 % of the land area of the country. Deforestation is continuing, with the annual rate of change of forest cover 1999-2000 reported to be –2.3 % (representing 36,000 ha; FAO, 2005).

In 2000 in **Guatemala**, forest was reported to cover 26.3 % of the land area of the country. The annual rate of change of forest cover 1999-2000 was reported to be -1.7 % (representing 54,000 ha; FAO, 2005).

Forests represented 28.9 % of the land area in 2000 in **Mexico**. The annual rate of change of forest cover 1999-2000 was reported to be –1.1 % (representing 631,000 ha; FAO, 2005).

4.5 Geographic trends

The historical situation is complex, as the ancient Maya were responsible for substantial deforestation in the region (Sever, 1998) and much of what is thought to be virgin forest today was farmed using the swidden method hundreds of years ago (Berkey, 1995).

D. stevensonii has a restricted distribution, mainly concentrated in southern **Belize**. No information is available as to whether it was previously more or less widespread. It has been reported to be endemic in **Belize** (Standley and Steyermark, 1946), and although it has been found in other countries since, this suggests that it has never been common elsewhere. No information is available on trends for the species in **Guatemala** or **Mexico**.

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2 Now Belize.

5. Threats

Throughout its range, deforestation due to a number of causes appears to be the greatest threat to the survival of the species. Demand for the precious wood will place pressure on the remaining stocks. The success of national legislation to protect the species from logging has not been evaluated.

D. stevensonii is threatened in **Belize** by genetic erosion and habitat loss (Cho and Quiroz, 2005). Southern **Belize** is a relatively under-developed region that is being inundated with colonists practising slash-and-burn agriculture (Newman, 2004). The Government of **Belize** has very little money to manage the protected areas or enforce environmental regulations. One important example is a frequently ignored rule that new farms and orchards carved out of forests should leave standing a belt of 20 m of forest along all waterways (Beletsky, 1999). Given that *D. stevensonii* is mainly found alongside rivers (Stevenson, 1927) this is a particularly threatening activity. The extremely high rate of human population growth (2.33 % 2005 estimate, CIA World Factbook) and increased accessibility to southern areas is putting additional pressure on *Dalbergia* habitats in **Belize** (Newman, 2004).

The tropical forest of Petén, **Guatemala**, is being destroyed at an alarming rate due to a combination of factors, including amongst others cattle ranching and slash-and-burn agriculture (Sever, 1998). Based on trends observed between 1986-1995 using remote sensing imagery, Sever (1998) predicted that only 2 % of the Petén's forest would survive by 2010. Izabal has also suffered heavy deforestation (USAID, 2003).

Since 1960, the rate of deforestation in Chiapas has been higher than the rest of **Mexico**, and is among the highest in the world (González-Espinosa, 2005). For example, the Montes Azules Biosphere reserve in Chiapas is critically threatened by problems including forest fires, deforestation and land invasions (Parkswatch, 2004).

6. Utilization and trade

6.1 National utilization

D. stevensonii, in common with other rosewoods, is prized for its rich colouration; the heartwood is pinkish-brown to purple with irregular light and dark zones (NAS, 1979). It is present in international trade, although it is widely reported to be difficult to obtain.

The main use is for the manufacture of bars for marimbas and xylophones (Kline, 1980), for which it is a preferred species (Farmer, 1972; Rendle, 1969). It is superior to Brazilian rosewood for this purpose due to greater density, toughness and resonance qualities (Kline, 1980).

D. stevensonii is recommended as an acceptable, even superior substitute for Brazilian rosewood (*D. nigra*) in the manufacture of guitars. Trade in *D. nigra* has declined since its listing in CITES Appendix I in 1992 (Affre *et al.*, 2004) and several guitar manufacturers (www.lmii.com, www.cbguitars.com, www.alliedlutherie.com, for example), even though commenting on its limited availability, recommend *D. stevensonii* as a substitute. This can only increase the pressure on the species.

It is also used for making novelty and craft items (Cho and Quiroz, 2005, Echenique-Marique and Plumptre, 1990) and speciality items including knife handles and veneers for fine furniture (Farmer, 1972; Ricker and Daly, 1997).

A search on eBay (United States of America) for "Honduras rosewood' (http://search.ebay.com, 13 February 2006) listed 25 small, high-quality wood items, including: pen blanks; crochet hooks; and small (c. 1 m) pieces of timber. All finished items were reported by the four vendors to have been manufactured in the United States of America, thus the international trade appears to be in timber.

The lengths to which enthusiasts are willing to go to obtain the wood are illustrated by a story given by the company Friendly Forest Products, which at great effort imported a giant burl of the species from **Belize** to Miami, **United States of America** (Friendly Forest, 2006).

In **Belize**, wood is removed from the forest in log form and transported to sawmill sites in long lengths where it is processed (Anon, 2000). There has been a limited amount of replanting in **Belize** (Section 8.1).

6.2 Legal trade

There are no comprehensive reports of the levels of local or international trade in the species. However, the restricted growth area of the species limits the amount of trade (Flynn, 1994) and there is some difficulty in fulfilling demand (Titmuss, 1971).

ITTO (2004) does not report any export or import trade in *D. stevensonii*. Patchy, *ad hoc* records of trade in the species have been reported. Systematic forestry began in **Belize** (British Honduras) in 1922 with the formation of the forest department, although timber production had been ongoing for the previous 250 years (Standley and Record, 1936). Records of trade in the early 20th century indicate that in 1925, 248 tonnes and in 1926, 76 tonnes of *D. stevensonii* were exported from **Belize** (British Honduras) to the United States of America. In 1933, 37 tonnes were exported, mainly to the United Kingdom and France (Standley and Record, 1936). There is a record of 118 pieces shipped in 1841 (Record and Hess, 1943).

In 2004, 254.65 m^3 of timber from *D. stevensonii* valued at USD 381,390 extracted from regions outside protected areas were exported from **Guatemala**, principally to Belize, Germany, Japan, the Netherlands, El Salvador and United States of America (Szejner, 2005).

Suppliers on the Internet include: www.southernlumber.com; www.eisenbran.com; www.highlandhardwoods.com, which calls *D. stevensonii* 'morado', which is the common name of Bolivian rosewood, *Machaerium scleroxylon*; www.exotichardwood.com; http://www.woodcraft.com; http://www.colonialtonewoods.com.

The shortage of trade information demonstrates the need for improved trade records.

6.3 Parts and derivatives in trade

For *Dalbergia* timber species, only the heartwood yields quality timber, whereas the sapwood is of little value. Heartwood from old trees is valued for having the richest colouration (Zadro, 1975). The trees are slow in forming heartwood, so even large logs lose much of their volume when the sapwood is removed (NAS, 1979). This is not always the case, as sometimes the contrasting sapwood is retained for ornamental purposes (www.lmii.com, for example). Wastage may be as high as 70-80 % as only the finest straight grain logs are used in making bars for marimbas and xylophones (Kline, 1980).

6.4 Illegal trade

Little information is available on the level of illegal trade in *D. stevensonii*. There are, however, reports of illegal logging in the range States.

Illegal logging was reported to be a significant problem in **Belize** (Bird, 1998), even within protected areas (Section 8.5).

In **Guatemala**, population pressures around protected areas result in illegal timber harvesting and land clearing for agriculture in national parks (Mongabay, 2006). In 2001, an employee of the Guatemala National Forestry Institute was shot and killed, apparently in retaliation for efforts to control illegal logging and contraband trade in protected precious woods (Amnesty International, 2002).

In **Mexico**, illegal logging is also a serious problem. ITTO (2005) cites an estimate by PROFEPA that consumption of illegally harvested timber in the country is about 5-7 million m^3 of round-wood per year, which represents approximately 80 % of legally harvested timber.

6.5 Actual or potential trade impacts

D. stevensonii is used to make luxury items from its beautiful high-value wood. It is unclear how much of its use is local, but given that the range States are developing countries and that in **Belize** dimensional lumber products are no longer available locally (Cho and Quiroz, 2005), it seems likely that most timber or products made from timber of this species are traded internationally. International trade has therefore promoted cutting of *D. stevensonii*.

In spite of felling restrictions in the country (Section 7.1), several international suppliers give the source of the wood as originating from **Belize** (for example www.gilmerwood.com, www.edensawveneers.com, www.exoticflooring.com, this supplier also sources in **Guatemala**). Other suppliers fail to supply information on the country of origin on their websites (www.highlandhardwoods.com, www.colonialtonewoods.com) or give the vague description 'Central America' (www.ellisguitars.com, www.woodcraft.com).

7. Legal instruments

7.1 National

In **Belize**, there is local trade only in finished products and dimensional lumber is rare. Only finished products and squared stumps may be exported (Cho and Quiroz, 2005).

7.2 International

Dalbergia stevensonii is not protected under any international legal instruments. [NB *Dalbergia nigra* was included in CITES Appendix I in 1992].

8. Species management

8.1 Management measures

A tree-planting scheme following the damage caused by Hurricane Iris in the Golden Stream Corridor Preserve, **Belize**, has focussed on planting saplings of species historically felled for timber, including *D. stevensonii* (Global Trees Campaign, no date). A tree nursery including *D. stevensonii* is being developed in **Belize** (Cho and Quiroz, 2005).

The National Forest Institute (INAB) is responsible for administering and managing most of the forests in **Guatemala**. The legal framework for forest activities includes the Forestry Law (Decree 101-96) and the Protected Areas Law (Decree 4-89 and its reforms: 18-89; 110-96; 117-97; Ferroukhi and Echeverría, 2003). Taxes on lumber are used to help finance forest management.

Mexico is a member of the Montreal Process for sustainable forest management (Montreal Process Working Group, 1998-2005).

8.2 Population monitoring

No population monitoring reports have been published for the species.

8.3 Control measures

8.3.1 International

There are no international measures in place to control movements of specimens of the species across international borders.

8.3.2 Domestic

D. stevensonii is listed in the First Schedule of the **Belize** Forests Act 2003, which specifies that no person shall convert the wood without first having obtained a licence. Felling restrictions were placed on this species and felling of live, natural trees is now

prohibited in **Belize** (Cho and Quiroz, 2005). Additionally, a licence is required to cut or otherwise injure any tree within forest reserves, national land and private land to which the Act has been applied.

D. stevensonii is listed in Category 3 of CONAP (Consejo Nacional de Áreas Protegidas) resolution No. ALC 028/2001 of **Guatemala** to prevent the species from becoming in danger of extinction. Commercial exploitation of the species is subject to strict regulation (Melgar, 2003).

Between 1970 and the mid-1980s, forestry practices in the Chiapas region of **Mexico** centred on unsustainable commercial and traditional logging by private and State groups. A ban on logging in 1989, which extended to rural uses such as fuel wood collection, resulted in a number of clashes between the authorities and the indigenous communities in the Chiapas highlands and other areas (Castaños, 1994).

8.4 Captive breeding and artificial propagation

D. stevensonii does not appear to be widely grown in plantations although it may be suitable for commercial growth. For example, Stevenson (1927) describes how the stumps of the trees sprout freely, quickly producing heartwood, and that with careful attention and selective thinning valuable timber should be obtainable in a fairly short time. It is included in a tree nursery being developed in **Belize** (Section 8.1).

There are no suppliers of *D. stevensonii* with FSC-certification listed on the Forest Stewardship Council database (FSC, 2006).

8.5 Habitat conservation

Belize has a high proportion of protected land area, with 42 % of its land under some form of legal protected status (Protected Areas Conservation Trust, Anon, 2000). *D. stevensonii* is found in some nature reserves in **Belize**. An area of the Bladen branch has been an official Nature Reserve since 1990, open only to scientists and other researchers (Zisman, 1996). The species is found in the Sarstoon Temash National Park (Meerman *et al*., 2003) and Cockscomb Basin Forest Reserve (WCMC, 1991). In the Sarstoon Temash National Park, **Belize**, *D. stevensonii* has a high level of protection, although it is a target for cross-border illegal logging (IMCG, 2005). The Cockscomb Basin Wildlife Sanctuary, **Belize**, has populations of *D. stevensonii* and this high-profile reserve (a jaguar sanctuary) is well protected from deforestation, and although concerns about illegal logging have been raised, they have been addressed (Catzim, 2003). *D. stevensonii* is still found in broadleaf hill forest on limestone in rolling or flat terrain within the Columbia River Forest Reserve (Meerman and Matola, 2003), which is one of the only large, continuous tracts of relatively undisturbed land in Mesoamerica (Parker *et al*., 1993). Forest reserves in **Belize** are, however, created for wood exploitation rather than habitat conservation (Berkey, 1995).

In **Belize**, the Forest Planning and Management Project (FPMP) ran between 1992 and 1998 with the aim of utilizing the national forest estate on a sustainable basis through forest management planning and research (Bird, 1998).

Belize FFI is supporting sustainable forest management and income generation in areas adjacent to the Golden Stream Corridor Preserve, in Toledo District, as part of the overall biodiversity strategy for the area. A training programme is being provided for indigenous communities to develop sustainable forestry management (Cho and Quiroz, 2005).

The northern forests of the Petén, **Guatemala**, have been protected by the Maya Biosphere reserve since 1995. The NGOs The Nature Conservancy, Conservation International and Wildlife Conservation society are active in Petén (USAID, 2003).

The species is found in the Montes Azules Biosphere Reserve in **Mexico**. This reserve of 331,200 ha of moist forest was created in 1978. Although the reserve offers some legal protection, and the Natural Protected Areas system is considered to be working in the region, it is critically threatened by a variety of problems (Parkswatch, 2004; Section 5).

8.6 Safeguards

Not applicable.

9. Information on similar species

Brazilian rosewood, *Dalbergia nigra* (Vell. Conc.) Benth., was added to CITES Appendix I in 1992. *D. tilarana* can be confused with *D. stevensonii* (Zamora, 2000).

10. Consultations

Assistance from the CITES Plants Committee is requested in relation to the following issue:

a) Sever (1998) predicted that only 2 % of the Petén's forest would remain by 2010. Are current forest statistics available for this region?

11. Additional remarks

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