Inclusion of all African populations of African mahogany *Afzelia* spp. in Appendix II with annotation #17

Proponents: Benin, Côte d'Ivoire, European Union, Liberia, Senegal

Summary: *Afzelia* is a genus of African and South-East Asian trees in the family Leguminosae. The seven African species are an important source of high-quality timber traded internationally as Afzelia, Doussie, Pod Mahogany, or African Mahogany. Two species are found in the Zambezi region, one in the Sudanian region and four in the Guinea-Congo region. They are typically slow-growing and occur at low densities. There are not known to be introduced populations or plantations of these species outside Africa.

The timber of different *Afzelia* species is difficult to distinguish and is marketed under the same commercial names. It has a wide range of uses as decorative veneer, flooring, door frames, staircases, docks, boatbuilding, exterior millwork and construction, furniture, musical instruments, turned objects, inlays, and other small speciality wood items. Exports from Africa include logs and sawn timber. *Afzelia* are also important locally for a wide range of subsistence uses. They provide traditional medicine ingredients, livestock fodder, wood for construction, charcoal, and fuelwood.

Five species are currently identified as of major commercial importance: *Afzelia africana*, *A. bella*, *A. bipindensis*, *A. pachyloba,* and *A. quanzensis*. Despite the paucity of inventory data, a global population decline has been noted as a result of timber harvesting for international trade for *A. africana.* The population of *A. quanzensis* is suspected to be decreasing as this species is becoming locally threatened in some areas due to selective logging for its timber. The proposal is to include all African populations of *Afzelia africana*, *A. bipindensis*, *A. pachyloba,* and *A. quanzensis* in Appendix II owing to concerns about unsustainable trade, and, because of the similarity of appearance of their timber, all other African populations of the genus *Afzelia* (i.e., *A. bella, A. parviflora,* and *A. peturei*) in Appendix II, under lookalike criteria.

In general, there appears to be very limited data on the level of international trade in *Afzelia spp.* The Supporting Statement provides information on trade in African Mahogany noting that this may refer to *Khaya* spp. (also proposed for listing in CITES Appendix II, see CoP19 Prop.51) and other species in addition to *Afzelia* spp. *Afzelia africana*, *A. bipindensis*, *A. pachyloba,* and *A. quanzensis* are widespread species that are considered to be in high demand for international trade. Although global population data are not generally available for these species, significant population declines are noted at African, national and local levels. The rare species *A. peturei* is not thought to be in trade; its timber properties are unknown.

- ***Afzelia africana*** is widespread but considered Vulnerable (IUCN Red List, 2019) with intensive and unsustainable harvesting resulting in a population reduction of at least 30% over the past three generations (150 years). Threats are still ongoing. Intensive exploitation of this species for timber used in the international market is a significant threat. *Afzelia africana* is exported from Ghana where there has been no recent official inventory of the species. The national population is, however, suspected to be decreasing due to intensive annual fires in forest savanna ecotones of the country.
- Both ***Afzelia bipindensis*** and ***A. pachyloba*** were assessed as Vulnerable in 1998 due to population decline. IUCN Red List reassessments for these two species are in progress. *Afzelia bipindensis* and *A. pachyloba* have been reported as the most commonly traded African *Afzelia* spp. with Cameroon noted as the main African exporter of the genus. Côte d'Ivoire and Ghana are also major exporters. *Afzelia bipindensis*, *A. pachyloba* and an additional species, *A. bella,* are all industrially exploited in the Congo Basin.
- ***Afzelia quanzensis*** is considered to be locally threatened in various countries due to depletion from unsustainable and illegal logging but was assessed in 2019 on the IUCN Red List as Least Concern. In Mozambique it is one of the three main timbers harvested (by volume) and one of five major timber species exported with China being the major export destination. It is

one of the main species harvested and traded in Angola. *A. quanzensis* is considered to be a potential replacement timber for the Appendix II listed *Pterocarpus erinaceus.*

- ***Afzelia peturei*** is a restricted range species occurring in Democratic Republic of the Congo (DRC) and Zambia close to the border between the two countries. It is considered Vulnerable (IUCN Red List, 2019) due to its restricted range and human disturbance. It is not known to be in trade.
- The wood of ***A. parviflora*** (Least Concern, IUCN Red List, 2019) is harvested but it is unclear whether it is traded internationally.
- ***A.bella*** is also widespread and in international trade but there is not currently thought to be a significant population decline.

Analysis: African *Afzelia* spp. produce high quality timber that is valued in the international market for its durability and aesthetic appearance. Four of the seven currently recognised African species (*Afzelia africana*, *A. bipindensis*, *A. pachyloba,* and *A. quanzensis)* are widespread African trees that have been heavily harvested in at least parts of their range for their timber. There are reports of declining populations as a result of harvest in a number of different range States. As a result, three of these species have been classified as Vulnerable on the IUCN Red List (*A. africana* in 2019 and *A. bipindensis* and *A. pachyloba* in 1998). Harvesting and export has continued, which is likely to have led to further depletion and in some cases exhaustion of harvestable stocks. The fourth (*A. quanzensis)* was assessed as Least Concern in 2019 but is known to be widely harvested in at least one important range State (Mozambique). There are no known national population estimates or stock assessments for any of the species. There are strong indications that all four of these species are currently harvested unsustainably in sometimes large parts of their range increasing their vulnerability to other important threats, therefore meeting criteria for inclusion in Appendix II as set out in Criterion B of Annex 2a, Res. Conf. 9.24 (Rev. CoP17).

Furthermore, given that it is difficult to distinguish between the timber of different African *Afzelia* spp., the other African members of the genus would appear to meet the lookalike criteria for listing in Appendix II in Annex 2b of the Resolution.

Annotation
The timber of these species is mainly exported as logs and sawn timber by African countries to be processed elsewhere for a range of uses. Therefore, Annotation #17 which designates “Logs, sawn wood, veneer sheets, plywood and transformed wood”, appears to be appropriate as it includes those specimens that first appear in international trade.

Summary of Available Information

Text in non-italics is based on information in the Proposal and Supporting Statement (SS), text in italics is based on additional information and/or assessment of information in the SS.

Taxonomy
Seven African species of *Afzelia* are currently recognised. *Afzelia africana*, *A. bella A. bipindensis*, *A. pachyloba*, *A. Parviflora, A. peturei* and *A. quanzensis.*

The genus *Afzelia* also occurs in South-East Asia, although for these species the taxonomy is more uncertain.

IUCN Global Category, Range and Population Trend

Table 1. IUCN Red List assessment, distribution range and population status of the seven African species of the genus *Afzelia*: *A. africana, A. bella, A. bipindendis, A. pachyloba, A. parviflora, A. peturei*, and *A. quanzensis* (Sources: SS and IUCN Red List assessments)

Species	IUCN Global Category	Range	Extent of occurrence (km^2)	Population trend
Afzelia africana	Vulnerable A2cd (assessed 2019, ver 3.1)	Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo, Democratic	4,850,397	Decreasing

Species	IUCN Global Category	Range	Extent of occurrence (km²)	Population trend
		Republic of the Congo; Côte d'Ivoire, Ghana, Guinea, Guinea-Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone, South Sudan, Sudan, Togo, Uganda		
Afzelia bella	Least Concern (assessed 2019, ver 3.1)	Angola, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Guinea, Liberia, Nigeria, Togo	5,014,355	Stable
Afzelia bipindensis	Vulnerable A1cd (assessed 1998, ver 2.3)	Angola, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Gabon, Nigeria, Uganda	-	Unspecified
Afzelia pachyloba	Vulnerable A1d (assessed 1998, ver 2.3)	Angola, Cameroon, Congo, Democratic Republic of the Congo, Gabon, Nigeria	-	Unspecified
Afzelia parviflora	Least Concern (assessed 2018, ver 3.1)	Angola, Côte d'Ivoire, Guinea, Liberia, Sierra Leone	296,562	Stable
Afzelia peturei	Vulnerable B2ab(iii) (assessed 2019, ver 3.1)	Democratic Republic of the Congo, Zambia	378,492	Decreasing
Afzelia quanzensis	Least Concern (assessed 2019, ver 3.1)	Angola, Botswana, Burundi, Democratic Republic of the Congo, Eswatini, Kenya, Malawi, Mozambique, Namibia, Somalia, South Africa, United Republic of Tanzania, Uganda, Zambia, Zimbabwe	6,290,416	Decreasing

Biological and trade criteria for inclusion in Appendix II (Res. Conf. 9.24 (Rev. CoP 17) Annex 2a)

A) Trade regulation needed to prevent future inclusion in Appendix I

B) Regulation of trade required to ensure that harvest from the wild is not reducing population to level where survival might be threatened by continued harvest or other influences

Information available for each of the seven African *Afzelia* species:

Afzelia africana

This species is widespread in Africa, with an estimated extent of occurrence (EOO) of 4,850,397 km² (Table 1). The species occurs in Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, DRC, Ghana, Guinea, Guinea-Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone, South Sudan, Sudan, Togo, and Uganda. As reported in the Supporting Statement, *Afzelia africana* populations were suspected to have undergone a decline of 30% over three generations (150 years) as a result of intensive and unsustainable harvesting, and the species showed a decreasing population trend as of 2020 due to ongoing harvest pressure. *A. africana* is considered endangered in Benin due to unsustainable harvest resulting in the decline of natural populations. In Burkina Faso, *A. africana* is considered nationally threatened due to overharvesting and is abundant only in protected areas and in sacred groves. It is not known for these two countries what proportion of the harvesting is for the export trade. *A. africana* was categorised as nationally vulnerable in Cameroon in 2011 due to exploitation for the international timber trade as well as deforestation for agriculture. In Sudan, *A. africana* was considered

"endangered" as a result of intensive and increasing exploitation for timber and fuelwood, encroachment of agricultural and urban areas, overgrazing, and the species' intrinsic poor natural regeneration. *A. africana* is reported to be under "immense logging pressure" in South Sudan, with large trees selectively targeted for harvest; the rate of felling is reported to exceed the species' rate of natural regeneration, and there is a risk of extirpation at a local level.

Afzelia africana *is considered to be endangered in Uganda where the species has declined dramatically in West Nile in recent years because of charcoal use and carvings for the tourist market. It is now restricted to three locations with ongoing threats. However, it is still confirmed in Murchison where it is relatively protected (GlobalTree Portal 2022). In the last two years, Uganda has experienced rampant illegal harvest of the species in protected areas and private land mainly for timber export to Asia. This prompted a government ban on the harvest and trade in 2017, though this did not stop the export trade (Hills,* in litt.*, 2022).*

Afzelia africana is *exported from Ghana where there has been no recent official inventory of the species. The national population is however suspected to be decreasing due to intensive annual fires in forest savanna ecotones of the country (Ofori,* in litt., *2022).*

Afzelia africana *is considered to be a possible substitute species for* Pterocarpus erinaceus *(Treanor, 2022)***.**

Afzelia bella
This species is widespread, with a large EOO (>5 million km²) spanning Angola, Cameroon, Central African Republic, Congo, Côte d'Ivoire, DRC, Equatorial Guinea, Gabon, Ghana, Guinea, Liberia, Nigeria, and Togo (Table 1). According to trade information in the Supporting Statement there was a significant volume of trade in 2003–2005 exported from Cameroon.

Afzelia bipindensis
This species occurs in Angola, Cameroon, Central African Republic, Congo, DRC, Gabon, Nigeria, and Uganda (Table 1). The CITES Management Authority (MA) of Zambia reports the species in Zambia. *A. bipindensis* was categorised as nationally vulnerable in Cameroon in 2011 due to heavy exploitation for the international timber trade. The species was listed as nationally endangered in DRC in 2014, as a result of unsustainable logging, deforestation caused by urbanisation and agriculture, and tree bark damage by Forest Elephants. Overexploitation of the species in DRC has led to a "continued and accelerated decline" considered "irreversible" due to illegal logging, poor forest governance, and slash and burn agriculture negatively impacting regeneration. The authors noted an increase in harvestable volume permitted by the DRC forestry administration of 8 m³ to 1,836 m³ over five years (assumed to be 2009–2014), with no accompanying conservation measures for the species.

Afzelia bipendensis *is considered to be vulnerable in Uganda where it is rarely seen and is harvested for timber. There is likely to be a small population in Uganda with only three sites noted in WCS surveys (GlobalTree Portal 2022). It is also considered to be threatened in Zambia (GlobalTree Portal 2022).*

Afzelia pachyloba
This species is native to Angola, Cameroon, Central African Republic, Congo, DRC, Gabon, and Nigeria (Table 1). *Doucet (*in litt.*, 2022) notes that* A. pachyloba *is not present in the DRC.* The distribution given in Plants of the World Online (POWO) does not include DRC.

Afzelia pachyloba was categorised as nationally vulnerable in Cameroon in 2011 due to heavy exploitation for the international timber trade. In DRC, the species is restricted to the extreme southwestern region where harvest pressure for timber, subsistence uses and cabinet making is considered to be contributing to its local disappearance; however, the species was categorised as nationally least concern in 2014. *Doucet (in litt.,* 2022) *notes that* A. pachyloba *is not present in DRC.*

In Angola, *Afzelia* spp. including *A. pachyloba* are considered "still in relative ecological balance, considering the volumes licensed annually [for harvest]"

Afzelia parviflora
This species is found in Angola, Côte d'Ivoire, Guinea, Liberia, and Sierra Leone, with an EOO of 296,562 km² and an area of occupancy (AOO) of 132 km² (Table 1).

Afzelia peturei
This species is restricted to DRC and Zambia (Table 1)*, with an estimated EOO of 378,492 km² and an estimated AOO of only 28 km² (Kamau* et al.*, 2021). Afzelia peturei* is not thought to be in trade but would be negatively impacted if included in mixed timber consignments.

Afzelia quanzensis
This species is widespread, occurring in Angola, Botswana (from the extreme northeast to the periphery of the Okavango Delta in the northwest), Burundi, DRC, Eswatini, Kenya, Malawi, Mozambique, Namibia, Somalia, South Africa, Uganda, United Republic of Tanzania (henceforth Tanzania), Zambia, and Zimbabwe, and with a large estimated EOO of >6 million km². Although widespread, the global population of *A. quanzensis* is suspected to be decreasing due to local declines from unsustainable and illegal harvest. *A. quanzensis* has also been reported to be locally threatened in Angola, Mozambique, and Somalia by timber logging and local use, and the species is listed in the national red lists of Malawi and Mozambique as vulnerable and near threatened respectively. The species' population in Malawi has declined over the past 30 years, from once being "conspicuous along riverbanks" to a level where trees can "hardly be found". The country's *A. quanzensis* population is considered to be threatened at present due to high demand for its timber and timber products. A 2012 assessment of Burundi's forest genetic resources determined that the species was nationally threatened, and mature trees are reported to be rare in Zambia. In eastern Tanzania *A. quanzensis* is considered at risk of becoming commercially extinct due to harvest pressure, with traders in some regions reportedly resorting to harvesting diseased and irregular shaped specimens for production of short planks. However, a study published in 2009 [exact fieldwork date unknown] noted that illegal logging of remaining *A. quanzensis* trees of >20 cm dbh (diameter at breast height) was still evident in Tanzania's north-eastern coastal woodlands. In Botswana, the species is "under excessive pressure" due to high demand for its wood, as well as subsistence harvest of leaves, bark and roots, forest fires and destructive foraging by elephants.

In Tanzania, a 60% decline in the population of A. quanzensis is estimated *based on seed collection data between 2000–2020 with an estimated 75% decline in use and trade in 94 local timber yards surveyed (*Mashimba*,* in litt., 2022*)*.

In Zimbabwe, Zambia, and Mozambique A. quanzensis *is of scattered occurrence, found throughout miombo woodland and also in drier areas. It is not scarce or even particularly uncommon. Sometimes a few individuals occur together in somewhat rocky areas with stands of more than five individuals rarely seen, unlike many other timber trees. Bigger, well-formed trees are often harvested for carving or higher quality timber if close to motorable tracks, especially in Mozambique. The timber is little used for general construction and not for firewood but is certainly sought after where available and accessible. Owing to its scattered distribution it is not easy to harvest systematically, so it tends to be cut down as individual trees are encountered (Timberlake* in litt., 2022*)*.

Afzelia quanzensis is considered to be threatened in Zimbabwe based on a SANBI 2001 assessment. *The Fifth National Report to the Convention on Biodiversity (CBD) by Zambia notes that* Afzelia quanzensis *is locally threatened due to exploitation with mature trees rare as a consequence (Nott* et al., 2020). *Although Mozambique has more than 100 forest species with potential for wood production,* A. quanzensis *(chanfuta) is one of the five species that dominate the trade due to demand in the national and international markets and is one of three species that together account for more than half the volume of all timber harvested (the others being* Pterocarpus angolensis *and* Millettia stuhlmannii*). Most of the exports of the main timber species exported from Mozambique are logs or low value-added products.* Afzelia quanzensisis *is one of the species that has been most affected by irregularities during the harvesting process, such as cutting trees that are smaller than the minimum permitted diameter, cutting outside of licensed areas and illegal cutting. Trees larger than the minimum permitted diameters have become difficult to find due to the pressure on logging, which incentivises cutting trees below these limits. Lack of information is also a problem since local tree fellers cut trees first and try to sell to those who show interest afterwards. Any wood not bought by foreign, often Chinese operators, is bought by local carpenters for furniture production, except curved or split wood, which is often abandoned in the forest. Forest and wildlife regulations state that 15% of the timber harvesting licence fee is intended for reforestation by the government. However, almost no replanting occurs in licensed areas. (MacQueen, 2018).*

Afzelia quanzensis *is one of the species exploited in Angola (Nott* et al., *2020).*

At the genus level, the three major *Afzelia* spp. exporting range States are Cameroon, Ghana, and Côte d'Ivoire. *Afzelia* spp. produce high-quality timber with properties comparable to *Tectona grandis* (Teak) and *Tieghemella* spp. The timber of *Afzelia* spp. is termite resistant, has a neutral pH, and is durable for use in permanent humid conditions, making it highly sought after on the international market for various construction and industrial uses including boat building and precision machinery. *Afzelia* wood is also prized for its aesthetics, and the species are also traded for use in furniture, flooring, veneer and musical instruments. As a result of their stability, durability and decorative appearance, *Afzelia* timber have high economic value and are considered one of "the very best timbers in the world".

Afzelia bipindensis *and* A. pachyloba *are traded as Doussie, one of the 24 timbers currently harvested in Gabon according to the Timber Trade Portal.*

The following table summarises data extracted from the Proposal on the volumes of legal trade recorded for *A. africana, A. bella, A. bipindensis, A. pachyloba,* and *A. quanzensis*.

Table 2. Annual and total volume of legal international trade of *A. africana, A. bella, A. bipindensis, A. pachyloba,* and *A. quanzensis* as reported by the Proposal. No data for *A. parviflora* and *A. peturei* are available. Extent of occurrence (EOO) is not known for all species (Source: SS).

Species	Extent of occurrence / current IUCN Red List assessment	Purpose of trade	Total volume of legal trade (m^3)	Period	= Annual volume of trade (m^3)
A. africana	4,850,397 km^2 / VU (2019)	Construction or structural materials, horticulture, handicrafts, jewellery	75,897	2003–2017	5,060
A. bella	5,014,355 km^2 / LC (2019)	Construction or structural materials	57,650	2003–2005	19,217
A. bipindensis	VU (1998)	Unknown	1,450	2019–2021	483
A. pachyloba	VU (1998)	Unknown	44,275	1991–2021	1,428
A. quanzensis	6,290,416 km^2/ LC (2019)	Construction or structural materials	4,425	2021	4,425

Inclusion in Appendix II to improve control of other listed species

A) Specimens in trade resemble those of species listed in Appendix II under Res. Conf. 9.24 (Rev. CoP17) Annex 2 a or listed in Appendix I

It is considered difficult to distinguish between the timber of different African *Afzelia* spp. using morphological characteristics and timber of different species is traded under the same trade names.

Additional information

Threats

Local subsistence harvest for fuelwood, charcoal, livestock fodder, and traditional medicine ingredients put additional pressure on *Afzelia* spp. Seedlings are susceptible to fire, browsing and drought. Additionally, numerous *Afzelia* spp. range States are undergoing significant deforestation.

Conservation, management and legislation

Legislative measures to protect national populations of *Afzelia* spp. are in place in a number of range States. *Cameroon, Gabon, Central African Republic, DRC, and Congo have all defined minimum cutting diameters for* Afzelia *species. Minimum recovery rates are also imposed (Doucet* in litt., *2022)*.

Artificial propagation

Preliminary results of mixed stand plantation trials in Côte d'Ivoire recommend mixed forest plantations of 13 timber species, including *A. africana*, for wood production and provision of other ecosystem services. In Sudan, *A. africana* is reportedly grown in nurseries and has been cultivated along rivers in several regions.

In Burkina Faso, agroforestry management practices for *A. africana,* such as assisted natural regeneration, seedling or sapling transplantation within farmlands, have not been practised. This might be due to the magic or taboo status associated with *A. africana* that poses major challenges to its domestication and sustainable conservation within the country (Balima *et al*., 2018).

Plantation trials of *A. quanzensis* were established in Mozambique in the early 1930s; after 60 years, plantation trees were found to have shorter trunks and lower branches than wild specimens. It was noted that plantation production of slow growing hardwood species such as *A. quanzensis* represented a poor economic return and does not reduce harvesting pressure on wild stocks.

Implementation challenges (including similar species)

The implementation of CITES for valuable African timbers has proved challenging and it has been suggested that substantial funds may be required to produce non-detriment findings (NDFs) (ATIBT Flash News, 2022).

The volume of re-exports of worked products of Afzelia *produced in non-African countries could produce a significant implementation burden.*

Trade in African mahogany may refer to both Khaya *and* Afzelia *species, both of which are proposed to be included in Appendix II with Annotation #17 at CoP19. If one is listed and not the other, this could create challenges for customs officials.*

Potential risk(s) of a listing
A potential risk of listing is to shift the burden of international trade to related species with desirable timbers including Asian Afzelia *spp*. The two genera *Afzelia* and *Intsia* are closely related and wood of the two can easily be confused: careful examination is needed to distinguish *I. bijuga* from *Afzelia* spp. timber. Similarly, expert knowledge and chemical tests are needed to differentiate between timber of the Asian *Intsia palembanica* and *Afzelia* spp. Neither *I. palembanica* nor *I. bijuga* naturally occur in any of the African *Afzelia* spp. range States; I. bijuga *is native to Madagascar* but has been planted in Tanzania.

Potential benefit(s) of listing for trade regulation
Forest concessions in the Congo Basin cover over 50 million ha. Most are managed under a management plan, which has proved to be the best tool for planning timber harvests, even if readjustments are needed. Mechanisms to verify that production is legal have been set up in recent years (notably through Voluntary Partnership Agreements (VPAs) and the EU Timber Regulation (EUTR), as have voluntary certification standards. A ban on export of logs for all the Central African countries is forthcoming. The States of the region are preparing to support in-depth transformation of the sector with a set of reforms. A different challenge is oversight of the timber sector in local markets, which accounts for a significant portion of timber harvest, but which jeopardises the sustainability of forest resources and produces no direct benefits for nation states. Formalisation of this sector will require adaptation of national regulatory frameworks and the development of transactions within a reorganised sector (*Eba'a Atyi* et al., *2022).*

Efforts to improve sustainable forest management and promote certification such as those for the Congo Basin could potentially be reinforced by the CITES listing. Furthermore, it could establish necessary controls needed for more effective data gathering on trade and support regional collaboration in data sharing and transparency as recommended by Mahonghol et al. *(2020).*

Other comments
Afzelia *is within the scope of certification schemes as the FSC Certificates Public Dashboard records certificates for the genus relating to Cameroon, Gabon, and Ghana.*

The proposal notes that Afzelia *spp. are nitrogen fixing legumes. This is not the case (Doucet* in litt., *2022; Timberlake* in litt., *2022).*

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Deletion of North Indian Rosewood *Dalbergia sissoo* from Appendix II

Proponents: India, Nepal

Summary: North Indian Rosewood *Dalbergia sissoo* is a fast-growing perennial tree, native to Afghanistan, Bangladesh, Bhutan, India, Myanmar, Nepal, and Pakistan, and also widely introduced, especially in Africa and Asia. In some regions it is considered invasive. The population size is not known, and although disease has impacted both wild and cultivated populations in a number of range States, the species' high regeneration and growth rate provide resilience to this threat. In Bangladesh, India, Nepal, and Pakistan the species is widely cultivated and has also successfully naturalised following afforestation programmes. The species was assessed by IUCN as Least Concern in 2019.

Dalbergia sissoo is primarily harvested for its timber, which is used for a wide range of products including handicrafts and furniture. It has become one of the most widely used plantation tree species in the Indian subcontinent where it is economically important for its value in forestry, agroforestry, and horticulture.

The entire genus *Dalbergia,* apart from those species already included in Appendix I, was included in Appendix II at CoP17 (2016) with annotation #15. It was argued at the time of the proposed listing that only some *Dalbergia* species met the criteria in Annex 2a, but enforcement and customs officers who encountered specimens of *Dalbergia* products would be unlikely to be able to distinguish reliably between the various species. At CoP18, an unsuccessful proposal (Prop. 51) was submitted to delete *Dalbergia sissoo* from the Appendices. India as one of the proponents raised particular concerns over the impact that the listing of *Dalbergia sissoo* had had on its handicraft industry. However, at CoP18 (2019), annotation #15 was amended to include an exemption for wood products under 500 g. It was believed that this might mitigate some of the impacts on the handicraft industry, although it is unclear if this has been the case.

India has had a reservation in place for the genus since 2017, as well as stricter domestic measures banning the export of all wild specimens of all species, with a few exceptions including trade in *Dalbergia sissoo*.

From 2017 to 2020, the predominant commodities of *D. sissoo* reported in direct CITES trade were wood products (~19.5 million kg, plus ~1.5 million items) and carvings (~6.3 million kg plus ~40,000 items), reported by importers. Most were reported as sourced from artificial propagation (74% of items reported by weight, and 80% of those reported by number), and the remainder were declared as from Pre-Convention and wild sources, with sources changing from primarily Pre-Convention in 2017 to artificial propagation. The majority of trade was reported as from India, and trade was stable between 2017 and 2020, with ~6.5 million kg reported as imported from India annually (India did not report this trade). Importers were primarily the EU, the USA, and the UK.

Many experts acknowledge that, without the use of technology, it is difficult for non-experts to readily identify *Dalbergia sissoo* once made into finished products, which appear to be the predominant form in which *D. sissoo* is traded. While technological methods to identify *D. sissoo* exist, they require expertise and/or equipment not currently available on a global scale.

Analysis: Wild populations of *Dalbergia sissoo* are found over a large range and in general there is no evidence that they are declining due to trade. The species is of significant economic importance in several range States, particularly India and Pakistan, where large volumes of trade are sourced from artificially propagated populations. While the species does not meet the criteria for inclusion in Appendix II in Annex 2a of Res. Conf. 9.24 (Rev. CoP17), differentiating this species in trade from all other *Dalbergia* species does, at present, remain an implementation challenge. While methods exist to differentiate *D. sissoo* from other members of the genus in international trade, these require expertise and technology not currently available globally. The species therefore meets the criteria in Annex 2bA. If this proposal were accepted *Dalbergia sissoo w*ould be the only *Dalbergia* species not included in the Appendices.

Summary of Available Information

Text in non-italics is based on information in the Proposal and Supporting Statement (SS), text in italics is based on additional information and/or assessment of information in the SS.

Taxonomy

There is no CITES Standard Reference for Dalbergia*.*

The CITES Dalbergia *Checklist (Cowell* et al. *2022) will be proposed as the CITES Standard Reference at CoP19 (CoP19 Doc. 84.1).*

Range

Native: Afghanistan, Bangladesh, Bhutan, India, Islamic Republic of Iran, Iraq, Myanmar, Nepal, Pakistan *(although according to Javaid et al., (2014) it was introduced to Pakistan in the mid-1800s). The IUCN Red List assessment does not include Iraq in its range (Lakhey* et al*., 2020).*

Introduced: Antigua and Barbuda, Australia, Benin, Brazil, Burkina Faso, Cameroon, Chad, China, Cyprus, Dominican Republic, Ethiopia, French Polynesia, Ghana, Guinea Bissau, Indonesia, Israel, Kenya, Malawi, Malaysia, Mauritius, Mozambique, New Caledonia, Niger, Nigeria, Oman, Pakistan, Panama, Paraguay, Philippines, Puerto Rico, Senegal, Sierra Leone, South Africa, Sri Lanka, Sudan, Thailand, Togo, Uganda, United Republic of Tanzania, Uganda, United States of America, Virgin Islands of the USA, Zambia, Zimbabwe.

IUCN Global Category

Least Concern (assessed 2019, criteria version 3.1)

Biological and trade criteria for retention in Appendix II (Res. Conf. 9.24 (Rev. CoP 17) Annex 2a)

A) Trade regulation needed to prevent future inclusion in Appendix I

B) Regulation of trade required to ensure that harvest from the wild is not reducing population to level where survival might be threatened by continued harvest or other influences

Dalbergia sissoo is a fast-growing tree primarily harvested for its timber, which is used to produce a wide range of products including handicraft items, boats, carts, carriages, gun handles, rail-sleepers, cabinets, furniture, decorative veneer, ornamental turnery, plywood, musical instruments, skis, carvings, tool handles, floorings, etc. Within India, *D. sissoo* is said to be the second most important cultivated timber tree.

The species is native to nine range States and has also been introduced to many others. In some cases, it is considered to be an invasive species (CABI, 2022). While there is a lack of data regarding the status of natural populations (Dhayani, in litt*., 2019),* Dalbergia sissoo*'s natural range primarily occurs throughout the sub-Himalayan tract and outer Himalayan valley, ranging from Bangladesh to Afghanistan (Khan, 2000). It is also reported to be widespread in plantations within Bangladesh, India, Nepal, and Pakistan (Hossain and Martin, 2013; Javaid* et al.*, 2014). While their current extent is unclear, in 1979, Pakistan was said to have 100,000 ha of irrigated plantations (National Research Council, 1979). The global Extent of Occurrence (EOO) was estimated at 4,074,747 km^2 (Lakhey* et al.*, 2020).*

Within India the extent of occurrence is at least 198,974 km^2 considering only the sub-Himalayan tracts from where wild subpopulations of the species are reported. In parts of India, following afforestation programmes, this adaptable species has also become naturalised, further increasing its range.

Wild subpopulations in different parts of India comprise medium-sized, sometimes large trees, unevenly distributed, with a reported 8–38 mature individuals per ha, compared with 3–39 per ha for cultivated stocks and up to 1,600 per ha for pure and monospecific plantations. In 2021 the number of *D. sissoo* trees outside of forests was estimated to be over 75 million trees in India, an increase of 1 million since 2017. Although disease has caused population declines in some parts of India during the last few decades, based on a recent non-detriment finding (NDF) study submitted by the Botanical Survey of India, the species is not considered to be under threat. Harvest or trade primarily utilises cultivated trees, although wild exports have been reported (see below).

The Supporting Statement of CoP18 Prop. 51 reported that between February 2013 and November 2016, a total of 4,739 shipments of Dalbergia sissoo *were exported from India, worth USD1,079,870, (with an average price per unit of USD4.15 and average value per shipment of USD228), destined for a number of countries around the globe.* The Supporting Statement of the current CoP19 proposal additionally states that the price per cubic foot of wood ranged between INR400–INR750 (~USD5–USD9), and that of logs ranged between INR800–INR4,500 (~USD10–USD56) according to online advertisements in May 2022[1].

[1] Conversion INR to USD on 1st May 2022 was INR 0.012905 to USD 1, according to www.xe.com, accessed 22nd July 2022.

According to the CITES Trade Database, the predominant commodities in trade in 2017 were wood products and carvings (see Table 1). Trade data are not yet complete for 2021. There were significant discrepancies reported by exporting countries and importing countries, with importers reporting far more than exporters (see Table 1). India (the main reported exporter) has submitted all CITES annual reports for 2017–2020, and the main importers (EU Member States[2] and the UK) have submitted annual reports for 2017–2020, except for the USA (at the time of writing 2019 and 2020 had not yet been received). According to LEMIS data, the USA imported 150 D. sissoo *wood products and refused the import of a further 245 (242 of which were subsequently seized) originating from Pakistan and India, between 2017 and 2019. India has taken a reservation on* Dalbergia *spp. (since January 2017) and a Notification (2018/031) states that India has banned the export for commercial purposes of all wild-taken specimens of species in the appendices apart from certain products of* Dalbergia sissoo *and* D. latifolia, *explaining some of the discrepancies between importer and exporter reported data.*

Table 1. Global CITES trade in *Dalbergia sissoo* 2017–2020 reported by importing and exporting countries, by trade term and source.

		Number of items		Weight (kg)	
Term	**Source**	**Importer-reported**	**Exporter-reported**	**Importer-reported**	**Exporter-reported**
Carvings	A	37,139	199	1,100,903	
	O	3,048		5,221,589	
	W	186		3,949	
Derivatives	A	1,182		444	
	O	1,080		7,958	
Timber	O			33,152	
Wood product	A	1,164,898	114,292	17,959,203	
	O	89,711	236	1,497,947	
	W	199,462	110	83,223	14,896
Total		1,496,706	114,837	25,908,368	14,896

Artificially propagated ("A"), Pre-Convention ("O"), and Wild-sourced ("W"; CITES Trade Database, 2022).

Nearly all trade reported by importers was sourced from artificial propagation (74% of items reported by weight, and 80% of those reported by number), and the remainder was from Pre-Convention and wild sources, with the source changing from primarily Pre-Convention in 2017 to artificial propagation. The majority of trade was reported as from India, and trade was stable between 2017 and 2020, with ~6.5 million kg reported as imported from India annually (India did not report this trade) and Pakistan and Egypt exporting low volumes. Virtually all trade was for commercial purposes (>99%). The main importers were the EU (predominantly France but also others including Poland and the Netherlands), the USA, and the UK.

In the years 2017 and 2018, 2,206 import permits for ~12 million kg of furniture made of Dalbergia sissoo *were issued by the German Management Authority (*in litt., *2019). In comparison, only ~5 million kg of other small wood products (most of them chess boards/pieces) were imported with 28 import permits over that period.*

Between 2017 and 2020, seizures of Dalbergia sissoo *were reported by the EU (including reports made by the UK prior to 2019), primarily because they were shipped without CITES permits, and totalling 29,738 items including wood products, carvings, and pieces of timber (EU-TWIX, 2022). The majority were reported as originating from India (96%), with the remaining from unknown origin, Nepal, Pakistan, and the USA (EU-TWIX, 2022). Further* Dalbergia *seizures recorded to genus level may also include* D. sissoo. *A total of 392 seizure events involving the genus* Dalbergia *were reported in WiTIS between 2006 and 2022.*

Retention in Appendix II to improve control of other listed species

A) Specimens in trade resemble those of species listed in Appendix II under Res. Conf. 9.24 (Rev. CoP17) Annex 2 a or listed in Appendix I

In 2017, the entire Dalbergia *genus was listed in CITES Appendix II except for the species listed in Appendix I. It was argued at the time of the proposed listing that some species met the criteria in Annex 2a but that enforcement and customs officers who encountered specimens of* Dalbergia *products would be unlikely to be able to distinguish between the various species of* Dalbergia *reliably so that that the whole genus should be listed. It was also noted that many species of* Dalbergia *have the same wood anatomy, and the process of identification of different species*

[2] With the exception of Luxembourg for which no CITES annual report was available for 2020 at the time of writing.

is very difficult, due to the hardness of the wood which hampers the preparation of thin sections for microscopic analysis (McLure et al.*, 2015).*

The Supporting Statement notes that living *Dalbergia sissoo* is easy to identify and is unlikely to be confused with other species. *However, live specimens are not the main product in trade.*

"Topical legumes: Resources for the future" published in 1979, states that "Although closely related to the rosewoods Dalbergia sissoo *wood is light coloured and lacks the rosewoods' striking grain" (National Research Council, 1979). However, many experts acknowledge that, without the use of technology or high levels of expertise, it is difficult for non-experts readily to identify* Dalbergia sissoo *once made into finished products (Hartvig* et al.*, 2015; Dhyani,* in litt.*, 2019; Koch,* in litt.*, 2019, 2022; Sivadas,* in litt.*, 2019; Vlam and Zuidema,* in litt.*, 2019; Ahmedullah,* in litt.*, 2022).*

*Koch (*in litt.*, 2022), also notes that, in particular,* Dalbergia oliveri *(range: Myanmar, Thailand, Lao People's Democratic Republic (PDR), Viet Nam, and Cambodia) bears a similar colour and texture to* D. sissoo *and requires expertise for differentiation, particularly if the origin of the wood is unknown.* D. oliveri *was assessed as Critically Endangered (A2cd+3cd+4cd) in the IUCN Red List in 2020 (Barstow* et al.*, 2022).*

A range of techniques to enable the identification of Dalbergia sissoo *in trade is available (Hartvig* et al.*, 2015; Espinoza,* in litt.*, 2019; Koch,* in litt.*, 2019; Vlam and Zuidema,* in litt.*, 2019; Ahmedullah,* in litt.*, 2022; Sivadas,* in litt.*, 2022):*

Macro- and microscopic visual methods
Macroscopic visual identification methods using identification guides (such as CITESwoodID) can be utilised by non-experts to identify Dalbergia sissoo *to genus level (Koch, in litt., 2022). However, to identify* D. sissoo *to species level, microscopic inspection of a range of additional structural features is required, which demands a high level of expertise and laboratory equipment to perform (Koch,* et al.*, 2011; Koch,* in litt.*, 2022). The only exception is for distinguishing between* D. sissoo *and* D. latifolia *when the origin country is known, for which macroscopic inspection would suffice (Koch* in litt.*, 2019). The level of expertise and experience required to perform microscopic inspection (Dormontt* et al.*, 2015; Koch,* in litt.*, 2019), means that, at present, this technique is not widely available to global enforcement efforts. In addition, others consider that visual techniques cannot always be used to identify wood within composite materials, or that have been stained/dyed a different colour. In addition, the increasing artificial propagation of* D. sissoo *outside of its native range, results in wood that resembles juvenile wood (for example, wider growth rings and lower wood density), and is therefore distinguishable as likely artificially propagated (Koch* in litt.*, 2022).*

Near-Infrared and Raman Spectroscopy
The Supporting Statement notes that the Indian Institute of Science, Bengaluru uses Raman Spectroscopy and the Institute of Wood Science and Technology (IWST), Bengaluru uses Near Infrared Techniques to differentiate various wood samples. *The IWST has developed near-infrared and Raman Spectroscopy techniques to differentiate wood samples, however an extensive library of reference materials are needed from across the* Dalbergia sissoo *range to implement (Ahmedullah* in litt.*, 2022). If developed, portable equipment (Raman Spectrometer) would aid customs agencies to identify wood samples (Ahmedullah,* in litt.*, 2022).*

DART TOFMS
Technological methods include DART TOFMS (Direct Analysis in Real Time, Time of Flight Mass Spectrometry), which has proven ability to identify Dalbergia sissoo *in trade (Espinoza,* in litt.*, 2019). This system works by combusting a small sample of wood, which enables its chemical profile to be analysed. It is capable of identifying samples to species level, with 2,000 species (including 90% of those listed within CITES) catalogued within its database, including* D. sissoo*. The system is also accurate regardless of the age or part of the tree that is tested, and with the exception of very thin plywood (which is contaminated with glue), it is capable of identifying all forms of wooden products in trade. The cost of this system (USD250,000 to install and, in the US, USD250 to process each sample in 2019) may currently be a barrier to its implementation, and to date, uptake of the system by global enforcement agencies has been low (Espinoza*, in litt.*, 2019), with only very few specialised laboratories operating the method for the purpose of customs identification (Koch,* in litt.*, 2022). It is not widely known to be used in India (Ahmedullah,* in litt.*, 2022).*

DNA barcoding
DNA barcoding is another technology available for identification *and has been demonstrated as capable of identifying* Dalbergia sissoo *to species level (Hartvig* et al.*, 2015). However, to be used practically, this technique first requires the creation of reference datasets, or species-specific assays. DNA extracted from timber may also be of poor quality, which can hamper the process (Hartvig* et al.*, 2015). This technology has also been used to differentiate eight endangered* Dalbergia *timber species from China, South-East Asia, Africa and South America (He* et al.*, 2018).*

At the present time, therefore, a considerable gap remains between the potential and realised application of such methodologies (Dormontt et al.*, 2015).*

Additional information

Threats

The main impacts on wild and cultivated populations of *Dalbergia sissoo* are fungal and bacterial diseases (root rot, wilt, and dieback being the diseases that have the largest impact) and insect infestations. Wilt disease has been reported from some plantations within India where *D. sissoo* has been raised in unsuitable conditions, and older trees are more susceptible to the disease. *Plantations of* D. sissoo *have suffered from significant dieback in Bangladesh, where mortalities in excess of >50% have been reported (Winfield* et al.*, 2016).* The frequency of mortality due to diseases is also lower in wild subpopulations than in cultivated plantations. The species' high regeneration and growth rate, however, reduces their impact upon the species as a whole.

Conservation, management and legislation

The Government of India has banned the export for commercial purposes of all wild-taken specimens of species included in Appendices I, II and III. It has, however, taken a general reservation to Dalbergia *spp. (except species in Appendix I) and permits the export of cultivated varieties of plant species included in Appendices I and II and of products from wild sourced* D. sissoo *and* D. latifolia *that are authorised for export by a CITES Comparable Certificate, except logs, timber, stumps, roots, bark, chips, powder, flakes, dust, and charcoal. CITES Comparable Certificates will be issued with a footnote, stating that the wild (W) source specimens are covered under Legal Procurement Certificate as per regional and national laws in India (Notification No. 2018/031).*

The Supporting Statement also notes that within India, wild populations of *Dalbergia sissoo* are found within several protected areas where it is prohibited to remove trees, in accordance with the Wild Life (Protection) Act, 1972. Harvest outside of protected areas is regulated but this varies geographically. Its fast growth rate and use within a number of industries have made *D. sissoo* a preferred choice for forest departments and other agencies undertaking afforestation programmes, and also for farmers who grow this species for commercial use.

Apart from the CITES Management Authority of India, the Export Promotion Council for Handicrafts (EPCH) is also authorised to issue CITES comparable documentation for export of *D. sissoo* specimens from India. EPCH has developed the "Vriksh standard Timber Legality Assessment and Verification Scheme". EPCH issues "Vriksh Shipment Certificates" for exporting goods containing *D. sissoo* by verifying various documents ensuring legal acquisition.

Artificial propagation

The species can be found in plantations and/or agroforestry systems in almost every part of India. It can be found growing under controlled conditions within farms, gardens, and plantations. Artificial propagation is widely available and possible from almost all common practices such as: sowing seeds; planting stumps, root sections, and stem cuttings; cloning cuttings; and entire transplanting. Stump and root planting was said to be the most effective method of artificial regeneration. Artificial propagation in India is frequently carried out by the Forest Departments of almost all Indian States and Union Territories. Commercial plantations exist in both the area of natural distribution (Indian subcontinent), as well as in China and some African countries. *A new source code "Y" was adopted at CoP18 for assisted production which would seem more appropriate for India's production systems (see Res. Conf. 11.11 (Rev. CoP18)).*

Implementation challenges

Dalbergia sissoo is easy to identify as a whole tree with leaves (e.g. live), *however the species is not commonly traded as live or as a whole organism* (CITES Trade Database, 2022). In India, *Dalbergia sissoo* is primarily harvested for its timber which is used in the making of handicraft items, furniture, boats, carts, carriages, gun handles, rail-sleepers, cabinets, decorative veneer, ornamental turnery, plywood, musical instruments, skis, carvings, boats, tool-handles, floorings, etc.

Identification of timber from other species of *Dalbergia* requires analysis of anatomical features, genetic sequencing, or DART TOFMS, Near-Infrared and Raman Spectroscopy. *It is unclear how many range States of* Dalbergia sissoo *have access to this technology and whether the capacity exists to implement at a wide scale. It is unclear whether artificially propagated and wild-sourced* D. sissoo *wood can be distinguished (Chen,* in litt.*, 2022).*

Potential risk(s) of a deletion

A lack of enforcement capability would leave open the possibility of other rosewood species being misdeclared as Dalbergia sissoo*, with the detection and prosecution of these crimes hampered by the practical difficulties outlined above. As the range of* D. sissoo *overlaps with that of other* Dalbergia *species, (Winfield* et al.*, 2016), it is conceivable that such opportunities may arise. Prior to the* Dalbergia *genus listing, traffickers were said to have taken advantage of gaps in the CITES listings for rosewood, for example, by misdeclaring* D. retusa*, as the then unlisted and similar-looking,* D. bariensis *(EIA, 2016).*

There was no mention in the Supporting Statement of whether wild-sourced trees are favoured over artificially propagated individuals, or vice versa, for their timber quality or other reasons. The deletion of the species from the appendices may have implications for wild populations (Chen, in litt*., 2022).*

Potential benefit(s) of deletion for trade regulation

The Supporting Statement notes that since the listing of *Dalbergia* in CITES Appendix II in 2016, the value of exported furniture and handicrafts has decreased from ~USD129 million per annum before listing to ~USD64–USD77 million after listing. Additionally, it was noted that the share of *D. sissoo* products in total woodware exports from India decreased from 25% (before the 2016 listing) to 7.29% after the listing (2021–2022). It was noted that this has affected the livelihoods of around 50,000 artisans working with the species, as well as other stakeholders involved in the supply chain.

It is possible that deleting *Dalbergia sissoo* from Appendix II would mitigate the negative impacts that this listing has reportedly had on some areas of international trade, particularly the negative impacts on the trade in wooden handicrafts and furniture from India.

Other comments

Many species of Dalbergia *are under a range of threats, including deforestation, forest conversion for agriculture/human development, and legal and illegal logging to supply domestic and international markets (Winfield* et al.*, 2016). Trade in some species of* Dalbergia *considered to be "precious woods" with high market values, has resulted in their overexploitation (Jenkins* et al.*, 2012). The Genus* Dalbergia *currently includes 269 accepted species according to Kew Plants of the World (POWO, 2022). The IUCN Red List has assessed 270 species, with 20 Critically Endangered, 55 Endangered, 55 Vulnerable, 18 Near Threatened, and the remainder Data Deficient (26) and Least Concern (96). One of the assessed species,* D. gloveri*, is not accepted by POWO.*

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Inclusion of Cumaru *Dipteryx spp.* in Appendix II with new annotation designating logs, sawn wood, veneer sheets, plywood and transformed wood, and seeds

Proponents: Colombia, European Union, Panama

Summary: *Dipteryx* is a taxonomically complex genus encompassing 14 species of large, canopy emergent, slow growing trees distributed across Central and South America and occurring in tropical rainforest, seasonally dry forests, and woodlands. The genus is targeted for its valuable hardwood timber (traded as Cumaru, Shihuahuaco, and Brazilian Teak), as well as its seeds (known as tonka beans), which are traded internationally for use in the fragrance, tobacco, and food industries. In several range States *Dipteryx* spp. are also locally important for food, traditional medicine, charcoal, oil, as shade trees in cocoa agroforestry systems, and providing livelihoods to indigenous and local communities involved in the tonka bean supply chain. *Dipteryx* spp. face deforestation and habitat degradation throughout their global range, and logging adds to the pressure on wild populations.

The proposal is to include the species *Dipteryx alata*, *D. micrantha*, *D. odorata,* and *D. oleifera* in Appendix II of with Criterion B of Annex 2a of Resolution Conf. 9.24 (Rev. CoP17), and to include the remaining species of the genus *Dipteryx* in Appendix II of CITES for lookalike reasons, satisfying Criterion A of Annex 2b, with a new proposed annotation: "Logs, sawn wood, veneer sheets, plywood, transformed wood, and seeds" (current Annotation #17 with the addition of seeds).

- ***Dipteryx alata:*** Assessed as Vulnerable on the IUCN Red List in 2017 with a decreasing population trend, but no population estimate available. Occurs in Brazil, Paraguay, Plurinational State of Bolivia (henceforth Bolivia), and possibly Peru with an estimated extent of occurrence of seven million km^2. The species has undergone declines estimated between 30–50% over three generations in parts of its range. The seeds are harvested for tonka beans (see below).
- ***Dipteryx micrantha:*** Assessed as Data Deficient on the IUCN Red List in 2017 with a decreasing population trend. Occurs in Brazil, Ecuador, Peru, and possibly Bolivia, and Colombia. *D. micrantha* is reported to reach reproductive maturity at a minimum of 40 cm dbh (diameter at breast height) and live over 1,000 years. Considered in decline due to overharvest for timber, particularly in Peru where large volumes have been reported in exports: over 82 million kg (~ 76,000 m^3) reported between 2018 and 2021 with 51 million kg (~7,000 m^3) going to China, 19 million kg (~ 17,000 m^3) to the EU and 1.8 million kg (~ 1,700 m^3) to the USA. The population is estimated to have undergone a 33% decline in Peru between 2000 and 2020 with larger future declines projected.
- ***Dipteryx odorata:*** Assessed as Data Deficient on the IUCN Red List in 2017 with a decreasing population trend. Occurs in Bolivia, Bolivarian Republic of Venezuela (henceforth Venezuela), Colombia, French Guiana, Guyana, Honduras, Suriname, and possibly Peru. Introduced in Bahamas, Dominica, and Trinidad and Tobago. Nationally assessed as vulnerable in Colombia. The species is very slow growing and reaches maturity at 39 cm dbh. Timber harvest is believed to have major impacts on the species. High levels of timber trade are reported from Brazil and Colombia. The seeds harvested for tonka beans.
- ***Dipteryx oleifera:*** Least Concern on the IUCN Red List in 2020 and occurring in Colombia, Costa Rica, Nicaragua, Panama, Ecuador, and Honduras. Nationally assessed as vulnerable in Costa Rica, Colombia, and Panama. Currently listed in CITES Appendix III (under synonym *D. panamensis*) by Costa Rica (since 2003) and Nicaragua (since 2007), with a zero export quota for Nicaragua in 2022. The majority of trade since then has been reported by importers, originating from Panama (~ 51,000 kg, or ~ 47 m^3), just under half of which was declared as from seized and/or confiscated sources.

Europe, the USA, and China are key importers of *Dipteryx* timber. Bolivia exported ~3.5 million kg of Cumaru to the European Union (EU) in 2019, and exports from Brazil to the USA and EU in 2018–2021 were around 11 million kg and 7 million kg, respectively. The genus *Dipteryx* comprised 80% of all

wood exports from Peru in 2015. The timber of different *Dipteryx* species is not easily distinguished and is often traded under the genus, trade names, and common names comprising multiple species. The main products in trade appear to be logs, sawn wood, strips and joinery, decking.

Tonka beans are primarily harvested from *D. punctata, D. odorata,* and *D. alata*. *Dipteryx punctata* and *D. alata* have the shortest reported time to reach maturity of the *Dipteryx* species, estimated at 5–6 years. International trade in tonka beans boomed in the early 20th century, with intensive wild harvesting taking place, and declined in the 1940s. Current trade levels are reportedly a fraction of what they once were due to regulatory and voluntary restrictions on use of coumarin as an additive in the food and tobacco industries over recent decades. Presently, Brazil and Venezuela are the main range States supplying wild-sourced tonka beans to the international market for use in the perfumery and the food industry. Harvesting in Venezuela and Brazil is reportedly primarily carried out by indigenous communities, being an integral part of livelihoods and providing an alternative to involvement in extractive industries. Some experts note that the exploitation of tonka beans is driving conservation efforts for the species involved. Seeds are proposed for inclusion in Appendix II as a Precautionary measure because the impact of current tonka bean trade remains unknown. It has also been argued that, were onerous harvesting restrictions on seeds to be imposed, those who rely on the harvest for their livelihoods might turn to other, possibly destructive, uses of the parent trees, thereby having a negative impact on tree populations.

Several species of *Dipteryx* are traded under the common names Cumaru or Shihuahuaco and are neither distinguishable nor identified to species level in trade. It is not possible to distinguish the individual species within the genus *Dipteryx* using macroscopic or microscopic identification of wood anatomy, although identification of *D. alata, D. ferrea, D. micrantha, D. odorata,* and *D. punctata* using genetic markers is currently possible. Furthermore, *D. alata* and *D. odorata* are "commonly confused" in trade with *Handroanthus* spp., *Tabebuia* spp., and *Roseodendron* spp. traded as "Ipê" and the subject of Prop. 44.

Analysis: Trees in the genus *Dipteryx* are generally slow growing, and most species take a long time to mature (46–177 years), while *D. alata* and *D. punctata* have a faster age of maturity (5–6 years). Due to the slow growth of the main species in trade, the genus is particularly vulnerable to overexploitation, and the primary identified threat to *Dipteryx* is logging for timber. International trade in *Dipteryx* timber appears to be increasing. The seeds of *D. punctata, D. odorata,* and *D. alata* are also in trade primarily from Brazil and Venezuela as tonka beans, and it is unclear whether the harvest of seeds negatively impacts the species.

Dipteryx alata appears to meet Criterion B of Annex 2a of Res. Conf. 9.24 (Rev CoP17) on the basis of ongoing and historic decreases of over 30% over three generations driven by deforestation. While *D. odorata* and *D. micrantha* are both assessed as Data Deficient and do not have enough population information available to infer global population trends, they are both perceived to be decreasing and are assessed as threatened in parts of their range, with reported timber exports from Peru being a particular cause for concern, as well as very slow growth rates and age of maturity for both species. *D. oleifera* has been nationally assessed as vulnerable in three range States. Since its listing in Appendix III by Costa Rica (2003) and Nicaragua (2007) low levels of trade have been reported; however, given the generally poor reporting of trade in Appendix III listed species, this may not be an accurate representation of global levels of trade. Based on available information, it is unclear whether or not *D. odorata, D. micrantha,* and *D. oleifera* also meet Criterion B of Annex 2a. However, due to the difficulties of identification of timber and trade under the same name, these species meet Criterion A of Annex 2b.

While the remaining species also do not have sufficient population data to determine whether or not they meet the criteria for listing, due to significant taxonomic uncertainty, issues of timber identification, reporting of trade under generic and common names, uncertain distributions in range States, and nationally assessed threat levels, the genus appears to meet Criterion A of Annex 2b. *Dipteryx alata* and *D. odorata* are "commonly confused" with *Handroanthus* spp., *Tabebuia* spp., and *Roseodendron* spp. (known as "Ipê") which are proposed for listing in Proposal 44, therefore they would also meet the criteria in Annex 2bA were that proposal to be accepted.

Annotation
From available trade data the products most in trade from range States are timber and timber products and would be covered by the proposed new annotation or by #17. The overall impact of tonka bean harvesting remains unclear, with some considering its harvest contributes to the conservation and management of the species. Therefore, Annotation #17 without the addition of seeds may be more appropriate until strategies to mitigate potential negative impacts on livelihoods, and knock-on effects on forest cover, are developed in accordance with Res. Conf. 16.6 (Rev. CoP18) on *CITES and livelihoods*.

Summary of Available Information

Text in non-italics is based on information in the Proposal and Supporting Statement (SS), text in italics is based on additional information and/or assessment of information in the SS.

Taxonomy
The Proposal follows the taxonomy according to Carvalho *et al.* (2020), as outlined in CoP19 Doc. 84.2.

Fourteen species of the genus *Dipteryx* are currently recognised, following a nomenclatural review conducted in 2020 (Carvalho *et al*.; Table 1). However, there is considerable taxonomic uncertainty regarding *Dipteryx*.

In 2021, Carvalho *et al.* (2021) published a proposal to rename *D. oleifera* under its synonym "*Coumarouna panamensis* (*D. panamensis*)", on the basis that *C. panamensis* and *D. panamensis* are more well-established names for the species and have been used in numerous national and regional floras, government publications and long-term ecological and socioeconomic studies. *Dipteryx panamensis* (*Dipteryx oleifera* according to the proposed standard reference) is currently listed in CITES Appendix III by Costa Rica (since 2003) and Nicaragua (since 2007), with a zero-export quota for Nicaragua in 2022.

Table 1. Taxonomy of *Dipteryx* according to various sources. An asterisk (*) indicates the species being proposed under Annex 2a Criterion B, dagger (†) indicates a species listed in CITES Appendix III.

Species according to the proposed standard reference (*Dipteryx*, Carvalho *et al.*, 2020)	**Kew Plants of the World Online (POWO, 2021)**	**Botanical Gardens Conservation International Global Tree Search (BCGI, 2021)**	**Systematic revision by Carvalho *et al.* (in prep.)**	***Pariente Mondragon (2018)***
D. alata Vogel (1837)*				
D. casiquiarensis (Pittier) Lewis and Gasson (2000)	Not accepted	Not accepted	Synonym of *D. magnifica*	
D. charapilla (J. F. Macbr.) Ducke (1948)				
D. ferrea (Ducke) Ducke (1940)		Not accepted		*Synonym of* D. charapilla
D. lacunifera Ducke (1948)				
D. magnifica (Ducke) Ducke (1940)				
D. micrantha Harms (1926)*				*Synonym of* D. alata
D. odorata (Aubl.) Forsyth f. (1794)*				
D. oleifera Benth. (1850)* †				
D. polyphylla Huber (1913)				
D. punctata (S.F.Blake) Amshoff (1939)				
D. rosea Spruce ex Benth. (1860)				*Synonym of* D. charapilla
D. tetraphylla Benth. (1860)		Not accepted	Synonym of *D. odorata*	
D. trifoliolata (Ducke) Ducke (1940)	Not accepted	Not accepted	Synonym of *D. punctata*	

Range and IUCN Global Category
Dipteryx spp. occur in Central and South America (Table 2). The presence of *Dipteryx* spp. in the Bahamas, Dominica, and Trinidad and Tobago as native or introduced populations remains uncertain, *as well as anecdotal evidence of introduced populations or plantations in Nigeria and Kenya, evidenced through mentions of Nigeria as a*

major exporter of tonka. No evidence for these exports could be found, and the genus was not thought to occur in Kenya (Luke, in litt., *2022).*

Table 2. Range and IUCN Global Category. "(?)" in the Range column indicates there is uncertainty. An asterisk (*) indicates the species being proposed under Annex 2a Criterion B, dagger (†) indicates a species listed in CITES Appendix III. IUCN Red List population trends: **–**: stable, ▼: declining and **?**: unknown. EOO: extent of occurrence, AOO: area of occupation.

Species	Range	IUCN Red List Assessment	National threat status	EOO (km^2)	AOO (km^2)
*D. alata**	Brazil, Bolivia, Paraguay, Peru (?) *De Carvalho (*in litt.*, 2022) noted that this species does not occur in Peru.*	Vulnerable (A2cd+3cd+4cd, assessed 2017, version 3.1) ▼	Brazil: least concern (2012) *Peru: the species appears to meet the criteria for endangered based on an independent assessment (may refer to* D. micrantha, *Pariente Mondragon, 2018).*	6,922,000	
D. casiquairensis	Venezuela, (?)				
D. charapilla	Brazil, Peru	Vulnerable (D2, assessed 1998, version 2.3)	*Peru: the species appears to meet the criteria for endangered based on an independent assessment (Pariente Mondragon, 2018).*		
D. ferrea	Bolivia, Brazil (?), Peru		An independent assessment suggested the species meets the IUCN Red List criteria for endangered in Peru.		
D. lacunifera	Brazil	Least Concern (Assessed 2018, version 3.1) –			
D. magnifica	Brazil, Colombia, Venezuela, Ecuador (?), Peru (?),				
*D. micrantha**	Bolivia (?), Brazil, Colombia (?), Ecuador, Peru	Data Deficient (Assessed 2017, version 3.1) ▼	An independent assessment suggested the species meets the IUCN Red List criteria for endangered in Peru.	2,258,500 Peru: 22,516	
*D. odorata**	Brazil, French Guiana, Guyana, Suriname, Venezuela	Data Deficient (Assessed	Colombia: vulnerable	9,670,000	

Species	Range	IUCN Red List Assessment	National threat status	EOO (km²)	AOO (km²)
	Bolivia, Colombia, Honduras, Peru (?) Introduced: Bahamas, Dominica, Trinidad and Tobago *Pariente Mondragon (2018) notes that* D. odorata *does not occur in Peru*	2017, version 3.1) ▼			
*D. oleifera**†	Colombia, Costa Rica, Nicaragua, Panama Ecuador, Honduras	Least Concern (Assessed 2020, version 3.1) **?**	Colombia: vulnerable Costa Rica: vulnerable Panama: vulnerable	541,000 Costa Rica: 10,180	
D. polyphylla	Brazil, Colombia	Near Threatened (B2ab(iii), assessed 2020, version 3.1) **?**		690,946	100
D. punctata	Brazil, Colombia, French Guiana, Guyana, Suriname, Venezuela	Least Concern (Assessed 2018, version 3.1) **–**			
D. rosea	Brazil, Peru, Venezuela, Colombia *De Carvalho (*in litt.*, 2022) noted that this species does not occur in Peru.*				
D. tetraphylla	*Brazil (POWO, 2022)*				
D. trifoliolata	Brazil, (?)				

Biological and trade criteria for inclusion in Appendix II (Res. Conf. 9.24 (Rev. CoP 17) Annex 2a)

A) Trade regulation needed to prevent future inclusion in Appendix I

B) Regulation of trade required to ensure that harvest from the wild is not reducing population to level where survival might be threatened by continued harvest or other influences

The Supporting Statement notes that the market for timber and seeds is both national and international, but the international market for timber was noted to be expanding, in part due to increased scarcity and protection afforded to other Amazonian hardwoods, such as *Swietenia macrophylla* and *Cedrela odorata*. In addition, substantial illegalities have been identified in the timber industries in some of the species' range States, and regulation of trade was noted as necessary to reduce the increasingly detrimental pressure of harvest on the species' survival in the wild. Ensuring that trade is sustainable is critical for the survival of the genus and to maintain the important ecological role of the species as providers of food and habitat to a number of threatened species of fauna.

Dipteryx spp. are slow growing and long-lived, which makes them inherently vulnerable to overharvesting. There are no population data for any species of *Dipteryx* across their entire range. However, while there is little information regarding the current number of mature individuals, the growth of these species is very slow, and they generally occur at low densities. *Experts noted that in Brazil* Dipteryx spp. *are rare in forests, and that even in well-managed forests* Dipteryx spp. *did not recover well after logging (Menu,* in litt., *2022).*

The Supporting Statement notes that Brazilian authorities reported that none of the *Dipteryx* spp. were threatened in the country as of 2022. *Dipteryx* spp. are threatened by targeted logging and in some regions also illegal harvest. The timber of several species is in great demand due to their dense, hard wood. Cumaru timber

(*D. odorata*) has a reported average dried weight of 1,085 kg per m^3 (The Wood Database, 2022). Cumaru decking has a market value of USD1,204–1,237/m^3 in the USA and USD1,093–1,119/m^3 in Asia, making it one of the most expensive timbers in the global market. Table 4 includes a summary of available information on *Dipteryx* spp. timber trade, and Table 5 on tonka bean trade.

WiTIS holds records on six seizure events and one enforcement action from 2016–2022. Three seizures involving Dipteryx *were reported in Peru between 2019–2022. In 2019, an undisclosed amount of timber was seized due to a lack of documentation and led to two arrests; in 2021, just over 6 m^3 of* D. odorata *timber valued at ~USD12,790 was seized due to invalid documents; and in 2022, a seizure of 11,250 kg of charcoal was made alongside an undisclosed amount of forest products including some originating from* D. micrantha*. Additionally, 19 members of an illegal logging ring in Ucuyali, Peru were arrested in 2016, their main timber target being* D. micrantha, *with the main destinations identified as China, Mexico, and the USA. Prosecutors estimated that the gang exported 300 m^3 per month over six years. In 2020, 8.68 m^3 of* Dipteryx *timber was seized in Mexico due to a lack of proof of legal acquisition. In southeastern Pará, Brazil, illegal logging of* Dipteryx *was reported in 2019. In 2022, 26.66 m^3 of* D. odorata *being transported in Acre, Brazil, without documentation were seized.*

Dipteryx alata
Biological characteristics: One study reported a maturation time of six years and productive lifespan of 50 years for *D. alata* in agroforestry systems. Seeds are dispersed by mammals including bats and monkeys.

Population status: *Dipteryx alata* was reported to be "abundant and well preserved" in 2018 in eastern Bolivia, and to occupy approximately 72% of the Brazilian Cerrado ecoregion. The global population of *D. alata* was also suspected to have undergone a 30–50% population decline over the past three generations, mainly as a result of habitat conversion in the Cerrado and exploitation for timber. *Pariente Mondragon (2018) reported that in Peru, the species meets the criteria for endangered status according to IUCN criteria.*

Threats: *Dipteryx alata* is considered in decline due to previous and ongoing timber harvest. The global *D. alata* population has intrinsic low genetic diversity, resulting in less resilience to ongoing (modern) population fragmentation resulting from habitat loss, such as in the Brazilian Cerrado. Habitat fragmentation has been noted to hinder mammalian seed dispersal of *D. alata*. A study on *D. alata* gene flow in Brazil in 2014 found that deforestation had led to fragmentation of subpopulations within forest fragments and pastures, leading to isolation of individuals and higher levels of inbreeding than seen in higher density populations, potentially leading to inbreeding depression resulting in reduced seed germination and seedling survival rates.

Dipteryx micrantha
Biological characteristics: In the Madre de Dios region of Peru, an average annual growth rate of 2.77 mm over the first 100 rings/years and 0.86 mm after 300 rings/years was recorded for *D. micrantha*, indicating extremely slow growth. *Dipteryx micrantha* is reported to reach reproductive maturity at a minimum of 40 cm dbh and live over 1,000 years. *Taken together, these measurements could indicate that the species' maturation takes longer than 100 years.*

Population status: The global population was assessed as Data Deficient and in decline in the IUCN Red List in 2017. An independent assessment suggested the species meets the IUCN Red List criteria for endangered in Peru, based on an estimate of 33% decline between 2000 and 2020 and a projected decline of 66% by 2036. Data from 356 permanent forest plots in primary forests across a number of locations in the Peruvian Amazon, covering a total of 165 ha, recorded a total of 66 individuals (equivalent to 0.19 individuals per ha), which is similar to the estimated 0.29 individuals per ha with a dbh of >51 cm in Madre de Dios and 0.2 individuals per ha in Ucayali; these are the two main areas of occurrence in the country and where many logging concessions are located. A higher population density of 0.71 individuals per ha was recorded in a forest conservation concession in Madre de Dios, and the species was found to be "abundant" at Cocha Cashu Biological Station (also in Madre de Dios; 1.75 individuals per ha), and at only slightly lower abundance in the surrounding region (1.25 individuals per ha). Individuals recorded in 2019 in the Madre de Dios forest conservation concession in the Las Piedras River basin, Peru, were all extremely old (the average dbh was 87.66 cm, meaning that the average age of the trees was estimated at 684.8 years), and levels of regeneration and recruitment were very low: only 0.06 juvenile trees (10–40 cm diameter) were found per ha and there was a total absence of saplings of 4–10 cm in diameter. The authors noted that the low numbers of seedlings and absence of saplings indicated that recruitment levels were insufficient for the species' long-term survival in the Madre de Dios conservation concession.

Threats: The IUCN Red List assessment noted that selective logging poses a "major threat", and the species' intrinsic slow growth impedes regeneration after harvest, and considered deforestation and habitat degradation to be major threats to the species. The Supporting Statement notes that the species was considered "high risk" species facing illegal and/or unsustainable harvest in Peru and Bolivia.

Dipteryx odorata
Biological characteristics: Reproductive maturity was reported at a minimum dbh of 39 cm. A maximum adult age of 1,200 years has been estimated for the species. Seeds are mainly dispersed by bats.

Population status: The global population was assessed as Data Deficient and in decline in the IUCN Red List in 2017. The species occurs in very low densities.

A study carried out in Brazil in 2012 in three forest inventories that practised reduced impact logging (RIL) noted that *D. odorata* displayed a very low density of adults (classed as trees of >45 cm dbh) of under 0.15 trees per ha in all three locations. Within Tapajós National Forest, Brazil, the density of large mature *D. odorata* trees (≥45 cm dbh) was also found to be low, at 0.12 individuals per ha.

The species was noted to exhibit an "inverted J-shaped" distribution throughout its range, with few adult trees in large size classes and higher numbers of juveniles. According to an inventory of *D. odorata* in Brazil where RIL was practised, all large-diameter (>90 cm dbh) trees had been extracted. The authors noted that the negative impact of RIL on reproduction and regeneration processes of the species may reduce the already relatively low density of saplings in future. Two studies noted the lack of smaller adult size classes (~15–45 cm dbh) in two localities in Brazil, attributed to the intensive seed collecting boom of the 1940s (see section on "Tonka bean trade" below) that affected recruitment. It was noted that unsustainable seed collection could negatively impact population viability.

Threats: The IUCN Red List assessment noted that selective logging poses a "major threat" and the species' intrinsic slow growth impedes regeneration after harvest. The Supporting Statement notes that the species was considered "high risk" and facing illegal and/or unsustainable harvest in Peru and Bolivia.

Dipteryx oleifera
Biological characteristics: The genus is slow growing, with species taking an estimated average of 46–177 years to reach 30 cm in diameter, the size at which individuals of *D. oleifera* were observed to reach reproductive maturity and begin bearing fruit. A maximum adult age of 330 years has been estimated for the species. Seeds are dispersed by mammals, mainly bats, as well as agoutis and squirrels.

Population status: *Dipteryx oleifera* was assessed as globally Least Concern with an unknown population trend in the IUCN Red List in 2020. Globally, the species' population was considered to have been reduced and fragmented by exploitation and clearance of forest for agriculture across its range, with the species considered a conservation priority. The species was nationally assessed as vulnerable in Colombia (2007), Costa Rica (2005), and Panama (2016). Approximately 40% of the Colombian population of *D. oleifera* was considered to have been "heavily exploited for timber." In Costa Rica, the potential distribution of *D. oleifera*, based on known occurrence points, was estimated at approximately 10,180 km^2; however, the species' assessors noted that less than half of this area had remaining forest cover suitable for the species. *D. oleifera* was reported to occur at a mean density of approximately 1.08 trees per ha in central Panama.

Threats: Slash and burn agriculture was considered to threaten the survival in Nicaragua.

CITES trade summary: Dipteryx oleifera *(according to the proposed standard reference: it was originally listed as* D. panamensis*) is currently listed in CITES Appendix III by Costa Rica (since 2003) and Nicaragua (since 2007), with a zero-export quota for Nicaragua in 2022.*

Following its 2003 listing, CITES trade in D. oleifera *from Costa Rica totalled 23 m^3 of timber from artificially propagated sources exported to the USA for commercial purposes (Table 3). Trade from Nicaragua mainly comprised sawn wood and timber (364 m^3) exported to Costa Rica, Cuba, and the USA (Table 3). Trade from Panama mainly comprised wild-sourced sawn wood, totalling 28,700 kg reported as imports by Germany and 22,746 kg by the USA (Table 3).*

This may not be a complete picture of global trade in D. oleifera *(*D. panamensis*), as some Parties report CITES Annual Reports based on permits issued and not all trade, therefore origin permits of trade from range States other than Costa Rica and Nicaragua in accordance with Article V of the Convention may not always be captured in the CITES Trade Database.*

Table 3. *All CITES trade in* Dipteryx oleifera *(reported under its synonym* D. panamensis*) since its listing in CITES Appendix III by Costa Rica (2003) and Nicaragua (2007: trade records were available from 2007–2020). All trade was direct and rounded up to the nearest whole number. All exporting Parties submitted annual reports for 2003–2020 (CITES Trade Database, 2022).*

Exporter	Importer	Term	Unit	Source	Purpose	Reported by	Total
Costa Rica	*USA*	*timber*	*m^3*	*A*	*T*	*Exporter*	*23*
						Importer	
Nicaragua	*Costa Rica*	*carvings*	*m^3*	*W*	*T*	*Exporter*	*19*
						Importer	
		sawn wood	*m^3*	*W*	*T*	*Exporter*	*211*
						Importer	*39*
		timber	*m^3*	*W*	*T*	*Exporter*	*95*
						Importer	
	Cuba	*sawn wood*	*m^3*	*W*	*T*	*Exporter*	*42*
						Importer	
	USA	*carvings*	*m^3*	*I*	*T*	*Exporter*	
						Importer	*4*
		sawn wood	*m3*	*W*	*T*	*Exporter*	*0.5*
						Importer	
		timber	*m^3*	*W*	*T*	*Exporter*	*15*
						Importer	
		wood product	*m^3*	*W*	*T*	*Exporter*	*2*
						Importer	*2*
Panama	*Germany*	*sawn wood*	*kg*	*W*	*T*	*Exporter*	
						Importer	*28,700*
	USA	*sawn wood*	*kg*	*I*	*T*	*Exporter*	
						Importer	*22,746*
		specimens	*(blank)*	*W*	*S*	*Exporter*	*50*
						Importer	

Dipteryx punctata
Biological characteristics: *In Venezuela, the species reportedly takes five years to reach reproductive maturity (Santórum,* in litt., *2022).*

Population status: *An expert estimated that there are hundreds of thousands of trees in the southern states of Venezuela (Amazonas and Bolívar; Santórum,* in litt., *2022).*

Dipteryx charapilla
Population status: Assessed as globally Vulnerable in the IUCN Red List in 1998, based on the species' limited distribution. The species is potentially endemic to Peru: its occurrence in Brazil is uncertain. *Pariente Mondragon (2018) reported that in Peru the species meets the IUCN criteria for endangered.*

Dipteryx ferrea
Population status: An independent assessment suggested the species meets the IUCN Red List criteria for critically endangered in Peru, based on declines as a result of logging.

Dipteryx polyphylla
Population status: Assessed as globally Near Threatened in the IUCN Red List in 2020, based on habitat loss driven by land use change. Timber exploitation was listed as a possible threat.

Table 4. Trade summary of *Dipteryx* timber reported at genus level and species level where available.

Range State	Trade summary
Bolivia	*Dipteryx* spp. made up 26% of Bolivia's exports of wooden flooring by volume in 2019. Europe was considered the largest export destination with exports to the region increasing by 200% between 2016–2019. Bolivia exported over 3.5 million kg of *Dipteryx* to Europe in 2019, of which 90% was imported by France, Germany, the Netherlands, and Belgium. In 2019, approximately 35% of Bolivia's wooden flooring exports by volume did not specify species or trade names, therefore the country's recent *Dipteryx* export figures may be an underestimate.
Brazil	The USA and the EU imported 11 million kg and around 7 million kg of *Dipteryx* timber from Brazil respectively (reported as "Cumaru decking", "Brazilian Teak (Cumaru)", "yellow Cumaru lumber", and sometimes identified as *D. odorata*) between 2018–2021. The species exported by Brazil is likely to be *D. odorata*. D. odorata *was the third-most exported species in Brazil between 2017 and 2022 (SERPRO, 2022).*
Costa Rica	According to the CITES Trade Database, exports of *D. panamensis* (*D. oleifera*) as reported by Costa Rica from 2010–2019 consisted entirely of 22.9 m^3 of artificially propagated timber exported to the USA for commercial purposes.
Colombia	Colombia's National Environmental Licensing Authority (ANLA) approved the export of a total of 19,893 m^3 of *Dipteryx* timber from 2019–2020, of which 43% was reported to the genus level and 43% was reported as *D. oleifera.* Colombia's national reporting system indicates harvest of 98,696 m^3 of *Dipteryx* timber between 2019–2021; almost 80% of this volume was harvested in 2019. Of the total amount of timber harvested over this period, 75% was reported at the genus level, with *D. oleifera* and *D. odorata* accounting for 23,898 m^3 and 1,726 m^3 respectively.
Guyana	The Guyana Forestry Commission (2016) reported average prices in 2015 for Tonka Bean tree (possibly *D. odorata*) as USD162 and USD827 per m^3 of logs and dressed lumber, respectively. Export quantities (assumed to be measured in m^3 of logs, no units were given) of the species over 2009–2014 were reported to be low, ranging from 112 in 2015 to 952 in 2010.
Nicaragua	According to the CITES Trade Database, between 2010 and 2019 exports of *D. panamensis* (*D. oleifera*) as reported by Nicaragua principally comprised 254 m^3 wild-sourced sawn wood, exported for commercial purposes to Costa Rica and Cuba (Table 4). Smaller volumes of carvings, timber, and wood products were exported to Costa Rica, Cuba and the USA.
Panama	According to the CITES Trade Database, trade in of *D. panamensis* (*D. oleifera*) from Panama 2010–2019 principally comprised 27,800 kg sawn wood imported for commercial purposes in 2010, as reported by Germany only. Panama also reported exports of 50 specimens to the USA for scientific purposes (Table 4).
Peru	*Dipteryx* was reported to have undergone an extractive boom in Peru over the last decade. In 2006, *Dipteryx* spp. traded under the common name Shihuahuaco represented 50% of wood exports from Peru; by 2015 it was reported that this had risen to 80%. The majority of *Dipteryx* timber extracted from Peru is thought to be exported to China to provide raw material for the flooring market. According to MINAGRI-SERFOR forest yearbooks, 1,064,333 m^3 of Peruvian *D. micrantha* wood was estimated to have been harvested from 2000–2020, equivalent to approximately 110,079 mature trees (>51 cm dbh), although it was noted that this may be an underestimate of harvest as the datasets used do not include *D. micrantha* felled for charcoal production and do not fully address illegal as well as legal logging volumes. Analysis of trade data of Peruvian exports of timber under the common names Shihuahuaco and Cumaru reveals that from 2015–2018 Peru exported over 101 million kg, with roughly 79 million kg going to China, 14 million kg to the EU and 1.3 million kg to the USA. Between 2018–2021 Peru exported over 82 million kg, with 51 million kg going to China, 19 million kg to the EU and 1.8 million kg to the USA. According to SERFOR, 247,395 logs of *Dipteryx* spp. were harvested as Cumaru in 2019, of which 64,698 m^3 were exported as sawnwood, strips and joinery. For the same year, seven timber species accounted for more than 90% of the total harvested volume, all of them considered hardwood for the decking industry, of which 60% was reported as Cumaru (*Dipteryx* spp.).

Range State	Trade summary
	A 1,805 km^2 forest concession in Alto Ucayali, east-central Peru, which included *D. micrantha*, was managed using a 30 year cutting cycle and an average applied logging intensity of 12 m^3 per ha per year. *The only record of* Dipteryx *in the LEMIS database from 2008–2020 is one trade record of a wild-sourced scientific specimen of* Dipteryx alata *imported in 2014 from Peru via Mexico.*

Tonka bean trade
Several *Dipteryx* spp. are also subject to seed collection for the national and international markets, *normally traded as dried seeds (Santórum,* in litt., *2022)*. Nationally they are used as a food source and internationally they are primarily used in the perfumery industry. Dipteryx odorata *and* D. punctata *are two species whose seeds are traded internationally (De Carvalho,* in litt., *2022).*

Dipteryx spp. produce mature fruits supra-annually. *Honorio Conorado (*in litt.*, 2022) noted that mature fruit production occurs at intervals of 1–7 years. However, Santórum (*in litt., *2022) noted that in Venezuela* D. punctata *trees bear fruit every two years.* Average fruit production per tree has been reported to be 150 kg in *D. alata* and 10–20 kg in *D. odorata* (or possibly *D. punctata*). *Average fruit production per tree was estimated at 20–30 kg for* D. punctata *in Venezuela, depending on the size and age of the tree (Santórum,* in litt., *2022), and in Brazil one* D. odorata *tree was thought to produce fruits equivalent to 5 kg of dried tonka beans (Menu,* in litt., *2022). Fallen* Dipteryx *fruits are gathered from beneath the trees, and must be gathered within five days of falling, as older fruits will rot and are not suitable for commercialisation (Guzman* in litt.*, 2022). To obtain 1 kg of marketable tonka beans, 350–400 fruits are needed, or about 40 kg of unprocessed fruits for 2 kg of seeds (Santórum,* in litt., *2022). Processed fruits (dried) yield 1 kg of tonka beans from 11 kg of fruits (Santórum,* in litt., *2022). A study in the state of Pará in Brazil noted that ~80 kg of green seeds (fresh) yields ~40 kg of dried seeds (da Silva* et al., *2010). Tonka beans can be stored up to five years when processed (dried) (Santórum,* in litt., *2022).*

Tonka bean trade boomed alongside the rubber trade as extractive industries were established in the Amazon in 1870–1960 (Torrealba and Scaramelli, 2018). In Venezuela, in the Orinoco and Cauca River basins, tonka bean trade was the principal commodity exported from 1870–1965, primarily to France, Germany, and the USA (Torrealba and Scaramelli, 2018). Collection was organised around "sarrapieras", temporary stations in the forest from which collectors, mainly indigenous peoples and local communities, were based during the tonka bean collection season (Torrealba and Scaramelli, 2018). At its peak, Venezuela exported 784 t of tonka beans in 1942 (Santórum, in litt., *2022). From the 1940s, the demand for tonka beans declined due to the development of synthetic compounds, and in the 1950s, Venezuela centralised the tonka bean industry through the Instituto Agrario National, and later in 1964 Venezuela prohibits the extraction of tonka beans through "sarrapieras" (Torrealba and Scaramelli, 2018). In 1954, the US Food and Drug Administration banned the use of tonka beans as a food additive due to their coumarin content (Guzman,* in litt., *2022),* and coumarin is also restricted as an additive in the EU since 2008*. Later, in the 1960s, the extraction came to a halt in Venezuela as no markets for the beans could be found (Torrealba and Scaramelli, 2018). Tonka beans were important as a flavouring in the tobacco industry until the ingredient was largely removed from use between 1985 and 1997 (Guzman,* in litt.*, 2022). Since the 80s, the level of tonka bean harvest has been at much lower levels (Torrealba and Scaramelli, 2018). Based on available data (Table 5), tonka bean trade appears to be fluctuating but not steadily increasing, with production from Brazil fluctuating between ~40 and ~100 t annually (Table 5).*

Historical seed collection in combination with logging was considered to have caused major population declines in *D. alata*, according to the IUCN Red List assessment from 1998 (WCMC, 1998), *possibly referring to the tonka bean boom of the early 20th century until the 1940s*. *Harvest of, and international trade in, seeds were not mentioned as threats in the most recent IUCN Red List assessment for* D. alata *dating 2017 (Requena Suarez, 2021).* The Supporting Statement notes that harvest of *D. alata, D. odorata* and *D. punctata* seeds for the tonka bean trade has the potential to impact recruitment in wild populations, particularly as *Dipteryx* spp. produce mature fruits supra-annually, only a small percentage of mature trees may produce fruit each year, and there is a risk of synergistic pressure from both timber and seed harvest in some areas. *Honorio Conorado (*in litt.*, 2022) noted that in scarce years, harvesters may cover more ground to reach desired volumes of beans. De Carvalho (*in litt., *2022) noted that more research is needed to evaluate the impact of seed collection.*

Table 5. Summary on tonka bean trade from Brazil, Venezuela, and Bolivia.

Range State	Trade summary
Brazil	A study of the market for *D. odorata* seeds from Pará state, Brazil, reported that, in 2005, exports were mainly to Japan, France, Germany, and China. Pará state was noted to produce almost all of Brazil's tonka beans at the time of the study; seeds were reported to be harvested by ~2,700 rural families in the agricultural off-season from September–November, with each family harvesting ~80 kg of fresh seeds equivalent to ~40 kg of dried beans. *They were sold both as fresh seeds and as dried seeds (da Silva* et al., *2010)*. The trade in tonka beans in the region was observed to be somewhat dependent on the Brazil nut (*Bertholletia excelsa*) trade, as middlemen only purchased tonka beans together with Brazil nuts. Overall production in Pará for 2005 was estimated at ~108,000 kg of beans, of which 80–90% were purchased by only two companies in Belém; however, the beans are also used in Brazil's domestic perfume and cosmetics industry, making total export volumes unclear. *Menu (*in litt., *2022) noted that the Brazilian market for tonka beans (known nationally as Brazilian vanilla) was a "very small part" of the global production.* *Between 1989 and 1996, tonka bean exports from Brazil peaked in 1994, with just under 120,000 kg exported, and declined to under 40,000 exported in 1996 (da Silva* et al., *2010). Production of seeds in the state of Pará increased from 43,000 kg in 1997 to 110,000 kg in 2005 (da Silva* et al., *2010). In 2020, Brazil produced a total of 117,000 kg of tonka beans, worth ~USD514 million*[1] *(Menu,* in litt., *2022).* *Two programmes, Origens do Brasil and Florestas de Valor, commercialised 11,170 kg of dried tonka beans involving six different producing institutions representing 600 people living in 12 communities and 42 indigenous villages in a territory of 11,943,866 ha of Amazonian Forest (Menu*, in litt., *2022). One tree can produce 5 kg of dried tonka beans, which can be sold for ~USD9.65*[2] *per kg, representing an income of ~USD42 per tree per year, compared to the value of a cut tree estimated at USD96 (Menu,* in litt., *2022). This source of income was reported to deter people from cutting* Dipteryx *spp. (Menu,* in litt., *2022). Origens do Brasil and Florestas de Valor were estimated to represent 15% of the Brazilian market for tonka beans, with the remainder sold by other communities, middlemen, as well as from privately owned land (Menu*, in litt., *2022).* *According to Froes (in litt., 2022), tonka beans are traded as dried beans or in the form of an absolute, which is the raw material used in the fragrance production. Most of the absolute processors are in Europe and the USA, with few producers of absolute in Brazil, where most is exported in the form of dried beans (Froes,* in litt., *2022). In Brazil, harvesters collect the fallen fruits near their home, walking no further than 5 km into the jungle for collection (Froes,* in litt., *2022). The fruits are brought back to villages in baskets where they are opened manually with a hammer or a knife to release the bean, after which the beans are dried in the sun and in the shade and gathered together in big bags to be sold (Froes,* in litt., *2022).* *According to Herrero-Jáuregui* et al. *(2012), "current intensities of* D. odorata *seed collection increases the density of saplings" however the development of saplings into young trees did not appear to occur in two plots of 25 ha in Brazil. The authors concluded that enrichment planting was needed to prevent local extinctions (Herrero-Jáuregui* et al., *2012). No information on the level of extraction was provided and the authors noted that the study should be interpreted with caution due to low sample sizes (Herrero-Jáuregui* et al., *2012).*
Venezuela	*Santórum (*in litt., *2022) described a similar process as outlined above for tonka bean harvesting by indigenous communities in Venezuela. In Venezuela,* Dipteryx *mainly occurs in the Amazonas and Bolívar states (Santórum,* in litt., *2022). Tonka bean collectors stop collection during the rainy season, even though trees will reportedly still have many harvestable fruits (Santórum,* in litt., *2022).*

[1] Based on an average exchange rate of BRL1 to USD0.1958 in 2020, for BRL2,625 million, (https://www.exchangerates.org.uk/BRL-USD-spot-exchange-rates-history-2020.html#:~:text=Welcome%20to%20the%202020%20BRL,rate%20in%202020%3A%200.1958%20USD).

[2] Based on an exchange rate of BRL1 to USD0.1929 on 19th August 2022 (https://www.xe.com/currencyconverter/convert/?Amount=50&From=BRL&To=USD).

Range State	Trade summary
	One company operating in Venezuela reported a minimum harvest of 40–60 tonnes of D. punctata *annually from the Caura River basin (Santórum,* in litt.*, 2022).* *While some experts noted that when trees do not produce a full crop of fruits harvesters go further afield, Guzman (*in litt.*, 2022) noted that harvesters will not harvest fruits from trees that are not producing well in a given year, thus leaving some trees untouched every harvesting cycle. Additionally, Guzman (*in litt.*, 2022) noted that only 5% of the area of occurrence is utilised for tonka bean extraction. Guzman (*in litt.*, 2022) noted that tonka bean harvesting and trade does not threaten Venezuelan populations of* Dipteryx*, and that the harvesting promotes the conservation of the tree.* Communities in some tonka bean-producing range States cultivate *Dipteryx* spp. stands for seed harvest, which may reduce the impact on wild populations. *This was corroborated by Santórum, Guzman, and Quintero (*in litt.*, 2022).* Additionally, a small-scale community tonka bean harvesting and forest conservation project has been running in Venezuela since 2007.
Bolivia	In Bolivia, the seeds of *D. alata* (known as Almendra Chiquitana in Bolivia) are exported internationally, with harvest taking place in communities in the department of Santa Cruz. Demand for Almendra Chiquitana was reported to be growing. In 2018, the harvest of seeds was estimated at 9,000 kg from the Santa Cruz department for both national and international use.

Inclusion in Appendix II to improve control of other listed species

A) Specimens in trade resemble those of species listed in Appendix II under Res. Conf. 9.24 (Rev. CoP17) Annex 2 a or listed in Appendix I

B) Compelling other reasons to ensure that effective control of trade in currently listed species is achieved

The fruit, seeds and flowers of *Dipteryx* spp. are important food sources for numerous mammal, bird and insect species, including bats, parrots, agoutis, peccaries, deer, tapir, hummingbirds, and bees. *Dipteryx oleifera* is classified as a keystone species because its fruits support many species during a time of food scarcity for frugivorous animals. In addition, the broad buttresses of *Dipteryx* spp. make these trees ecologically important both for forest structural integrity while standing and for the large gaps created when they fall, facilitating successional forest growth.

Dipteryx alata, *D. micrantha*, *D. odorata* and *D. oleifera* provide nesting sites for threatened birds. Logging of *Dipteryx* spp. in Peru has reportedly resulted in the loss of nests and juveniles and a reduced availability of nesting sites for the nationally vulnerable and globally Near Threatened Harpy Eagle *Harpia harpyja*. Cavities in the trunks of *D. micrantha* trees are used as nest sites by the CITES Appendix I listed Scarlet Macaw *Ara macao* and other threatened macaw species such as the Red-and-Green Macaw *Ara chloroptera*. In addition, *D. micrantha* is an important nesting tree species for Peru's nationally vulnerable Crested Eagle *Morphnus guianensis*. Similarly, the decline in *D. oleifera* in Costa Rica was considered the cause of the decline in the Critically Endangered Great Green Macaw *Ara ambiguus*. In Nicaragua, *D. oleifera* was also noted to provide an estimated 80% of the diet of *A. ambiguus* and 90% of its nesting sites.

Additional information

Threats

The habitats of *Dipteryx* spp., the Amazonian rainforests of Brazil and Peru, the savannas of Brazil, Bolivia and Paraguay, and the rainforests of Colombia, Costa Rica, Nicaragua, and Panama, are increasingly threatened by deforestation and forest degradation, logging, land conversion to agriculture, and climate change.

The rainforests of Central America for example have been subject to significant clearance for fruit plantations and pastureland. Major forest and woodland habitats in Brazil, in which at least 11 of the 14 recognised *Dipteryx* spp. occur are in decline. The rate of destruction of the Amazon region had declined in Brazil between 2004–2012 but, as has been widely documented, has begun to increase sharply, particularly since 2019. In the Xingu basin in the state of Pará, for example, 196 trees were reportedly felled per minute in March and April 2021, a 40% increase over the same period in 2020. Seasonally dry forest, including the Caatinga shrub and thornforest ecoregion, is increasingly threatened by grazing, logging and fire.

The savannas of Brazil, Bolivia, and Paraguay, including the Cerrado ecoregion in which *D. alata* occurs, are also under threat. Around 67% of the Cerrado has been already either completely converted for agriculture or modified in a major way*, with 19.8% remaining undisturbed as of 2017 (Strassburg* et al.*, 2017).*

Many of the range States of *Dipteryx* spp. have recently experienced substantial deforestation and forest degradation. The FAO's Global Forest Resources Assessment (FRA) for 2020 included three *Dipteryx* spp. range States (Brazil, Bolivia, and Paraguay) amongst the ten countries with the highest average annual net loss of forest area over the period 2010–2020, with an annual net loss of 0.30%, 0.43% and 1.93%, respectively. The assessment found that Brazil had the highest annual net loss of forest area of any country assessed, with an average net loss of 1,496 ha per year. Moreover, Brazil accounted for approximately 7% of global wood removals in 2018, the fourth highest percentage of any individual country, and annual deforestation rates in the Amazon increased significantly in 2016 to 3.9 million ha per year. The Cerrado biome in Brazil is experiencing similar declines, with a net loss of 9,520 km^2 between 2000 and 2015 and an annual net loss of 1.2% per year due to land conversion. Tropical moist forest degradation is also particularly prevalent in Nicaragua, where 65.8% of forests have been degraded between 1990 and 2019, the second highest proportion of forest loss of previously undisturbed forest (that is, forest unaffected by deforestation or degradation) in the Americas. Over the 30-year period 1990–2019, Brazil, Bolivia, Colombia, Peru, and Venezuela were found to have undergone total declines in the area of undisturbed tropical moist forests of 24.9%, 34%, 21.6%, 11.8%, and 18.6%, respectively. Additionally, disturbance rates (that is, natural and anthropogenic degradation or deforestation) in Colombia, Venezuela, Nicaragua, and Ecuador have increased significantly from 2000–2014 compared to 1990–1999, by 0.23 million ha per year, 0.17 million ha per year, 0.08 million ha per year, and 0.09 million ha per year, respectively.

Conservation, management and legislation

Table 6 summarises the available information on the national legislation in some of the range States of *Dipteryx*.

Table 6. Summary of national legislation in *Dipteryx* range States, including any MED (minimum exploitable diameter) when applicable.

Range State	National legislation summary
Bolivia	Export of logs is banned under Article 8 of Supreme Decree No. 24453 of 21st December 1996, which regulates the implementation of the Forestry Act No. 1700 of 12th July 1996.
Brazil	Under Normative Instruction No. 15 of 5th December 2011 (amended by Normative Instruction No. 13 of 24th April 2018 to specify that exports of charcoal of native species require authorisation from IBAMA, the export of roundwood of all native species from natural forests, with the exception of *Minquartia guianensis*, is prohibited. No *Dipteryx* spp. were included in the country's 2014 list of endangered flora. The current MED for species of *Dipteryx* is 50 cm. However, a modelling study of the *D. odorata* population in Brazil suggested that the MED should be increased to 100 cm, with cutting cycles of 30 years, in order to achieve sustainable timber harvest.
Costa Rica	*D. oleifera* was listed in CITES Appendix III by Costa Rica in 2003 under its synonym *D. panamensis*, due to concerns about overexploitation for the timber trade. A ruling of Costa Rica's Constitutional Chamber banned the exploitation of *D. oleifera* from the wild in 2008 (including standing wood, naturally fallen wood, and residual wood), noting that the ban should remain in place until the tree species itself as well as the Great Green macaw, *Ara ambiguus* (for which *D. oleifera* provides nest sites and is a critical food source) remain on the list of threatened species. However, it is unclear whether the ban was established via legislation, or via an executive decree. Prior to this, Ministerial Decree No. 25167 of 12th June 1996 restricted the harvest of *D. oleifera* in the north of the country (between the San Carlos, San Juan, and Sarapiquf rivers) to protect *A. ambiguus* nest trees, and a compensation payment scheme was established for owners of isolated trees of *D. oleifera* and forests containing the species within the area covered by the Decree, to encourage conservation. The export of logs and squared timber was additionally prohibited by Forest Law No. 7575 of 16th April 1996; however, it is unclear whether timber from plantations is exempt from this export ban.
Colombia	Colombia has reportedly had an export ban on roundwood from natural forests since 1997.
Ecuador	Under Article 46 of the Law on Forests and Conservation of Natural Areas and Wildlife of 10th September 2004, the export of roundwood, unless authorised by the Ministry of Environment for scientific purposes, is prohibited.
Guyana	Guyana agreed FLEGT Voluntary Partnership Agreements (VPAs) with the EU to ensure that timber and timber products exported to the EU are legally-sourced, although the EU-Guyana VPA has yet to be signed as of 2020. Under the Forest Regulations of 1st January 1953, the MED for all tree species unless otherwise specified is 60.96 cm.

Range State	National legislation summary
Honduras	Honduras agreed FLEGT Voluntary Partnership Agreements (VPAs) with the EU to ensure that timber and timber products exported to the EU are legally-sourced. The EU-Honduras VPA was signed in February 2021. Export of unprocessed roundwood or squared timber of broadleaved species from natural forests is prohibited under Article 102 of Decree No. 98-2007 of 26th February 2008.
Nicaragua	*Dipteryx oleifera* was listed in CITES Appendix III by Nicaragua in 2007, under its synonym *D. panamensis*, due to concerns about overexploitation for the timber trade. *Dipteryx oleifera* (under the synonym *D. panamensis*) was added to the list of species with indefinite national harvest bans by Ministerial Resolution No. 29/06 of 16th June 2006. Additionally, the export of roundwood, timber and sawn timber of "any forest species" from natural forests was prohibited by Law No. 585 of 21st June 2006.
Panama	Under Decree No. 107 of 19th January 2021, export of logs from natural forests or reservoirs that have not undergone primary processing or treatment (against insects and fungi) is prohibited; exported timber must also originate from areas with sustainable forest management plans endorsed by the Ministry of Environment. Previously, export of unprocessed timber from natural forests was restricted by Decree No. 83 of 6th August 2008, but this was repealed in January 2016 by Decree No. 7 as the restrictions were considered to have been "ineffective" at stimulating wood processing mechanisms within the national timber industry. Resolution No. 5 of 22nd January 1998 specifies that logging permit holders must record volumes felled and pay the costs of surveys, inspections and technical services for all trees ≥20 cm in diameter.
Paraguay	Under Decree No. 24498/72 of 18th February 1972, the export of roundwood, logs and beams is prohibited.
Peru	According to TRAFFIC's 2014 briefing document on Peru, a ban on the export of logs from natural forests has been in place since 1972 (TRAFFIC, 2014). However, the original legislation could not be found to verify this. According to the World Resources Institute's 2014 Peru country profile, forest concession agreements require reduced impact logging practices, cutting rotations of at least 20 years, and the retention of a minimum of 10% of mature adult trees (seed trees) of each harvested species to enable regeneration.
Suriname	Under the Forest Management Law of 18th September 1992, *D. odorata* and *D. punctata* are listed as Category C species, making felling these species illegal unless specifically approved by the Forestry Department. Additionally, a permit is required for the export of "raw wood, round wood, round or felled pole wood, processed wood, wood products and forest by-products". *Dipteryx odorata* and *D. punctata* are protected under the Forest Management Law of 18th September 1992. All other marketable or potentially marketable tree species have MEDs of 35 cm.
Venezuela	*In Venezuela*, D. punctata *has been protected since 1952, when it became the official tree of Bolivar state, meaning the felling of the tree became prohibited (Santórum,* in litt.*, 2022).* Reportedly, forest concession holders may only extract trees greater than 40 cm dbh (not specific to *Dipteryx* spp.)

Artificial propagation

Dipteryx oleifera timber plantations have been established in Panama and Costa Rica. In Costa Rica, an experimental plot planted with 49 *D. oleifera* individuals in 1985 was reported to have a 14% survival rate after 24 years, and the surviving trees were "straight and of good form". Planting schemes for *Dipteryx* spp. in Costa Rica have reportedly successfully produced fruiting trees. In pure stands of *D. oleifera* within a plantation at La Selva Biological Station, Costa Rica, rotation periods of 25 and 32 years were estimated for thinned and unthinned stands, respectively. *Dipteryx* spp. plantations have also been established in Trinidad and Tobago, and possibly also Jamaica, for seed collection and as shade trees for cocoa. Plantations have also reportedly been established in the Experimental Annex von Humbolt in Ucayali, in Peru. *Dipteryx* spp. (*D. odorata* and/or *D. punctata*) are cultivated and wild seedlings are supported by local communities in Venezuela *and Brazil (Froes,* in litt.*, 2022),* to ensure future tonka bean harvest and for conservation of the species. Communities in some

tonka bean-producing range States cultivate *Dipteryx* spp. stands for seed harvest, which may reduce the impact on wild populations. *This was corroborated by Santórum, Guzman, and Quintero (*in litt.*, 2022).*

Anecdotal evidence of introduced populations or plantations in Nigeria and Kenya were found in online advertisements for tonka beans, through mentions of Nigeria as a major exporter of tonka. No evidence for these exports could be found, and the genus was not thought to occur in Kenya (Luke, in litt.*, 2022).*

Implementation challenges (including similar species)
According to the Thünen Institute of Wood Research in Germany, it is not possible to distinguish clearly the individual species within the genus *Dipteryx* using macroscopic and microscopic identification of wood anatomy. Identification of *D. alata, D. ferrea, D. micrantha, D. odorata,* and *D. punctata* using genetic markers is currently possible. Samples of *Dipteryx* spp. will reportedly be included in the database of species identifiable in the field using the open source, field deployable XyloTron platform.

Several species of *Dipteryx* are traded under the common names Cumaru or Shihuahuaco and are neither distinguishable nor identified to species level in trade. For example, *D. punctata* is less known in international markets but is generally misidentified as *D. odorata*. According to Koch (*in litt*., 2019), *D. alata* and *D. odorata* are "commonly confused" with *Handroanthus* spp., *Tabebuia* spp., and *Roseodendron* spp. (known as "Ipê") in trade, although it is possible to differentiate between Dipteryx and Ipê timber based on microscopic wood characteristics. *CoP19 Prop. 44 is proposing the listing of Ipê (*Handroanthus *spp.,* Tabebuia *spp., and* Roseodendron *spp.) in CITES Appendix II.*

The Supporting Statement notes that the confusion regarding the taxonomy and distribution of some *Dipteryx* spp., such as *D. charapilla* and *D. odorata* in Peru, compounded by the difficulty in differentiating the timber to species level, has led to some species being mistakenly traded as others. For example, the principal species that are exported from Peru are unclear. *D. odorata* had previously been considered a major timber species in Peru and timber has been exported from Peru under numerous names including *D. odorata*, as well as synonyms *Coumarouna odorata*, *C. micrantha*, and the trade names Cumaru and Shihuahuaco. However, recent taxonomic studies indicate that *D. odorata* does not occur in Peru, and studies have concluded that the timber harvested in the south of the Peruvian Amazon described as *D. micrantha* or *D. odorata* is in fact *D. ferrea*; while timber extracted in the north is considered *D. micrantha.*

No identification manuals are available for the seeds (tonka beans).

Potential risk(s) of a listing
Experts expressed concern that with Appendix II listing of Dipteryx *seeds, harvest and sale of tonka beans may be halted for several years while CITES listing is implemented nationally, and therefore may drive communities currently harvesting the beans to other sources of income such as logging and agriculture (Froes,* in litt.*, 2022; Guzman,* in litt.*, 2022; Menu,* in litt.*, 2022; Santórum,* in litt.*, 2022). As the impact of tonka bean harvesting remains unclear, Annotation #17 without the addition of seeds may be more appropriate until strategies to mitigate potential negative impacts on livelihoods, and knock-on effects on forest cover, are developed in accordance with Conf. 16.6 (Rev. CoP18).*

*Menu (*in litt.*, 2022) noted that listing in Appendix II may stimulate illegal logging as legal avenues may have a deterrent effect and could create barriers for the development of sustainable forest management in Brazil.*

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Inclusion of Trumpet Trees *Handroanthus* spp., *Roseodendron* spp., and *Tabebuia* spp. in Appendix II with annotation #17

Proponents: Colombia, European Union, Panama

Summary: *Handroanthus*, *Tabebuia* and *Roseodendron* are genera of Bignoniaceae distributed from southern USA to Argentina and Chile, including the Caribbean. There are currently 113 recognised tree species across the three genera (35 in *Handroanthus*, 76 in *Tabebuia* and two in *Roseodendron*). The three genera were previously recognised as belonging to a single genus (*Tabebuia*), but were split in 2007 based on genetic studies, and new species continue to be described. While some are widely distributed, over half of the species are endemic to one range State or restricted to islands.

Most species within these genera produce a very hard, heavy, and durable wood that is used locally in the construction of houses, bridges, flooring, decking, and handicrafts. Internationally, where it is marketed under the single common name of Ipê, it is one of the preferred timbers for decking. Distinguishing between species and genera is reportedly difficult even at the microscopic level, and there are no identification guides covering all species. The bark is also traded internationally for medicinal and aromatic purposes. Little is known about this trade or whether harvesting bark is detrimental to the species in the wild.

Ipê is one of the most valuable timbers in the market with prices in Brazil reported to be as high as those achieved historically by Big-leaf Mahogany *Swietenia macrophylla* before commercial exploitation of the latter species was prohibited in the country. Due to their natural low densities, growth rates and shade-intolerant seedlings, Ipê species appear to be particularly vulnerable to logging, even at substantially reduced intensities. Various species have been widely planted throughout the Americas for commercial plantations, reforestation and urban landscaping as ornamentals.

The proponents seek to include the genera *Handroanthus*, *Tabebuia* and *Roseodendron* in Appendix II with annotation #17 (Logs, sawn wood, veneer sheets, plywood and transformed wood). *Handroanthus serratifolius* and *H. impetiginosus* are proposed under Annex 2a Criterion B, with the remaining species proposed under Annex 2b Criterion A based on timber being traded under the same trade name (Ipê) and under genus names, as well as due to identification, nomenclature, and taxonomic uncertainties. The three genera were previously proposed for Appendix II listing at CoP18 by Brazil (CoP18 Prop. 49), but the proposal was withdrawn before consideration.

Although no estimates for the total global trade in Ipê exist, Brazil is identified as a major exporter. Brazil reported a total of 255,723 m^3 of Ipê in trade in 2010–2016. Brazil reportedly exports Ipê to 60 countries, the principal importers being the USA and Europe. Trade from Brazil accounted for 93% of Ipê sawn wood and around 87% of Ipê flooring imports by the USA from 2008–2017. All Ipê timber production in Brazil derives from natural populations. Potentially high levels of illegal harvest have been reported in the country (as well as low volumes of seizures reported in Colombia, Mexico, and Venezuela), and there are concerns over inappropriate management measures including overestimation of sustainable offtakes, but it is unclear what proportion of illegally harvested timber enters international trade. In the forests of northeastern Brazil, *H. impetiginosus* and *H. serratifolius* have shown severe population declines, with no evidence of long-term population recovery.

- ***Handroanthus impetiginosus:*** *Handroanthus impetiginosus* was assessed as Near Threatened on the IUCN Red List in 2020, noting that its populations have declined considerably as a result of unsustainable exploitation for the international timber trade, with declines projected to continue. The species is currently categorised as near threatened in Brazil in 2019 (but was not included in the most recent assessment), threatened in Mexico and endangered in Peru. Populations of *H. impetiginosus* in parts of Brazil have reportedly suffered significant declines through overexploitation. Brazil reported exports of 1,644 m^3 of *H. impetiginosus* in 2010–2016. Exports of *H. impetiginosus* are also reported by Venezuela (20,491 m^3 from 2007–2017).

- ***Handroanthus serratifolius:*** *Handroanthus serratifolius* was categorised as globally Endangered on the IUCN Red List in 2020 on the basis that it is threatened by international trade and is predicted to experience a significant population decline in the future.

  Of Ipê exports reported by Brazil from 2010–2016, 70% (~180,000 m^3) were of *H. serratifolius*. Of the exports of this species, 75% were reported as decking, 16% as sawn wood and the remainder as flooring, clapboards and "other". The USA and European countries were the major importers.

  In the period 2010–2016, Brazilian exports of *H. serratifolius* peaked in 2012, with 36,000 m^3 reported. Brazil reported exports of 220,000 m^3 in 2017. In the years for which both production and export figures are available for *H. serratifolius* in Brazil (2012–2016), export volumes were ~16% of production volumes. While this may indicate that domestic use exceeds international trade, a 2008 study reported a relatively low processing efficiency for Ipê (42%) suggesting potentially high levels of wastage during processing of exported products. The average yield of this species is estimated at 2.4 m^3/ha. Colombia reported harvests of 1,727 m^3 in 2019–2021.

  Exploitation in some regions of Brazil has reportedly resulted in significant declines of *H. serratifolius*, with no evidence of long-term population recovery. The species is considered threatened in both Peru and Venezuela; relatively low levels of legal and illegal international trade in the species are reported by Peru, but it is unclear whether this trade has contributed to the reported declines.

- ***Handroanthus capitatus, Handroanthus chrysanthus,*** and ***Handroanthus incanus:*** These three species are all assessed as Vulnerable. Volumes in trade included reports of *H. capitatus*: ~3000 m^3 by Brazil 2010–2016 and ~13,000 m^3 by Suriname 2017–2019; *H. chrysanthus*: 50 m^3 by Brazil and ~24,000 m^3 by Colombia 2019–2021; and *H. incanus*: ~2000 m^3 by Brazil. There were additionally reports of seizures in Mexico and Colombia of illegally obtained *H. chrysanthus*.

Ipê is of increasing economic importance; it is mainly exported as decking, sawn wood and flooring for use in furniture and construction. The main importers are the EU and the USA. Over 525 million kg (or ~470,000 m^3) of Ipê timber products were exported from Brazil, Paraguay, Peru, and the Plurinational State of Bolivia (henceforth Bolivia) between 2017–2021. The majority of Ipê is exported from Brazil, which accounted for virtually all trade (96% based on volume). At least 13 species of *Handroanthus* were reportedly exported from Brazil during 2010–2016, however some trade is reported at the genus level, in many cases under synonymous names in the genus *Tabebuia*. The low natural density and low growth rate of *H. serratifolius*, as well as *H. impetiginosus*, typical of most of the other species within the three genera, combined with high demand for international trade, habitat loss and degradation, has had a negative impact on populations.

Although the known main international trade is in two species (*H. serratifolius* and *H. impetiginosus*), the trade name Ipê widely refers to any species of the three genera, as timber trade data are generally not recorded at the species level. Other species reported in international trade include *H. capitatus* (6,000 m^3 sawn wood exported from Suriname from 2011–2015), *H. heptaphyllus* (5,000 m^3 sawn wood exported from Guyana from 2011– 2015), *Roseodendron donnell-smithii* (183 m^3 sawn wood and 510 roundwood pieces exported from Mexico from 2010–2012), and *Tabebuia rosea* (exports from Venezuela totaling ~27,000 m^3 from 2007–2017). It is not clear whether international trade presents a threat to these species. Deforestation for land clearance is reportedly a threat to certain species in parts of their ranges, such as *H. chrysanthus* in Colombia and *T. rosea* in Mexico.

According to IUCN Red List assessments, Ipê (species of *Handroanthus*, *Tabebuia,* and *Roseodendron*) is increasingly being exploited unsustainably. Distinguishing distinct species of the three genera based on timber is macroscopically and microscopically not possible. Evidence suggests that current levels of exploitation of *H. serratifolius*, *H. impetiginosus* and potentially

numerous other Ipê-producing species for which trade data cannot be clearly assigned to a specific taxon, may lead to serious population decreases.

Analysis: *Handroanthus*, *Tabebuia,* and *Roseodendron* are genera of New World trees comprising over 100 species, with new species still being described. The timbers of certain species are in high demand both domestically and internationally and are reportedly some of the most valuable in the market. Woods of the three genera are marketed with the same common name (Ipê); distinguishing between the species and genera is reportedly difficult even at the microscopic level. The most highly traded species based on reported data are *H. serratifolius* and *H. impetiginosus*, which occur in several countries from Mexico to Argentina. *H. capitatus*, *H. chrysanthus,* and *H. incanus* are additionally reported in trade at lower levels according to available records.

While global data on trade are not available, Brazil appears to be the main exporter of Ipê, the majority of which is *H. serratifolius,* with 19 other species also reported in trade. *Tabebuia* spp. reported at the genus level was the second most reported in trade by Brazil, and *T. rosea* was reportedly exploited in high levels by Colombia and Venezuela. There are also reports of illegal Ipê harvest and trade taking place in Brazil, as well as seizures of timber reported by Brazil, Colombia, Mexico, and Venezuela. Overexploitation in some areas has reportedly resulted in significant population declines of *H. serratifolius* and *H. impetiginosus* which, like other species in these genera, appear to be particularly vulnerable to logging since they do not regenerate easily. *Handroanthus capitatus*, *H. chrysanthus*, *H. impetiginosus, H. incanus* and *H. serratifolius* have all been assessed as threatened (*H. serratifolius* as Endangered) with significant projected future population declines.

On this basis, *Handroanthus capitatus*, *H. chrysanthus*, *H. impetiginosus*, *H. incanus* and *H. serratifolius* appear to meet criterion B for inclusion in Appendix II in Annex 2a of Res. Conf. 9.24 (Rev. CoP17), and this may also be the case for many other species in the three genera for which distinct trade records are unavailable. The remaining species in all three genera meet the criteria for inclusion in Annex 2b as lookalikes, based on the reported identification difficulties, taxonomic and nomenclatural uncertainties, as well as being in trade under the same trade name.

Dipteryx alata and *D. odorata* are said to be commonly confused with *Handroanthus* spp., *Tabebuia* spp., and *Roseodendron* spp. which are proposed for listing in Proposal 48; these would also meet the lookalike criteria in Annex 2bA of Res. Conf. 9.24 (Rev. CoP17) were the current Proposal to be accepted.

Annotation
The majority of trade appears to be as sawn wood (HS code 4407) and wood flooring and decking (under HS code 4409) and clearly within the CITES definition of transformed wood. Bark has also been reported in trade, but no information exists on trade volumes and impact on the species. Therefore annotation #17 to include “Logs, sawn wood, veneer sheets, plywood and transformed wood” would seem to cover the main items first in trade from range States. If international bark trade is found to be detrimental to the species in the wild in the future, it may be appropriate to list the species with a new annotation, #17 with the inclusion of bark.

Summary of Available Information

Text in non-italics is based on information in the Proposal and Supporting Statement (SS), text in italics is based on additional information and/or assessment of information in the SS.

Taxonomy
According to the World Checklist of Vascular Plants (WCVP, 2022), the proposed Standard Reference, 35 species of *Handroanthus*, 76 of *Tabebuia,* and 2 of *Roseodendron* are currently accepted. Originally, all species of *Handroanthus*, *Tabebuia,* and *Roseodendron* were included in the genus *Tabebuia*. In 2007 it was proposed that *Tabebuia* be divided into three genera.

Range
Handroanthus, *Tabebuia,* and *Roseodendron* are distributed in the Americas, from southern USA to Argentina and Chile, including the Caribbean. *Of the 113 species, 67 are endemic to one range State with 29 endemic to Cuba, 20*

to Brazil, 9 to the Dominican Republic, 3 to Haiti, 3 to Puerto Rico (USA), 1 to Colombia, and 1 to Guyana (WCVP, 2022). The Proposal lists the distribution and range States for each species in Annex 1.

For the species proposed under Annex 2a B:

- *Handroanthus serratifolius:* Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, Trinidad and Tobago, and Venezuela. It is reported to be introduced in Cuba, Puerto Rico (USA), and the Venezuelan Antilles. It has an extent of occurrence of 12.4 million km^2.
- *Handroanthus impetiginosus:* Argentina, Bolivia, Brazil, Colombia, Costa Rica, El Salvador, French Guiana, Guatemala, Honduras, Mexico, Nicaragua, Panamá, Paraguay, Peru, Suriname, and Venezuela and has an extent of occurrence of over 24 million km^2.

Other species that are in trade and may meet criterion B of Annex 2a:

- *Handroanthus capitatus: Bolivia, Brazil, Colombia, French Guiana, Guyana, Peru, Suriname, Trinidad and Tobago, and Venezuela and has an extent of occurrence of over 5.1 million km^2 (Hills, 2021c).*
- *Handroanthus chrysanthus: Belize, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Peru, Trinidad and Tobago, and Venezuela and has an extent of occurrence of 11.1 million km^2, and an area of occupancy of 2,332 km^2 (Hills, 2021d).*
- *Handroanthus incana: Bolivia, Brazil, Colombia, Ecuador, and Peru (Hills. 2021e).*

IUCN Global Category
Of the 113 accepted species, 54 species have been assessed by the IUCN Red List, with a further seven accepted for publication in the December 2022 update of the IUCN Red List (version 2022-2), *and draft assessments for seven species not previously assessed (five as Endangered, one as Vulnerable, and one as Near Threatened; IUCN* in litt., *2022). Of the 113 species, 24 are globally assessed as critically endangered, endangered, or threatened according to national assessments (for endemic species) or the IUCN Red List. The assessed species and those accepted for v.2022-2 of the IUCN Red List are listed in Table 1.*

Table 1. Assessed species. Species claimed by the proponents to merit listing under Annex 2a are in bold. National assessments are included for endemic species that have not been assessed on the IUCN Red List. Asterisk (*) indicates IUCN Assessments accepted for publication in the December 2022 update of the IUCN Red List (version 2022-2). IUCN Red List population trends: **–**: stable, ▼: declining and **?**: unknown. National threatened status sources: Brazil – Government of Brazil, 2022; Cuba – González Torres *et al.*, 2016.

IUCN Global Category and national threat category	Species and assessment information
Critically Endangered	*Handroanthus grandiflorus*, B1ab(i,ii,iii)+2ab(i,ii,iii); D (Assessed 2018, version 3.1) ▼ *Tabebuia buchii*, (Possibly Extinct) B2ab(ii,iii) (Assessed 2020, version 3.1) ▼ *Tabebuia multinervis*, B2ab(ii,iii) (Assessed 2020, version 3.1) ▼
Nationally critically endangered	Tabebuia sauvallei *(Cuba, 2016)*
Endangered	***Handroanthus serratifolius***, A3cd+4cd (Assessed 2020, version 3.1) ▼ *Tabebuia conferta*, B1ab(iii) (Assessed 2020, version 3.1) ▼ *Tabebuia elongata*, B1+2c (Assessed 1998, version 2.3)
Nationally endangered	Handroanthus arianeae *(Brazil, 2022)* Handroanthus botelhensis *(Brazil, 2022)* Handroanthus cristatus *(Brazil, 2022)* Handroanthus riodocensis *(Brazil, 2022)* Handroanthus spongiosus *(Brazil, 2022)* Tabebuia bibracteolata *(Cuba, 2022)* Tabebuia clementis *(Cuba, 2016)* Tabebuia bullata *(Dominican Republic)* Tabebuia maxonii *(Dominican Republic)* Tabebuia ophiolitica *(Dominican Republic)* Tabebuia paniculata *(Dominican Republic)* Tabebuia ricardii *(Dominican Republic)* Tabebuia vinosa *(Dominican Republic)* Tabebuia zanonii *(Dominican Republic)*
Nationally threatened	Tabebuia caleticana *(Cuba, 2016)* Tabebuia inaequlpês *(Cuba, 2016)* Tabebuia pinetorum *(Cuba, 2016)*

IUCN Global Category and national threat category	Species and assessment information
Near Threatened	*Tabebuia platyantha*, Lower Risk/Near Threatened (Assessed 1998, version 2.3) *Handroanthus barbatus*, A3cd+4cd (Assessed 2020, version 3.1) ▼ ***Handroanthus impetiginosus***, A3cd+4cd (Assessed 2020, version 3.1) ▼ *Handroanthus lapacho*, B2ab(iii) (Assessed 2020, version 3.1) ▼ *Handroanthus subtilis*, B2ab(iii) (Assessed 2020, version 3.1) ▼ *Handroanthus uleanus*, B2ab(iii) (Assessed 2020, version 3.1) **?** *Roseodendron chryseum*, B2b(iii) (Assessed 2020, version 3.1) **?** *Tabebuia insignis*, A3cd+4cd (Assessed 2020, version 3.1) ▼ *Tabebuia orinocensis*, B1ab(iii)+2ab(iii) (Assessed 2020, version 3.1) **?** *Tabebuia pilosa*, B2ab(iii) (Assessed 2020, version 3.1) **?** *Tabebuia roseoalba*, A2cd+3cd (Assessed 2020, version 3.1) ▼
Nationally near threatened	Tabebuia brooksiana *(Cuba, 2016)* Tabebuia elegans *(Cuba, 2016)*
Vulnerable	*Handroanthus capitatus*, A3cd+4cd (Assessed 2020, version 3.1) ▼ *Handroanthus chrysanthus*, A3cd+4cd (Assessed 2020, version 3.1) ▼ *Handroanthus coralibe*, B2ab(iii) (Assessed 2020, version 3.1) ▼ *Handroanthus incanus*, A3cd+4cd (Assessed 2020, version 3.1) ▼ *Tabebuia anafensis*, B1+2c (Assessed 1998, version 2.3) *Tabebuia arimaoensis*, D2 (Assessed 1998, version 2.3) *(nationally threatened, Cuba endemic, 2016)* *Tabebuia bibracteolata*, D2 (Assessed 1998, version 2.3) *Tabebuia densifolia,* B2ab(ii,iii,v) (Assessed 2022, version 3.1)* ▼ *Tabebuia dubia*, B1+2c (Assessed 1998, version 2.3) *(nationally less concern, Cuba endemic, 2016)* *Tabebuia furfuracea*, B1+2c (Assessed 1998, version 2.3) *Tabebuia hypoleuca*, B1+2c (Assessed 1998, version 2.3) *(nationally less concern, Cuba endemic, 2016)* *Tabebuia jackiana*, D2 (Assessed 1998, version 2.3) *Tabebuia oligolepis*, B1+2c (Assessed 1998, version 2.3) *Tabebuia palustris*, A2c (Assessed 2008, version 3.1) ▼ *Tabebuia polyantha,* B2ab(i,ii,iii,iv,v) (Assessed 2022, version 3.1)* ▼ *Tabebuia polymorpha*, B1+2c (Assessed 1998, version 2.3) *(nationally threatened, Cuba endemic, 2016)* *Tabebuia shaferi*, B1+2c (Assessed 1998, version 2.3) *(nationally less concern, Cuba endemic, 2016)* *Tabebuia striata*, C2a (Assessed 1998, version 2.3)
Nationally vulnerable	Tabebuia cassinoides *(Brazil, 2022)*
Data Deficient	*Handroanthus diamantinensis*, (Assessed 2018, version 3.1) **?** *Handroanthus parviflorus*, (Assessed 2018, version 3.1) **?**
Nationally data deficient	Tabebuia glaucescens *(Cuba, 2016)*

IUCN Global Category and national threat category	Species and assessment information
Least Concern	*Handroanthus albus,* (Assessed 2018, version 3.1) **–** *Handroanthus bureavii,* (Assessed 2018, version 3.1) **?** *Handroanthus guayacan,* (Assessed 2020, version 3.1) **?** *Handroanthus heptaphyllus,* (Assessed 2018, version 3.1) **–** *Handroanthus obscurus,* (Assessed 2020, version 3.1) **?** *Handroanthus pedicellatus,* (Assessed 2018, version 3.1) **?** *Handroanthus umbellatus,* (Assessed 2018, version 3.1) **?** *Handroanthus vellosoi,* (Assessed 2018, version 3.1) **?** *Roseodendron donnell-smithii,* (Assessed 2020, version 3.1) **?** *Tabebuia acrophylla,* (Assessed 2022, version 3.1)* **–** *Tabebuia bahamensis,* (Assessed 2019, version 3.1) **–** *Tabebuia berteroi,* (Assessed 2022, version 3.1)* **–** *Tabebuia calcicola,* (Assessed 2022, version 3.1)* **–** *Tabebuia elliptica,* (Assessed 2018, version 3.1) **?** *Tabebuia fluviatilis,* (Assessed 2020, version 3.1) **?** *Tabebuia heterophylla,* (Assessed 2019, version 3.1) **?** *Tabebuia lepidota,* (Assessed 2021, version 3.1) ▼ *Tabebuia microphylla,* (Assessed 2022, version 3.1)* **–** *Tabebuia nodosa,* (Assessed 2020, version 3.1) ▼ *Tabebuia obovata,* (Assessed 2022, version 3.1)* **–** *Tabebuia pallida,* (Assessed 2020, version 3.1) **?** *Tabebuia reticulata,* (Assessed 2018, version 3.1) **?** *Tabebuia rosea,* (Assessed 2018, version 3.1) **–** *Tabebuia impetiginosa,* (Assessed 1998, version 2.3)
Nationally less concern	Handroanthus catarinensis *(Brazil)* Tabebuia lepidophylla *(Cuba, 2016)* Tabebuia leptoneura *(Cuba, 2016)* Tabebuia linearis *(Cuba, 2016)* Tabebuia obtusifolia *(Brazil)* Tabebuia simplicifolia *(Cuba, 2016)* Tabebuia trachycarpa *(Cuba, 2016)*

Biological and trade criteria for inclusion in Appendix II (Res. Conf. 9.24 (Rev. CoP 17) Annex 2a)

A) Trade regulation needed to prevent future inclusion in Appendix I

B) Regulation of trade required to ensure that harvest from the wild is not reducing population to level where survival might be threatened by continued harvest or other influences

There is limited information available on the population sizes of Ipê species. However, *Handroanthus* species are reported to occur at low natural densities, *and show a high level of endemism, with 59% of the species endemic to one range State, and a further 13 restricted to islands in the Caribbean (WCVP, 2022). Of the 61 species assessed on the IUCN Red List, approximately a third have declining population trends (Table 1).*

The Supporting Statement notes that in some commercial timber concessions in the Brazilian Amazon, pre-harvest inventories do not identify the different Ipê-species at the species level. This is problematic as it prevents species-specific population estimates and could lead to over-proportional harvesting of rare but highly exploited species.

Population status

Handroanthus impetiginosus

The species is assessed as Near Threatened in the IUCN Red List with a decreasing population trend as a result of unsustainable exploitation for the international timber trade, and a population decline of at least 25% over the next 100 years is expected, *and the assessment noted that monitoring of trade was essential (Hills, 2021a). The species was described as widespread and sometimes abundant and has an extent of occurrence of over 24 million km² and a minimum area of occupancy of 3,338 km² (Hills, 2021a).* The species is nationally threatened in Mexico and endangered in Peru. *The species is nationally assessed as near threatened in Brazil (Flora do Brasil, 2020).*

An inventory conducted in the 1970s by the Brazilian Ministry of Mines and Energy recorded all trees >30 cm dbh (Diameter Breast Height) in 2,364 plots of 1 ha throughout the Legal Amazon, finding an average density of 0.11 trees/ha for *H. impetiginosus*. In a 2004 study, a fragment of deciduous seasonal forest in the northeast of the Brazilian state of Goiás, an absolute density of 18.27/ha of *H. impetiginosus* with dbh ≥5 cm. Forest inventory data from Bolivia showed mean densities of 2.5 trees/ha for *H. impetiginosus*.

Handroanthus serratifolius
The species is categorised as globally Endangered on the IUCN Red List with a decreasing population trend on the basis that it is threatened by international trade and is predicted to experience a population decline of at least 50% over the next 100 years. Whilst the population size of *H. serratifolius* is considered to be large given its wide distribution, it is declining. The species is nationally threatened in Peru and Venezuela. In Venezuela, the species has reportedly been depleted in its natural populations as a consequence of the demand for wood for the production of handicrafts in the states of Lara and Falcón.

For *H. serratifolius*, industrial development of the Amazon is considered a major threat, with Brazil having lost 20% of its forest cover between 2002–2019. In Brazil, exploitation was reported to have resulted in significant declines, with no evidence of long-term recovery.

Forest inventory data from 2000 in Bolivia indicated that the mean density of *H. serratifolius* was 0.45 trees/ha *with few young trees recorded relative to large, very old mature trees (Hills, 2021b)*. An inventory conducted in the 1970s by the Brazilian Ministry of Mines and Energy recorded all trees >30 cm dbh in 2,364 plots of 1 ha throughout the Legal Amazon, finding an average density of 0.32 trees/ha for *H. serratifolius*. A study published in 2008 noted that forest inventories carried out in the state of Pará, one of the main timber-producing states in the Brazilian Amazon, recorded *H. serratifolius* densities between 0.2–0.4 trees/ha with dbh ≥50 cm.

Handroanthus captitatus, H. chrysanthus, and *H. incanus*
These species are categorised as globally Vulnerable in the IUCN Red List with a decreasing population trend projected to experience a population decline of at least 30% over the next 100 years (Hills, 2021c; Hills, 2021d; Hills, 2021e). According to the assessments, these species are considered threatened by international trade, and threats to the species are predicted to increase.

Other species
Of the remaining species in the three genera, 16 have been recorded in the international timber trade. These include H. albus, H. barbatus H. billbergii, H. chrysotrichus, H. guayacan, H. heptaphyllus, H. incanus, H. ochraceus, H. speciosus, H. umbellatus, T. angustata, T. aurea, T. cassinoides, T. heterophylla, T. rosea, *and* T. roseoalba. *Of these, three have been assessed by the IUCN as Least Concern with a stable population trend, three as Least Concern with an unknown population trend, two as Near Threatened with decreasing population trends, one as Vulnerable with a decreasing population trend, and seven have not been assessed on the IUCN Red List.* H. chrysotrichus *is nationally assessed as critically endangered in Bolivia, and* T. cassinoides *is nationally assessed as vulnerable in Brazil, where it is also endemic.*

In a recent study on the risk of extinction of 80 socio-economically viable Neotropical tree species, *H. pulcherrimus* was assessed as one of seven species that deserve special attention because it is highly threatened throughout its distribution in South America. *H. grandifloras* (a Brazilian endemic with only one sub-population) is assessed as critically endangered, alongside two other *Handroanthus* species (Table 1).

Table 2. National threatened status, and endemism in range States according to Plants of the World Online (POWO), 2022. Bold indicates the species proposed under Annex 2a criterion B.

Range State	Nationally threatened species
Argentina	Threatened: *H. lapacho*
Bolivia	Critically endangered: *H. chrysotrichus, H. lapacho*
Brazil	Critically endangered: *H. grandifloras* (Endemic) Endangered: *H. arianeae* (Endemic), *H. botelhensis* (Endemic), *H. cristatus* (Endemic), *H. riodocensis* (Endemic), *H. spongiosus* (Endemic), *T. nodosa* Near threatened: ***H. impetiginosus*** Vulnerable: *T. cassinoides* (Endemic) Less concern: *H. albus, H. catarinensis* (Endemic), *H. heptaphyllus, T. obtusifolia* (Endemic)
Colombia	Threatened: *T. palustris, T striata*
Costa Rica	Threatened: *H. guayacan, T. palustris*
Cuba	Critically endangered: *T. leptopoda, T. pergracilis, T. pulverulenta* (Endemic), *T. sauvallei* (Endemic) Endangered: *T. bibracteolata* (Endemic), *T. clementis* (Endemic) Threatened: *T. arimaoensis* (Endemic), *T. bahamensis, T. berteroi, T. billbergii, T. caleticana* (Endemic), *T. densifolia, T. elongata, T. inaequlpês* (Endemic), *T. obovate, T. pinetorum* (Endemic), *T. polymorpha* (Endemic) Vulnerable: *T. jackiana* (Endemic) Near threatened: *T. brooksiana* (Endemic), *T. elegans* (Endemic) Less concern: *T. angustata, T. dubia* (Endemic), *T. heterophylla, T. hypoleuca* (Endemic), *T. lepidophylla* (Endemic), *T. lepidota, T. leptoneura* (Endemic),

Range State	Nationally threatened species
	T. linearis (Endemic), *T. microphylla, T. moensis, T. myrtifolia, T. shaferi* (Endemic), *T. simplicifolia* (Endemic), *T. trachycarpa* (Endemic) Data deficient: *T. calcicole, T. crispiflora, T. glaucescens* (Endemic)
Dominican Republic	Endangered: *T. bullata* (Endemic), *T. crispiflra, T. dominguensis, T. maxonii* (Endemic), *T. obovata, T. ophiolitica* (Endemic), *T. paniculata* (Endemic), *T. ricardii* (Endemic), *T. vinosa* (Endemic), *T. zanonii* (Endemic)
Haiti	Endangered: *T. conferta* (Endemic)
Jamaica	Almost threatened: *T. platyantha* (Endemic)
Mexico	Threatened: *H. chrysanthus*, ***H. impetiginosus***
Panama	Threatened: *T. palustris, T. striata*
Peru	Endangered: ***H. impetiginosus*** Threatened: ***H. serratifolius***
Venezuela	Threatened: ***H. serratifolius***

International trade

In the international market the very hard, heavy, and durable wood is highly sought after and is used for flooring, decks, exterior woods, veneer, and other turned objects, crafts, and posts. In several countries in the Americas *Handroanthus* spp. are considered multipurpose trees that provide both, high value timber and non-timber forest products (NTFP). The wood that most *Handroanthus*, *Tabebuia*, and *Roseodendron* species produce is used locally in the construction of houses and bridges, pavements, decks, exterior woods and handicrafts. The bark is used for medicinal purposes and is also traded internationally.

In the period 2017–2021, roughly 77% of Ipê exports were classified as flooring or decking, with 19% exported as sawn wood. In the same period, around 4% of the Ipê tracked was exported under other product categories or HS codes including joinery, particleboard, veneer, and plywood. Paraguay was the only country where more Ipê was exported as sawn wood than flooring. In 2018, it was estimated that the value of Ipê processed into flooring or decking can reach USD2,500/m³ in international markets. Over 525 million kg (or 469,613 m³) of Ipê timber products were exported from Bolivia, Brazil, Paraguay, and Peru between 2017–2021 (Table 3). The majority of Ipê was exported from Brazil, which accounted for 96% of the trade (based on volume).

Table 3. Volumes (m³) of Ipê timber in international trade by reported origin country of four range States, 2017–2021 (Norman & Zunino, 2022).

Origin	Volume (m³)					
	2017	2018	2019	2020	2021	Total
Brazil	77,846	94,258	99,323	101,310	76,643	449,381
Bolivia	3,052	2,473	1,885	–	–	7,410
Paraguay	1,955	1,663	1,231	922	1,306	7,077
Peru	974	1,183	1,157	923	1,508	5,744
Total	83,827	99,578	103,596	103,156	70,213	469,613

No total estimates for the global trade in Ipê exist, but wood is exported to at least 60 countries. The main species in trade appear to be *H. serratifolius* and *H. impetiginosus*. Nevertheless, at least 13 other species were reported as exported from range States. *The main range States for which data are available are outlined below.*

Brazil

According to the Supporting Statement (SS), all Brazilian Ipê wood comes from natural forests, as there are no plantations in the country. The SS notes that there was a 500% increase from 1998–2004 in Ipê timber exports from the Brazilian Amazon. In the period 2010–2016, Brazil reported exports of 255,723 m³, and over 70% of these exports were reported to be *H. serratifolius* (Table 4). *H. serratifolius* was primarily exported as decking (75%), followed by sawn wood (17%), and flooring (4%). Exports between 2010–2016 peaked in 2012 with over 35,000 m³ exported.

Table 4. Timber volume of Ipê reported as exports by Brazil from 2010–2016 (CoP18 Prop. 49, 2019). Bold indicates the species proposed under Annex 2a criterion B. National threat based on national red list from 2022 (Government of Brazil, 2022), "(end.)" denotes endemic.

Reported species	Equivalent species according to proposed CITES Standard Reference	IUCN Red List	National status (2022)	Volume (m³)
T. serratifolia	***H. serratifolius***	**EN (2020)**		**180,110**
Tabebuia spp.				61,227
T. capitata	*H. capitatus*	VU (2020)		2,887
T. incana	*H. incanus*	VU (2020)		2,243

T. impetiginosa	***H. impetiginosus***	**NT (2020)**		**1,644**
T. ochracea	*H. ochraceus*			1,439
T. vellosoi	*H. speciosus*			1,436
T. alba	*H. albus*	LC (2018)	Lc	1,373
T. heptaphylla	*H. heptaphyllus*		Lc	1,246
T. chrysotricha	*H. chrysotrichus*			898
T. lpê	*H. heptaphyllus;* ***H. impetiginosus***	**NT (2020)**		**317**
T. barbata	*H. barbatus*	NT (2020)		316
T. cassinoides			Vu (end.)	223
T. umbellata	*H. umbellatus*	LC (2018)		115
T. aurea				67
T. caraiba	*T. aurea*			61
T. chrysantha	*H. chrysanthus*	VU (2020)		50
T. angustata				24
T. roseo-alba	*T. roseoalba*	NT (2020)		24
T. avellanedae	***H. impetiginosus***	**NT (2020)**		21
Total				255,723

A study from 2022 noted that Brazil exported at least 449,381 m^3 between 2017 and 2021 in shipments that were listed as only containing Ipê products, suggesting that Brazilian Ipê exports grew at least 76% (by volume) between the periods 2010–2016 and 2017–2021.

During 2013–2015, the main importing countries for exports from Brazil were the USA with 47,372 m^3, France with 23,868 m^3, and Belgium with 11,763 m^3 of Ipê sawn wood. The EU (primarily France, Belgium, Spain, and Portugal) and the UK reportedly purchased 45% of all Ipê species (by volume) exported by Brazil between 2017–2021. French imports of Brazilian Ipê increased by 84% and Belgian imports by ~70% by volume for the period 2017–2021, compared with previously reported figures for 2010–2016.

According to the International Tropical Timber Organization (ITTO), Brazil exported a total of 83,992 metric tonnes of Ipê sawn wood between 2018–2021. The USA purchased roughly 36% of the Ipê exports based on volume over the period, with Canada purchasing 4% during the same span. While the USA imported less than the EU, the USA remains the primary single global buyer of Ipê. It was estimated that USA consumption of Ipê from Brazil has increased by 126% for the period 2017–2021, compared with previously reported figures for 2010–2016. According to the ITTO the USA imported 260,203 m^3 of Ipê sawn wood and 148,983 m^2 Ipê wood flooring between 2018–2020.

Colombia

Colombia reported a total of 126,223 m^3 of harvests of Ipê between 2019–2021 (Table 5). The main species in trade were *H. billbergii* and *H. chrysanthus*. Colombia noted that 2021 was the year in which the highest volumes were exploited. *It is unclear how much this was, and whether these volumes were also exported internationally.* Three export licences were approved in 2019–2020 for a total of 114m^3, of which 82 m^3 were for *Tabebuia* spp., 20 m^3 were for *T. rosea* and 12 m^3 were for *H. serratifolius*.

Table 5. Exploited volumes of Ipê by Colombia in the period 2019–2021. Bold indicates the species proposed under Annex 2a criterion B.

Reported species	Equivalent species according to proposed CITES Standard Reference	IUCN Red List	Volume (m^3)
H. billbergii			72,637
H. chrysanthus		VU (2020)	23,899
H. serratifolius		**EN (2020)**	**1,727**
Handroanthus spp.			348
H. guayacan		LC (2020)	14
T. rosea		LC (2018)	25,700
Tabebuia spp.			1,731
T. ochracea	*H. ochraceus*		156
T. chrysantha	*H. chrysanthus*	VU (2020)	9
T. heterophylla		LC (2019)	2
Total			126,223

Ecuador
H. chrysanthus was reported as among the 10 most used and commercialised forest species and from 2012–2013, 7,775 m³ was logged.

French Guyana
The annual inventory of *H. serratifolius* and *H. impetiginosus* in French Guyana averaged 1,099 m^3 between 2007–2021, and all timber was PEFC (Programme for the Endorsement of Forest Certification) certified. *Over the same period, the average annual exploitation was 881 m^3, equivalent to 175 logs annually (CoP18 Prop. 49, 2019).*

Guyana
The 2019–2020 biennial review noted that Guyana exported ~2,000 m^3 of Tabebuia *spp.* in 2017 *(ITTO, 2020).*

Mexico
Mexico reported exports of 183 m³ of sawn wood of *R. donnell-smithii* to Guatemala in the period 2010–2011. In 2012, Mexico exported 510 pieces of logs of *R. donnell-smithii* to Honduras.

Peru
Peru reported exports of *H. serratifolius* totalling 1,131 m³ from January 2016–March 2018. The biggest importers from Peru were China and the Dominican Republic. *Table 3 notes that Peru was reported as the origin for 5,744 m^3 of Ipê between 2017–2021 (Norman and Zunino, 2022).*

Suriname
ITTO biennial reports for the period 2011–2015 include exports from Suriname of 5,000 m³ logs and 1,000 m³ sawn wood of *H. serratifolius*, destination unspecified. *The 2019–2020 biennial review noted that Suriname exported ~3,000 m^3 of* H. serratifolius *and ~13,000 m^3* of H. capitatus *(ITTO, 2020).*

Venezuela
Venezuela reported exports of 29,637 m³ *T. rosea* and 20,491 m³ *H. impetiginosus* during 2007–2017 (Table 6). During this period, exports fluctuated and peaked in 2007 (Figure 1).

Table 6. Timber volume of Ipê reported as exports by Venezuela from 2007–2017 (CoP18 Prop. 49, 2019). Bold indicates the species proposed under Annex 2a criterion B.

Reported species	Equivalent species according to proposed CITES Standard Reference	IUCN Red List	Volume (m^3)
H. impetiginosa	***H. impetiginosus***	**EN (2020)**	20,491
T. fluviatilis		LC (2020)	232
T. rosea		LC (2018)	29,637
Total			50,360

Inclusion in Appendix II to improve control of other listed species

A) Specimens in trade resemble those of species listed in Appendix II under Res. Conf. 9.24 (Rev. CoP17) Annex 2 a or listed in Appendix I

Generally, the traded wood is not specified to species level, which does not allow species-specific estimations of trade volumes. The wood can be traded with the scientific name or the local common name, but at least 28% of the exports by weight were either only reported as Ipê or another generic common name which did not include any information on the botanical name.

Due to the great similarity between the woods of the different species and genera, they are marketed with the same common name (Ipê). The quantitative characteristics of the wood anatomy can present variations between individuals of a species and even within the same individual, resulting in distinguishing species being difficult. *A clear differentiation of the individual species is not possible on either the macroscopic or microscopic level (Koch,* in litt.*, 2022).* There are no identification guides for all species of the three genera. A clear differentiation between the genera *Handroanthus* and *Tabebuia* is not considered possible, especially for non-experts. The species of the genus *Roseodendron* may be distinguishable from *Handroanthus* and *Tabebuia* at the microscopic level (with relevant reference samples and expertise). *However, based on the very complex taxonomy of the three genera with many synonyms, a clear and assured differentiation may be difficult in practice (Koch,* in litt*., 2022).*

Experts from the Thuenen-Institute of Forest Genetics noted that although it is possible to distinguish H. serratifolia *from* H. impetiginosus *using genetic markers their use is not widespread (Blanc-Jolivet,* in litt., *2022; Schroeder,* in litt., *2022). In addition, molecular techniques were noted to be the only method for identification of these species and required significant expertise (Blanc-Jolivet,* in litt., *2022). Identification of origin was noted as only possible using isotope analysis (Blanc-Jolivet,* in litt., *2022).*

The following species are commonly confused with Ipê in trade: Dipteryx olifeira*,* Bulnesia sarmientoi (*CITES Appendix II)*, Guaiacum *spp. (CITES Appendix II), and* Chlorocardium *spp. (Koch,* in litt.*, 2022). The following species are additionally commonly confused and all are present in range States where the three proposed genera are also present (G. Koch,* in litt.*, 2019):* Acosmium *spp.: in Bolivia and Brazil (Rodrigues and Tozzi, 2009)* Leptolobium *spp. (Lapachillo, lapachin): from Mexico to Argentina (Rodrigues and Tozzi, 2012)* Dicorynia guianensis *Amsh.: in Suriname and French Guiana (ITTO, 2019)* Dicorynia paraensis *Benth. (Angélique, basralocus): in Brazil, Colombia, and Venezuela (Canteiro, 2018)* Dipteryx odorata *(Aubl.) Willd.: in Brazil, Colombia, French Guiana, Guyana, Suriname, and Venezuela (Requena Suarez, 2017)* Dipteryx alata *Vog. (Cumarú): in Brazil (Raquena Suarez, 2021).* Dipteryx *spp. is currently proposed for listing in CoP19 Prop. 48.*

Live standing trees are easily distinguished.

One of the Spanish common names used for the genera "Guayacan" is also used to refer to timber of CITES-listed species such as species of the genus *Guaiacum* and *Bulnesia sarmientoi*.

B) Compelling other reasons to ensure that effective control of trade in currently listed species is achieved

Additional information

Threats

The main threats to Ipê are deforestation and logging for both domestic and international trade. Latin America has suffered from very high deforestation rates in the last three decades, reducing the potential suitable habitat for Ipê trees significantly. Whilst settlement and agricultural development are major causes, expansion of road networks and mining are also threats to South American forests.

Locally, *Handroanthus*, *Tabebuia,* and *Roseodendron* species are also used domestically in the construction of houses and bridges, pavements, decks, exterior woods, handicrafts, and for medicinal purposes. Besides timber commodities, herbal products made from the inner bark of some species of *Handroanthus*, including, but not limited to *H. impetiginosus*, are traded internationally as "lapacho", "pau d'arco" or "taheebo". However, while trade data are not available for these products, no substantial role in international trade could be identified compared to timber trade volumes, and no information was found to suggest that this use has impacts on wild populations of *Handroanthus*, *Tabebuia,* and *Roseodendron*. *A book from 1997 noted that the international market for* Tabebuia *bark was growing and that this was increasing pressure on wild stands of the trees, with overharvesting reportedly occurring in Peru (Sheldon* et al.*, 1997).*

Deforestation

Based on satellite imagery, the total area deforested in the Brazilian Amazon in 2004 was 2.8 million ha. The annual rate of deforestation between 2012 and 2013 was 5.9 million ha, an increase of 28% compared to 2011. Deforestation was driven mainly by the demand for agricultural land. In Colombia, the reduction of forest fragments caused by the expansion of areas for agricultural and livestock use has restricted *H. chrysanthus* to the drier transition zone of xerophytic scrub vegetation in the south of the country. In Michoacán, Mexico, natural populations of *T. rosea* have decreased considerably due to anthropogenic factors, mainly deforestation for the construction of human settlements combined with obtaining wood, contributing to the reduction of their habitat.

Brazil is one of the most extensively forested countries in the world, with 463 million hectares of forests; 90% of them are in the Amazon Basin and the Cerrado. Brazil experienced rapid deforestation with mean annual rates between 0.2–0.4% during 2000–2015. According to Brazil's National Institute for Space Research, the total area deforested in the Brazilian Amazon in 2011–2012 was 460,000 ha, compared to 2.8 million hectares in 2004. In 2019, an area of 10,129 km² of forest was clear-cut, which is an increase of 34% compared to 2018 (7,536 km²). In 2020, deforestation was estimated to be 11,088 km², representing an increase of 47% and 9.5% compared to 2018 and 2019, respectively. Deforestation was driven primarily by demand for agricultural land with many of the forest conversion being illegal. In recent years, Ipê harvests have declined or ceased in most of the old, well-developed logging centres in eastern Amazonia, but at the same time, new logging frontiers in the remote central and southwestern Amazon region (where access and infrastructure had been poor) were opened up, with Ipê amongst the main species being harvested.

In Mexico, the negative effect of land use change, deforestation, elimination of ecotypes, clandestine logging, selective logging, fires, and introduction of exotic species have been documented to have a negative effect on *Roseodendron donnell-smithii* and to cause severe genetic degradation. Furthermore, Mexico lost 16% of forest cover from 1986–2000, which mainly affected the dry tropical forest with an annual deforestation rate of 3.7%; and forest cover loss increased to 22% between 2000–2011. The state of Michoacan, Mexico, lost almost 525,260 ha over the same 10-year period, which was partially being recovered with the reforestation of *T. rosea*.

In Colombia, the reduction of forest fragments driven by the expansion of areas for agricultural and livestock use have restricted the population of *H. chrysanthus* to the driest zone of transition of xerophytic scrub vegetation in the south of the country.

In Bolivia, based on spatial satellite imagery 276,000 and 281,283 ha were deforested in 2004 and 2005 respectively. Until 2010, approximately 4.6 million ha of forest were lost, corresponding to 10% of the area originally covered by forest.

In Peru, about 12,849 km² of forests are cut down annually—reportedly 80% cut illegally.

In Ecuador, originally about 35% (28,000 km²) of the land surface was covered by dry forest, with 80–90% of the original dry forest vegetation having disappeared due to land use change. The national annual deforestation from 2008–2020 ranged between 214.8 km²/year and 310 km²/year.

In Venezuela, the deforestation between 1990–2010 was 288,000 ha/year.

Logging

Most of the *Handroanthus* species are slow-growing heliophytes and require large areas of forest with little competition from other plants to reach the canopy; they are said to be some of the most vulnerable to logging in Amazonian forests because of their natural low density and low growth rates.

It is not possible to maintain timber production at current harvest levels on 30-yr cutting cycles, or even at substantially reduced logging intensities with the current log-and-leave reduced impact (RIL) model, and there appears to be no reason to believe that populations of Ipê subjected to logging are any more resilient than those of Mahogany (Schulze, in litt., *2019). A study by Richardson and Peres (2016) in Pará found no evidence that the post-logging timber species composition and total value of forest stands recovers beyond the first cut, suggesting that the commercially most valuable timber species (including Ipê) become predictably rare or economically extinct in old logging frontiers.*

The decline in other tropical timber species such as Big-leaf Mahogany *Swietenia macrophylla* has led to an increase in demand for species of Ipê on the international market, which has led to declines in some species. In Brazil, in particular, it was suggested that exploitation may lead to the extinction of *Handroanthus* species as a result. *Handroanthus* species are vulnerable to logging due to their low natural density and low growth rates.

In Brazil, a study examined the response of *H. serratifolius* and *H. impetiginosus* populations to logging in various locations in the eastern Amazon. The authors reported that the widely held assumption that 30-year cutting cycles combined with a minimal exploitable diameter (MED) of 50 cm dbh and 90% logging intensity (10% of the trees above MED should be left as seed trees) is sustainable is based on a limited number of small plots in Amazonia that do not consider logging impacts on timber species populations or recovery rates. The study projected that under the current logging regime, in some concessions projected volumes for a second logging cycle will be as low as 2–3% for *H. impetiginosus* and 4–12% for *H. serratifolius*. After selective logging, there was no evidence that the composition of the timber species and the overall value of the forest recovered, suggesting that the timber species with the highest commercial value, such as Ipê, would not show sufficient population recovery and become rare or economically extinct in former timber frontiers.

Illegal logging and trade

Illegal logging is reported to be a significant threat to species of Ipê, including *H. serratifolius*. The Supporting Statement notes that in the Brazilian Amazon, illegal timber laundering through overestimating the inventoried timber volume followed by fraudulently obtained official documentation is widespread. Greenpeace-Brazil, in collaboration with the State Secretariat for the Environment and Sustainability of Pará (SEMA) and Brazil's Public Prosecutor's Office, carried out a systematic review of all 1,325 extant management plans in Pará between 2006 and 2013 to assess the extent to which timber laundering occurred. In total, 746 plans listed Ipê in their inventories, approximately 14% of which overestimated the timber volume to be harvested during the logging intervention (3,000 m³ per concession or 60% above the species average of 2.4 m³/ha). Although illegal logging has been reported to have fallen to 54–75% in the Brazilian Amazon from 2003–2013, it still accounts for 35–72% of logging in this area. A comparison of satellite data with official records of licences issued by the SEMA suggested that 78% of the area logged from August 2011 to July 2012 in the state was not licensed. In 2017, 74% of the total volume of 33,389 m³ licensed for logging had a high risk of being overestimated in pre-harvest inventories. Presumably owing to its high value, Ipê was found to be the timber with the highest probability of fraudulent inventory data. The occurrence of illegal harvest suggests that the legally authorised timber volume is not sufficient to meet demand.

The Supporting Statement describes how, in 2016, the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA) dismantled a criminal scheme for the extraction, transport and commercialisation of

illegal wood in the northern region of Mato Grosso, one of the main timber producing states in Brazil's Central West region. In the action, approximately 350 m³ of sawn Ipê was secured (~18 loaded trucks), which were valued at ~USD567,000. The shipment was destined for the international market, mainly Belgium, the USA, and France. In January 2018, 400 containers containing wood from the Brazilian Amazon were seized by IBAMA and by the Brazilian Federal Police. Among them was 475 m³ of *Handroanthus* sawn timber without legal provenance. More than 43,000 m³ of wood were traded using fraudulent documentation from just one company in 2015, including about 12,000 m³ of Ipê, potentially worth at least USD7 million if processed and exported. Between 2016–2017, 10,171 m³ of Ipê wood from forest management plans with evidence of illegality was imported by 37 American companies. In addition, 11 EU countries, including France, Portugal, Belgium and the Netherlands imported 9,775 m³ in that timeframe, some of which was assumed to have come from an illegal origin. A strong driver for illegal trade appears to be the high prices in international markets for Ipê timber. The high export value of Ipê (up to USD2,500/m³ at export ports) gives loggers and sawmills a motivation to build illegal roads, leading to growing forest degradation and the destruction of biodiversity, and also to obtain official documentation through fraudulent inventory reports to launder and subsequently commercialise illegally harvested *Handroanthus* trees. Brazil´s non-integrated forest licensing and control system has been reported as being unreliable, with official documentation considered inadequate, meaning it is almost impossible to distinguish between legal and illegal Ipê timber.

In Venezuela, 65 m³ of wood and 1,062 units of *T. rosea* products were seized between 2013–2018. In Peru, 119.16 m³ of wood, 14.96 kg of bark and 4,738 pieces of *Tabebuia* (potentially *Handroanthus*) were seized during the period 2011–2017. In Colombia, between 2010–2020, a total of 270 m³ was seized, including *H. billbergii* (93 m³), *H. chrysanthus* (59 m³), and *T. rosea* (118 m^3), seized due to a lack of permits. Mexico reported 9 seizure events from 2017–2019, involving *H. chrysanthus* (0.485 m^3), *R. donnell-smithii* (4.16 m^3), and *T. rosea* (28.98 m^3 and 208 pieces).

Conservation, management and legislation

About half of the Brazilian forest area (243 million ha) has been identified as PFP "Permanent Forest Property", including public, federal and private forests (Indigenous Lands and Legal Reserves based on long-term land ownership for forest users). Forest management units for timber production within the PFP comprise 34.25 million ha or 14% of the PFP. Owners and users are responsible for management. Forest area that is not classified as PFP is open for conversion to other land uses. A positive example for a Sustainable Use Conservation Unit is the Altamira National Forest in the central-southwestern part of Pará. Its area of 689,000 ha is predominantly covered by dense ombrophilous forest and includes a protected area that represents a significant extension of ancient forests. Altamira is embedded in the so-called Xingu River Basin Corridor, with an area of more than 26 million ha and 18 Indigenous Lands (24 ethnic groups), various sustainable uses and fully protected areas, identified as areas of great importance for the preservation of biodiversity.

Mainly due to management actions, including the declaration of an effectively managed and enforced ban in 1978 and the application of *in-vitro* cultures, the populations of *H. chrysanthus* and *H. billbergii*, have recovered in Ecuador.

There are broad bans/restrictions on timber logging/export in several range States, examples are included in Table 3.

Table 3. Legislation in some of the range States.

Range State	Legislation
Brazil	The export of unfinished timber of native species (i.e., destined to be processed abroad) is prohibited according to Normative Instruction 15/2011, amended by Normative Instruction 13/ 2018. A prerequisite in Brazil for timber exploitation is an approved forest management plan that establishes how forestry activities will be carried out in a specific area which must be submitted to the environmental institutions of the Brazilian departments. Once approved, an annual operation plan must be submitted for the following year's harvest, including a forest inventory and a detailed logging map showing the trees to be felled. The minimum exploitable diameter (MED) is 50 cm for all commercially exploitable species, including Ipê, and 10% of the trees above the MED must be left standing as seed trees. The 2006 legislation transferred the responsibility for approval, monitoring and evaluation of forest management plans (FMPs) to individual states. The landowner or company proposing the forest management plan submits it to the authority responsible for timber regulation (State Environmental and Sustainability Secretariat (SEMAS), which

Range State	Legislation
	registers estates and licences, including those for logging, on a computerised system. The registration of timber producers, and the monitoring of the chain of custody through an electronic system intended to track timber and record transactions is the responsibility of state governments. All timber sales and shipments are accompanied by the corresponding quantity of credits entered into this system.
Bolivia	Export of unprocessed forestry products is subject to restrictions and highly regulated, mainly through forest certification (from 1996 onwards, last updated 2016).
Ecuador	There is an export ban on roundwood, except in limited quantities for scientific and experimental purposes, and semi-finished forest product exports are allowed only when "domestic needs and the minimum levels of industrialisation have been met" (from 2005 onwards, last updated 2016).
Mexico	The Environmental Attorney General's Office (PROFEPA) will carry out technical investigation, inspection and surveillance actions in forestry matters, carrying out documentary verifications on forest management programmes, justifying technical studies, the authorisations issued by the Secretariat or the Commission or the reports rendered. During the technical investigation, PROFEPA may obtain any data, information, or indication that it deems necessary to clarify the legality of any operations. They then prepare a report in which the information collected is analysed, to detect cases in which it is appropriate to exercise its powers of inspection, surveillance and sanctions.
Peru	There is an export ban on logs and forest products "in their natural state" except when they originate from nurseries or forest plantations and if they do not require processing for final consumption (from 1972 onwards, last updated 2016). Reportedly forest concession agreements require reduced impact logging practices, cutting rotations of at least 20 years, and the retention of a minimum of 10% of mature adult trees (seed trees) of each harvested species to enable regeneration.
Suriname	Under the Forest Management Law of 18 September 1992, *H. serratifolia* (*Tabebuia serratifolia*) is listed as a Category A species (market-worthy timber species), meaning that the minimum exploitable diameter is 35 cm (although exceptions can be made by the Forestry Department). Additionally, a permit is required for the export of "raw wood, round wood, round or felled pole wood, processed wood, wood products and forest by-products".
Venezuela	Reportedly, forest concession holders may only extract trees greater than 40 cm dbh (not specific to Ipê). In 2006, Venezuela decreed a ban on *T. spectabilis*, prohibiting the exploitation, use and any type of intervention on trees of this species throughout the national territory.

Artificial propagation
Various species in this genus are grown in nurseries for forest plantations, reforestation and urban planting throughout the Americas. In Panama, *T. rosea* was experimented with to reforest degraded areas and the yield was good in all sites. In Venezuela there are plantations of *T. rosea* in Barinas and Monagas states. In Jamaica *T. rufescens* and *T. rosea* are commonly cultivated. In Mexico there are 62,736 ha of plantations of Ipê of several species, mostly *T. rosea* (48,748 ha) that is managed in commercial plantations, as well as being used to enrich secondary forests and degraded paddocks. *Exploitation of* T. rosea *in Mexico is reportedly primarily for local use (Martínez Salas,* in litt., *2019)*. *T. heterophylla* is also grown in plantations in Puerto Rico (USA). *There are no Ipê plantations in Brazil.*

To date, *H. serratifolius* has rarely been utilised in forest plantations due to the lack of information regarding its development in both nursery and field conditions. The costs for the production of seedlings were found to be five times higher than for the production of *Swietenia macrophylla* seedlings.

Several species of *Handroanthus* and *Tabebuia* are commercially nursery-grown for urban landscape planting and street trees in countries with suitable environmental conditions. However, no indication was found on timber plantations outside of South America, Central America, and the Caribbean.

Potential risk(s) of a listing
Trade shifts to other non-listed species, as appears to have affected these genera following the listing of Mahogany (Brancalion et al., *2018).*

Potential benefit(s) of listing for trade regulation
The absence of international mechanisms to monitor and control international trade in these vulnerable and endangered species is believed to have contributed to their overexploitation, very high international trade volumes as well as laundering and illegal trafficking. A CITES-listing could help to regulate this trade towards a

sustainable volume and in a manner that is not detrimental to the survival of the species. The phenomenon that all 113 species might be traded under the same trade name and the fact that timber of the different species is hardly distinguishable suggests the listing of all species of *Handroanthus*, *Tabebuia,* and *Roseodendron* would be necessary to avoid enforcement problems and loopholes for timber laundering.

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Inclusion of African populations of *Khaya* spp. in Appendix II with annotation #17 "Designates logs, sawn wood, veneer sheets, plywood and transformed wood."

Proponents: Benin, Côte d'Ivoire, European Union, Liberia, Senegal

Summary: The genus *Khaya* consists of tree species native to tropical and subtropical Africa, Madagascar, and the Comoros. Five species are currently recognised: *K. anthotheca*, *K. grandifoliola*, *K. ivorensis*, *K. madagascariensis,* and *K. senegalensis.* A sixth species, *K. comorensis*, is subject to debate. A taxonomic revision of *K. anthotheca* is underway following a recent study based on genetic markers and morphological analysis.

The proposal covers African populations of the genus *Khaya*. No species within the genus are native elsewhere. Plantations of *Khaya* have been developed in Africa and in various countries outside this region, including Australia, Brazil, Indonesia, Malaysia, and Sri Lanka. These plantations are thought to be relatively small and may not yet be important sources of timber for international trade. *Khaya* spp. are all large trees that grow up to 60 m in height for the largest species (*K. anthotheca* and *K. ivorensis*). They produce some of Africa's most valuable timber for the international market traded under various names, notably as African Mahogany or Acajou. Logs, sawn timber and veneer are amongst the products exported from a range of African countries. The wood is used for boat building, construction, carpentry, panelling, flooring, furniture, veneer and plywood. It has been imported to Europe from West Africa since the late 19th century, with Central African countries later becoming an important source. The EU, USA, and China are currently among the major importers.

The timber of four of the five currently recognised *Khaya* spp. (*K. anthotheca, K. ivorensis, K. grandifoliola,* and *K. senegalensis)* is traded internationally, placing significant pressures on wild populations. These species are widespread in Africa but considered globally threatened because of population declines resulting primarily from commercial logging. They were all classified as Vulnerable in the IUCN Red List assessments in 1998 and are currently being re-assessed. Population density is generally considered to be low for *Khaya* spp.

The fifth species, *K. madagascariensis,* has been heavily exploited in the past so that commercial stocks are no longer available; it has an estimated population of 1,400 mature individuals, in approximately 14 subpopulations. The IUCN Red List assessment of 2020 classified it as Vulnerable based on past population declines of over 30% in three generations as a result of exploitation for timber.

- ***K. anthotheca*** is widespread in various forest types. It is harvested commercially for timber, traded as African Mahogany, Khaya or Acajou and has a declining population.
- ***K. grandifoliola*** occurs in semi-deciduous forest in countries extending from Guinea to Uganda. It has a declining population, and it is harvested commercially for timber, traded as African Mahogany, Khaya or Acajou.
- ***K. ivorensis*** is widespread occurring in evergreen and semi-deciduous forest with high rainfall. It is the most exploited species of the genus because its wood is regarded as of better quality than that of other species.
- ***K. madagascariensis*** is endemic to Madagascar and the Comoros. The population has declined due to timber exploitation in the past. There are no recent recorded exports.
- ***K. senegalensis*** is widespread in West and Central African savanna areas. The population has declined at least in parts of its range. It is harvested commercially for timber traded as African Mahogany, Khaya or Acajou.
- ***K. comorensis*** is not generally accepted as a distinct species. It is recorded from Comoros. There is no information known on its population size, trend or utilisation and trade.

No comprehensive global trade data exist for *Khaya* spp., however, from available, partial information from exporters and importers, Cameroon, Congo, and Côte d'Ivoire, Democratic Republic of the Congo (DRC), Gabon, and Ghana appear to be the main exporters of *Khaya* timber. Trade data, reported as

sawn wood or similar, are not disaggregated to species, but *K. anthotheca*, *K. grandifoliola*, *K. ivorensis,* and *K. senegalensis* occur in all or some of these countries. Other species traded as African Mahogany include *Entandrophragma* spp. which are in the same botanical family. The African species of the unrelated genus *Afzelia* (the subject of proposal CoP19 Prop. 46) are also sometimes traded as African Mahogany.

Khaya spp. are regarded as indistinguishable from one another based on macroscopic features of their wood and also, according to the Supporting Statement (SS), based on microscopic wood characteristics. Generally, the timber of *Khaya* spp. is mixed in international trade shipments. The wood of *Khaya* spp. Is easily mistaken for that of the CITES-listed *Swietenia* spp.

Analysis: Four of the five currently recognised *Khaya* species are widespread African trees that have been heavily harvested for their timber, in some cases for long periods (the fifth is *K. madagascariensis,* endemic to Madagascar and the Comoros). There are reports of declining populations as a result of harvest in a number of different range States. As a result all four species were classified as Vulnerable by IUCN in 1998 (*K. madagascariensis* was assigned the same status in 2020). However, apart from *K. madagascariensis,* there are no known national population estimates or stock assessments for the species. Nevertheless, harvesting and export has continued which is likely to have led to further depletion and in some cases exhaustion of harvestable stocks as is the case with *K. madagascriensis* which is no longer known to be in trade. There are strong indications that timber producing specimens of four (*K. anthotheca*, *K. grandifoliola*, *K. ivorensis*, and *K. senegalensis)* species are currently harvested unsustainably in sometimes large parts of their range, increasing their vulnerability to other important threats and therefore meeting Criterion B of Annex 2a Res. Conf. 9.24 (Rev. CoP17).

Given the similarity of appearance and the mixing of timbers in trade, other members of the genus would meet the lookalike criteria in Annex 2b of the Resolution. Plantations of *Khaya* have been developed in Africa and in other countries including Australia, Brazil, Indonesia, Malaysia, and Sri Lanka. Trade from plantations outside Africa would not be included under this listing, but trade from plantations within Africa would be included. The size of the African plantations and the extent to which they supply the global timber market is not known.

Available trade data for African Mahogany indicate that exports are mainly sawn wood or similar products. Annotation #17 Logs, sawn wood, veneer sheets, plywood and transformed wood would cover the products that are traded internationally from Africa. Furthermore, the inclusion of transformed wood would ensure that loopholes exploited for other timber species by minimal processing (See CoP17 Prop. 53) are closed.

Summary of Available Information

Text in non-italics is based on information in the Proposal and Supporting Statement (SS), text in italics is based on additional information and/or assessment of information in the SS.

Taxonomy

The taxonomy of *Khaya* remains unresolved. This proposal follows the nomenclature outlined in Royal Botanic Gardens Kew's Plants of the World Online database (POWO, 2022), which recognises five species (*K. anthotheca* (Welw.) C. DC. (1878), *K. grandifoliola* C. DC. (1907), *K. ivorensis* A. Chev. (1907), *K. madagascariensis* Jum. and Perr. (1906) and *K. senegalensis* (Desr.) A. Juss. (1830)), with the addition of a sixth species, *K. comorensis*, as reported by the CITES Management Authority of Comoros.

There is uncertainty as to whether K. comorensis *is validly published. It is not included in POWO, 2022, Tropicos or IPNI. It is listed here (https://unesdoc.unesco.org/ark:/48223/pf0000058054) as nom nud (i.e., not published with the correct description or types).* (Rivers*, in litt*., 2022*).*

A recent review of *K. anthotheca* by Bouka *et al*. (2022) identified two new undescribed species and supported the rehabilitation to the rank of species of three taxa previously considered to be synonyms of *K. anthotheca*: *K. agboensis*, *K. euryphylla,* and *K. nyasica*. A full taxonomic revision of the genus is currently underway (Bouka *et al*., 2022).

IUCN Global Category, Range and population trend for *Khaya* spp.

Table 1. IUCN assessment, distribution range and population status of *Khaya spp.* (Sources SS and IUCN Red List Assessments)

Species	IUCN Global Category	Range as given on IUCN Red List Assessment	Range as given in SS	Population trend
K. anthotheca	Vulnerable A1cd (assessed 1998, ver 2.3)	Angola, Cameroon, Congo, Democratic Republic of the Congo (henceforth DRC), Côte d'Ivoire, Ghana, Liberia, Malawi, Mozambique, Nigeria, Sierra Leone, Uganda, United Republic of Tanzania (henceforth Tanzania), Zambia, Zimbabwe	Angola, Cameroon, Congo, Côte d'Ivoire, DRC, Ghana, Liberia, Malawi, Mozambique, Nigeria, Sierra Leone, Uganda, Tanzania, Zambia and Zimbabwe.	Decreasing
K. comorensis	Not Evaluated		Comoros	
K. grandifoliola	Vulnerable A1cd (assessed 1998, ver 2.3)	Benin, Congo, DRC, Côte d'Ivoire, Ghana, Guinea, Nigeria, South Sudan, Sudan, Togo, Uganda	Benin, Burkina Faso, Congo, Côte d'Ivoire, DRC, Ghana, Guinea, Nigeria, South Sudan, Sudan, Togo and Uganda.	Decreasing
K. ivorensis	Vulnerable A1cd (assessed 1998, ver 2.3)	Angola, Cameroon, Côte d'Ivoire, Gabon, Ghana, Liberia, Nigeria	Angola, Cameroon, Côte d'Ivoire, Gabon, Ghana, Liberia, Nigeria	
K. madagascariensis	Vulnerable A2c (assessed 2020).	Madagascar, Comoros	Madagascar, Comoros	Decreasing
K. senegalensis	Vulnerable A1cd (assessed 1998, ver 2.3)	Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone, South Sudan, Sudan, Togo, Uganda	Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Mali, Niger, Nigeria, Senegal, Sierra Leone, South Sudan, Sudan, Togo, Uganda.	

All *Khaya* spp. with the exception of *K. comorensis* were assessed as Vulnerable on the IUCN Red List in 1998 on the basis of unsustainable harvest for timber.

The IUCN Red List assessments are currently being updated. If the taxonomic revision of up to six species now treated as the K. anthotheca *complex is published (see Bouka* et al., *2022) they will be assessed as separate species with smaller geographical ranges.*

Khaya grandifoliola, K. ivorensis, *and* K. senegalensis *are currently being re-assessed and are anticipated to remain in the same global threat category or move to a higher threat category (Bouka,* in litt., *2022).*

The recent reassessment of *K. madagascariensis* categorised the species as Vulnerable based on past population declines of over 30% in three generations as a result of exploitation for timber.

Khaya madagascariensis is endemic to Madagascar and the Comoros (islands of Grande Comore, Mohéli, and Anjouan). It occurs naturally in the northern, central highland and eastern regions of Madagascar including Ambilobe, Analamerana protected area, Antanimihavotra, and Bekolosy. As of 2020, the species had an estimated extent of occurrence of 262,803 km² but an estimated area of occupancy of only 56 km². *K. madagascariensis* was historically more widespread with subpopulations previously recorded in the Malagasy provinces of Antsiranana, Fianarantsoa, Mahajanga, Toamasina, and Toliara, and Nioumachoua Island in the Comoros; it is unclear whether the species has been completely lost from these locations.

Biological and trade criteria for inclusion in Appendix II (Res. Conf. 9.24 (Rev. CoP 17) Annex 2a)

A) Trade regulation needed to prevent future inclusion in Appendix I

B) Regulation of trade required to ensure that harvest from the wild is not reducing population to level where survival might be threatened by continued harvest or other influences

Commercial exploitation of wild populations of *Khaya* spp. for the international timber market is considered an ongoing, primary threat to the genus. All *Khaya* spp. with the exception of *K. comorensis* were assessed as globally Vulnerable in the IUCN Red List in 1998 on the basis of unsustainable harvest for timber.

As well as being considered threatened at a global level, national assessments note the decline of Khaya *spp. as shown below. For* Khaya *spp., even though there hasn't been an inventory in Ghana (*where K. anthotheca, K. granfifoliola, K. ivorensis *and* K. senegalensis *occur) across all ecological zones, it is also the general notion that the populations of the species have declined due to overexploitation such that they meet the CITES listing criteria (Ofori,* in litt., *2022).*

Khaya anthotheca

Khaya anthotheca *has declined greatly over the past 100 years in Uganda and is considered to be vulnerable at a national level. Intense harvesting has led to at least a 50% loss of the population in forests of western Uganda in the past 80 years.* K. anthotheca *is also considered to be threatened in DRC (GlobalTreePortal, 2022). In Tanzania a* 45% *decline in population* is estimated *based on seed collection data between 2000–2020, with an estimated 85% decline in use and trade in 94 local timber yards surveyed (Mashimba,* in litt., *2022). The Fifth National Report to the Convention on Biodiversity (CBD) for Zambia considers* Khaya nyasica *(currently included in* K. anthotheca*) as locally threatened due to exploitation and as a result, mature trees of these species are rare (Nott* et al.*, 2020).* K. anthotheca *is one of 11 timber species considered of high priority for conservation attention in Angola. Within the country,* K. anthotheca *is concentrated in Cabinda's Maiombe forest, with a very small extent of occurrence (EOO) in Angola, though widely distributed elsewhere in Guineo-Congolian rainforests. There is a need to take urgent action to protect the Cabinda's Maiombe forest, where there is a significant concentration of threatened timber species of high conservation priority. Cabinda's forest may be under increasing legal and illegal logging pressure and most of the historically known Angolan populations of important timbers are located outside the boundaries of the Maiombe National Park which is a transfrontier conservation area (Romeiras* et al.*, 2014). The main timber species harvested and traded in Angola include* K. anthotheca *(Nott* et al.*, 2020). This species has been recorded in the past as nationally threatened in Côte d'Ivoire, and Liberia (WCMC, 1991).*

Khaya grandifoliola

Khaya grandifoliola *is considered to be endangered in Uganda with intense harvesting leading to at least a 50% loss of the population in forests in western Uganda in the past 80 years.* K. grandifoliola *is also considered to be threatened in Burkina Faso, and DRC (GlobalTreePortal, 2022). It has also been recorded in the past as nationally threatened in Benin (WCMC, 1991).*

Khaya ivorensis

Khaya ivorensis *is considered to be nationally threatened in Cameroon (GlobalTreePortal, 2022). It is one of 11 timber species considered of high priority for conservation attention in Angola (Romeiras* et al.*, 2014). The main timber species harvested and traded in Angola include* K. ivorensis *(Nott* et al.*, 2020). It has been recorded in the past as nationally threatened in Côte d'Ivoire, Ghana, and Liberia (WCMC, 1991).*

Khaya madagascariensis

The reddish-brown wood of K. madagascariensis *has been highly valued for carpentry, implements, carvings and traditional canoes (Andriamanohera and Rakotoarisoa, 2020). It has been used for columns in traditional palaces in Antananarivo (Maroyi, 2008). There are no recorded exports (legal or illegal). The use is limited to the national level, mainly to produce charcoal. The barks and leaves are used for medicinal plants, and to date, there are no commercial plantations of this species (Ratsimbazafy*, in litt.*, 2022).*

Khaya senegalensis

Khaya senegalensis *has declined greatly over the past 100 years in Uganda. Intense harvesting has led to at least a 50% loss of the population in forests in West Nile, Acholi, and East Madi in the past 80 years* (GlobalTreePortal, 2022*). It has been recorded in the past as nationally threatened in Benin (WCMC, 1991).* Illegal exploitation is one of the threats to *K. senegalensis* in Sudan.

Trade

Species of the genus Khaya *produce some of Africa's most valuable timber. For two centuries, these species have all been traded as "African Mahogany" (Bouka Dipelet* et al., *2019).*

Commercial exploitation of *Khaya* and *Entandrophragma* spp. has "sustained much of the timber industry in Central Africa for several decades", with Meliaceae (including *Khaya* spp.) being the focus of "low levels of high-grade logging" in the region. *K. anthotheca* is also reported as one of several timber species that "dominate the domestic markets" in eastern and southern Africa. The USA, the EU, and China are three key international importers of the genus. Imports of *Khaya* spp. from Cameroon and Ghana have also been reported to enter the USA via Europe.

The major *Khaya* spp. exporting range States are Cameroon, Congo, Côte d'Ivoire, DRC, and Gabon. The volumes exported from Cameroon, Congo and Côte d'Ivoire are shown in Table 2 below.

Table 2. Volumes of *Khaya* spp. exported from Cameroon, Congo, and Côte d'Ivoire 2009–2019. Source: SS (Tables 3, 4 & 5 of Annex 2). Exports given by weight (kg) using conversion figures for exports from Côte d'Ivoire of 1 m^3 of sawn timber of *Khaya* = 600 kg (timberpolis.uk).

	Exports per year (kg)		
Range State	**Cameroon**	**Congo**	**Côte d'Ivoire**
Species occurring in range State	*K. anthotheca, K Ivorensis, K. senegalensis.*	*K. anthotheca, K. grandifolia*	*K. anthotheca, K. grandifolia, K Ivorensis, K. senegalensis.*
2007	112,476,340		
2008	716,813	6,433,518	
2009	345,016	191,187	8,611,224,600
2010	2,782,435	325,642	11,280,204,000
2011	4,242,703	574,237	4,059,006,600
2012	3,186,445	242,551	8,177,960,400
2013		3,321,992	6,215,648,400
2014	6,970,473	2,153,972	4,883,626,200
2015			4,023,636,600
2016			2,852,368,200
2017		714,733	2,015,328,600
2018			1,423,965,600
2019			1,526,990,400

The volume of Khaya exported from DRC 2007–2014 (all commodities combined) amounted to over 86,000 m^3. (Mahonghol et al., *2020). This compares with major species exported from the country during the same period, Wenge* Millettia laurentii *(~320,000 m^3) and Sapelli* Entandrophragma cylindricum *(~210,000 m^3). The amount of* Khaya *exported appears to have increased significantly in recent years (Table 3).*

Khaya ivorensis *and* Khaya anthotheca*—included as "Acajou" in the list of the 24 timbers currently harvested in Gabon and* Khaya grandifoliola *is one of the main timbers produced in DRC (timbertradeportal.com).* Over the period 2015–2019, China imported Acajou products (HS code 44072920) from Angola, Benin, Cameroon, Central Africa Republic, Congo, Cote d'Ivoire, DRC, Gabon, Gambia, Ghana, Nigeria, and Tanzania (Table 3). The quantities given are by weight (kg).

Table 3. *Khaya* spp. exported to China from African countries by weight (kg). Source: SS.

Exporter	**2015**	**2016**	**2017**	**2018**	**2019**	**Total**
Gabon	4,207,240	3,243,592	3,907,526	2,278,681	3,390,703	17,027,742
Cameroon	1,448,232	191,076	240,791	787,813	875,878	3,543,790
Congo			20,412	921,189	817,759	1,759,360
Côte d'Ivoire	108,058	70,798	124,561	7,395	94,153	404,965
DRC	4,280	14,026	83,149	149,290	92,110	342,855
Angola		140,050				140,050
Gambia			107,676			107,676
Benin	46,000	58,000				104,000
CAR				74,145	25,065	99,210
Nigeria		24,000	23,000			47,000
Tanzania	35,570					35,570
Ghana	34,315					34,315

In ITTO's 2017–2018 biennial review of the world timber situation, European consumer countries reporting imports of *Khaya* spp. included Cyprus, Czech Republic, Estonia, France, Latvia, and Malta.

There is a highly significant trade of Khaya *spp. between African countries, much of which is poorly documented. African Mahogany species,* K. anthotheca *together with* Entandrophragma *spp, are among the key timber resources that are exported from eastern DRC to markets in the East African region.* K. anthotheca *is one of the species imported into Tanzania from neighbouring countries;* K. anthotheca *and* K. senegalensis *are preferred species imported to Kenya from DRC for use in construction, joinery and furniture making; and timber from* Khaya *spp. particularly* K. senegalensis *from DRC also transits through Uganda (with small quantities from South Sudan) (Lukumbuzya and Sianga, 2017).*

Illegal exploitation of *Khaya* spp. has been documented in several countries, both for domestic use and for export.

Inclusion in Appendix II to improve control of other listed species

A) Specimens in trade resemble those of species listed in Appendix II under Res. Conf. 9.24 (Rev. CoP17) Annex 2 a or listed in Appendix I

Khaya spp. are considered to be indistinguishable from one another based on macroscopic features of their wood and also based on microscopic wood characteristics. The wood of *Khaya* spp. is considered to be easily mistaken for that of the CITES-listed *Swietenia* spp.

Within West and Central Africa due to similarities in appearance of the four species, K. anthotheca, K. ivorensis, K. grandifoliola, *and* K. senegalensis*, are usually mixed and traded on the global market (Pentsil* et al., *2016).*

Imports of *Khaya* spp. into the USA were noted to have increased as the species became a substitute for declining American Mahogany, *Swietenia* spp., which had become more expensive.

Additional information

Threats

High rates of deforestation due to factors such as agricultural and rural development, uncontrolled fires and urbanisation threaten natural *Khaya* spp. Desertification is noted as a threat to *K. senegalensis*. Harvest for traditional medicine was also noted to pose a "serious threat" to natural *K. senegalensis* populations across the species' global range.

Conservation, management and legislation

A range of specific conservation measures and forest management requirements are in place for *Khaya* spp. in different African countries. Minimum exploitable diameters are specified in Angola, Cameroon, Central African Republic, Côte d'Ivoire, DRC, Gabon, Ghana, Mozambique, Sierra Leone, and Tanzania.

Artificial propagation

Although *Khaya* spp. are considered to be "largely undomesticated throughout their natural range", and exploitation of African Mahoganies has largely focussed on natural populations rather than plantations, some plantations have been reported from Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, Nigeria, and Togo.

Plantations of Khaya *were established in parts of Africa around 100 years ago. In Côte d'Ivoire, the first plantation of* Khaya ivorensis *was established in 1927. Enrichment planting in degraded forests subsequently showed better growth rates. In tropical Africa,* Khaya ivorensis *has been planted with success in mixed plantations. In Togo,* Khaya senegalensis *plantations began in 1918 and in Benin in 1935. Plantations have also been developed in Côte d'Ivoire and Mali. In Côte d'Ivoire,* Khaya anthotheca *has been planted in degraded or secondary forests. Pure plantations have also been established (Pinheiro* et al., *2011).*

Khaya plantations have also been established in parts of Australia, Sri Lanka, South-East Asia, and South and Central America.

Khaya senegalensis *was introduced into Australia in the 1950s and was planted spasmodically on a small scale until the mid-1970s. Farm forestry plantings and further trials recommenced in the late 1990s, but industrial plantations did not begin until the mid-2000s, based on managed investment schemes. The area established (to 2008) exceeded 4,000 ha and was increasing at a rate of some 2,000 ha per year, almost wholly in the Northern Territory. (Underwood and Nikles, 2009). There are small seed orchards in Australia and a small breeding programme in Queensland (Lott and Read, 2021). In Australia,* K. senegalensis *was thought to have potential for musical instrument manufacture but has predominantly been used for pulp logs and sawn logs (Wrigley,* in litt.*, 2022).*

Khaya *was planted around Darwin in urban settings where it grows to a large size with huge surface roots that can lift roads and kerbing. It retains its leaves giving high resistance to wind and causing significant damage in cyclones. It is used locally to make furniture—but many of the trees that fall down are chipped and used as garden mulch (Leach,* in litt., 2022*).*

K. anthotheca *and* K. senegalensis *were introduced to Fiji in the 1900s for experimental cultivation (Wrigley,* in litt*., 2022).*

The forest department of Sri Lanka maintains Khaya *plantations. Here, the planted species is* Khaya senegalensis*. All plantations are in the dry zone area of the country. However, annual establishment rates in Sri Lanka are limited by a dearth of domestic seed production. Timbers are supplied to the local market and there is no export. The natural forests of Sri Lanka are conservation forests and there is a huge demand for plantation timber in the country. Nevertheless, there is not much interest in* Khaya *(Ediriweera,* in litt*., 2022).*

Underwood and Nikles (2009) note that Khaya *species are highly susceptible to* Hypsipyla *in Africa but plantings of African Mahogany in Australia and the Asian region have remained relatively free of shoot borer attack.*

In Brazil, the introduction of the species is relatively recent. Khaya ivorensis *is used in reforestation due to its resistance to* Hypsipyla grandella *Zeller, which is the main pest of Brazilian Mahogany and other Meliaceae, such as Cedar and Andiroba.* Khaya ivorensis *is cultivated in the Brazilian states of Para, Minas Gerais, Goias, and Mato Grosso, due to the importance of its wood, its price on the international market and, because when established in organised plantations, it shows satisfactory vegetative development* (*Pinheiro* et al., *2011). In 2019, the plantations in Brazil were confirmed as* K. grandifoliola*, and not* K. ivorensis *as previously thought. Most of the research that was published citing* K. ivorensis *from Brazilian plantations prior to 2019 related to* K. grandifoliola*. The current plantation area of African Mahogany in Brazil is estimated to be 50,000 ha, predominantly composed of the species* K. grandifoliola *(66%) and* K. senegalensis *(33%). Other African Mahogany species are also planted (K.* anthotheca *and* K. ivorensis*), but on a much smaller scale (Ferraz Filho* et al*., 2021). In Brazil, the African mahogany plantation area is expected to increase, independent of the species chosen, with possible help from foreign capital investment and with greater interest from rural producers in the diversification of production. The trading of planted African Mahogany timber of Brazilian origin in the national and international market is perceived as a successful goal (Ferraz Filho* et al., *2021).*

Implementation challenges (including similar species)
The implementation of CITES provisions for valuable African timbers has proved challenging, for example in relation to the development of non-detriment findings (NDFs). It has been suggested that substantial funds may be required to produce NDFs (ATIBT Flash News, 2022).

The volume of re-exports of worked products of Khaya *produced in non-African countries could produce a significant implementation burden.*

Potential risk(s) of a listing
Commercial exploitation of Khaya *has frequently been linked with exploitation of other species that produce similar timber, particularly* Entandrophragma *spp., which has also been traditionally traded as African Mahogany. Both* Khaya *and* Entandrophragma *are in the Meliaceae family as is the genus of "true mahoganies",* Swietenia*. Listing of* Khaya *could potentially shift the focus of trade to* Entandrophragma *together with species of* Guarea *and* Lovoa*. Various species of* Entandrophragma *are included on the IUCN Red List as Vulnerable or Near Threatened.*

There is a risk that permitting requirements resulting from the listing might favour plantation grown timber from non-African countries rather than the continued development of sustainable forest management for timber production within Africa.

Potential benefit(s) of listing for trade regulation
Efforts to improve sustainable forest management and promote certification are underway at national and regional levels. CITES listing could reinforce these efforts. Furthermore, it could establish necessary controls required for more effective data gathering on trade and support regional collaboration in data sharing and transparency as recommended by Mahonghol et al., *2020.*

Other comments
Khaya *is within the scope of certification schemes as the FSC Certificates Public Dashboard records certificates for the genus relating to Cameroon, Congo, Gabon, Ghana, Mozambique, and South Africa.*

Some rural forest communities depend extensively on resources from Khaya *for subsistence and income generation. Many natural products are obtained from the trees. Bark extracts have been used as astringents for wounds. The bark of* K. senegalensis *has been traditionally used in local leather industries by the people of the*

savannah zones of Africa for the tanning of leather, because of its rich red colour. The bark of most species of African Mahoganies contains low-quality gum Arabic, and the bark of African Mahoganies contains many medicinal properties that are used in the treatment of certain tropical diseases. In Ghana, the bark of K. ivorensis *is a key ingredient in the production of an alcoholic beverage called bitters. The demand for bitters is very high and attracts premium prices in the alcoholic beverage market. Traditionally, mahogany seed oil has been used for a wide range of purposes, most notably as a disinfectant against infection (Danquah* et al., *2020.)*

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Transfer of *Paubrasilia echinata* from Appendix II to Appendix I with annotation: All parts, derivatives and finished products, including bows of musical instruments, except musical instruments and their parts, composing travelling orchestras, and solo musicians carrying musical passports in accordance with Res. Conf. 16.8.

Proponent: Brazil

Summary: *Paubrasilia echinata*, commonly known as Pau-brasil, Pernambuco or Brazilwood, is a slow-growing leguminous tree, reaching around 15 m in height with a maximum trunk diameter of around 70 cm. It is endemic to the Mata Atlântica (Atlantic Coastal Forest) in Brazil, which is ranked fourth in the list of global biodiversity hotspots. Many aspects of the biology of Pau-brasil and the composition and structure of the plant community in which it occurs are poorly known. The wood of Pau-brasil is currently used worldwide for the manufacture of high-quality bows for musical instruments, for which the species has been exploited for over 200 years. *P. echinata* was classified as Endangered on the IUCN Red List in 1998 and has been assessed as endangered on the list of Brazilian flora threatened with extinction since 1992. The species was originally listed as *Caesalpinia echinata* in Appendix II at CoP14 (2007) with Annotation #10; that name became a synonym of *Paubrasilia echinata* in 2019, following taxonomic changes adopted at CoP18. Annotation #10 includes logs, sawn wood, veneer sheets and unfinished wood articles used for the fabrication of bows for stringed musical instruments, but exempted finished bows. This is the only species subject to this annotation.

Domestic trade in *P. echinata* wood between companies and bow makers within Brazil have been regulated and controlled by the Document of Forest Origin (DOF) since 2006, but there appears to be some uncertainty about the accuracy of records of existing stocks registered in Brazil at the time the Appendix II listing came into force. DOF does not regulate domestic or international trade in bows as finished products, and therefore these do not need to be declared to the authorities and the total number of bows sold and exported per year remains unknown. According to the International Pernambuco Conservation Initiative (IPCI), a new domestic permit requirement for the export of finished bows became effective in June 2022—however reports from Brazil show that permit applications are not yet possible.

No empirical estimates of the natural populations of *P. echinata* across the Atlantic Forest are currently available. The species is fragmented between forest remnants and localised extinctions of subpopulations have been observed. The deforestation of the Mata Atlântica has been intensifying in recent years and over 21,600 ha of the territory were lost to deforestation between 2020 and 2021. The ongoing habitat loss and decline in habitat quality, coupled with exploitation for its wood, strongly suggest the population trend of the species is declining.

The species has been heavily traded for over 500 years, initially as a source of red dye (brazilein) and more recently as timber. Since the early 1800s, the species' wood, which is highly valued for its combination of durability, flexibility and resonance, has been extracted to produce bows for several musical instruments such as violins, violas, cellos, and basses. Overall, it has been estimated that over half a million mature trees were removed over the last five centuries. Trade is international; 92% of production was exported, estimated at more than 127,000 pieces of bow blanks or bows according to data collected during inspections carried out by the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA) of companies producing bows. The vast majority of exports are to the USA and Europe and to a lesser extent Asia.

According to an international survey of bow makers in July 2022, the average number of bows made out of *P. echinata* produced every year worldwide is approximately 25,000. Of the 337 bow makers who responded, approximately 91% produce fewer than 50 bows per year and nearly 44% produce fewer than ten.

Harvesting of *P. echinata* in its natural habitat and export is prohibited under Brazilian law (Federal

Law No. 11,428/2006 and Federal Decree No. 6,660/2008) and only wood from planted trees that are registered with the environmental agency or pre-Convention material can be traded. Its designation as endangered on the list of Brazilian flora threatened with extinction, means collection, harvesting, transportation, storage, handling, processing, and commercialisation from natural habitat is prohibited.

In the last five years, investigations by IBAMA and the Federal Police have shown that wood from natural forests has continued to be harvested to supply the growing international market for bows for musical instruments. Since 2018, IBAMA officers seized over 200,000 bow blanks and bows made with illegal (i.e., native) raw wood. The proponent considers that significant trade in illegally sourced wood may have taken place since the species was listed.

The proponent seeks to list the species in Appendix I with an annotation to include all parts and derivatives, including bows of musical instruments, with the exception of musical instruments and their parts, composing travelling orchestras, and solo musicians carrying musical passports in accordance with Res. Conf. 16.8 (now Res. Conf. 16.8 (Rev. CoP17)) on *Frequent cross-border non-commercial movements of musical instruments*. The stated purpose of the Proposal is to recognise the precarious conservation status of the species and to bring trade in finished bows under CITES trade control in order to reduce the opportunity for exports in contravention of Brazilian law. The justification for and intention of an exception for trade under "musical passports" is less obvious.

Analysis: *Paubrasilia echinata* has been subject to extensive historical exploitation for international trade and is affected by habitat loss due to deforestation, agricultural development, and urbanisation. Population estimates are not available, although known native populations are fragmented and small across the species' range and some subpopulations have disappeared from areas where they used to occur. There is evidence of ongoing international demand in the USA, Europe, and Asia, and instances of illegal trade are being reported. Based on the registered annual rates of deforestation of the species' natural habitat that contributed to an overall decline of more than 90% of the forest's historical range, *P. echinata* appears to meet the biological criteria for inclusion in Appendix I of Annex 1 of Res. Conf. 9.24 (Rev. CoP17). Since Brazilian law does not allow the exploitation of *P. echinata* from its natural habitat, and only trade in wood from trees planted and registered with the environmental authorities or recognised as pre-Convention is allowed, the effect of the proposed transfer of this species from Appendix II to I largely relates to the cessation of the current Appendix II exemption for trade in finished products.

On this point, the proposed annotation for the species if transferred to Appendix I is to include "all parts and derivatives, including bows of musical instruments, with the exception of musical instruments and their parts, composing travelling orchestras, and solo musicians carrying musical passports in accordance with Res. 16.8" (now Res. Conf. 16.8 (Rev. CoP17)). Under that Resolution the use of "musical passports" only applies to Appendix I specimens acquired before the species was included in the Appendices, which in this case would be 2007 (the species was listed at CoP14), as well as Appendix II and III listed species. Any movement of post-2007 musical instruments and their parts, unless recognised as from artificially propagated trees, would need to be permitted on a case-by-case basis in compliance with Articles III and VII of the Convention (for example personal and household effects or pre-Convention specimens).

The inclusion of an annotation to an Appendix I listing proposal for a plant species would be unusual. If the intention of the proponent is to subject finished products to CITES trade control, while allowing for use of musical passports in accordance with Res. Conf. 16.8 (CoP17), this could alternatively be achieved by amending the Proposal to retain the species in Appendix II with a change to Annotation #10 to this effect. No other species are subject to this annotation. Brazil could also submit a zero quota for wild-sourced commercial exports to be posted on the CITES website to indicate that trade in wild harvest of the species from Brazil is not permitted.

Summary of Available Information

Text in non-italics is based on information in the Proposal and Supporting Statement (SS), text in italics is based on additional information and/or assessment of information in the SS.

Taxonomy
Paubrasilia echinata (Gagnon, Lima and Lewis, 2016)

The species was listed in CITES Appendix II with the synonym *Caesalpinia echinata* in 2007, which became a synonym of *Paubrasilia echinata* in 2019 following taxonomic changes adopted at CoP18.

Despite being recognised as a single species, the morphological features of Pau-brasil vary considerably across its range and different morphotypes are genetically distinct. However, no subspecies have been officially recognised.

Range
Brazil

IUCN Global Category
Endangered A1acd (assessed 1998, ver. 2.3)

Biological criteria for inclusion in Appendix I

A) Small wild population
No reliable, updated data on the size of the remaining populations are available. Natural populations are no longer found in Sergipe. A single forest fragment with a native population of Pau-brasil is situated in the state of Espírito Santo in Aracruz, and a new population has recently been discovered in another municipality of the same state. In compiling the National Floristic Inventory, the Brazilian Forest Service recorded no Pau-brasil specimens in sample plots in several areas where the species once occurred within the states of Espírito Santo, Sergipe, Paraíba, and Rio Grande do Norte. Natural populations of Pau-brasil were found in Rio de Janeiro, but no population size estimates were determined.

Extinctions of Pau-brasil subpopulations have been recorded over the years throughout the Atlantic Forest due to intense habitat degradation. Local extinctions caused the fragmentation of the species and the subsequent reduction in genetic variability. Further threats such as the decline of cocoa production areas (especially in southern Bahia) and selective logging of centennial trees in Paraíba, Rio Grande do Norte, to supply the market for musical instruments have aggravated the status of the remaining populations.

Despite a lack of concrete recent data on current population trends, the advance of deforestation, the demolition of the cocoa-cabruca agroforestry system and the increase in selective logging strongly suggest the overall trend to be declining.

B) Restricted area of distribution
Pau-brasil occurs exclusively in Brazil, specifically between Rio de Janeiro and Rio Grande do Norte, and it is restricted to the Mata Atlântica (Atlantic Coastal Forest). The Atlantic Coastal Forest currently extends for less than 100,000 km², i.e., approximately 7% of its original extent. The species inhabits lowland semi-decidual seasonal forests, dense rainforest, dune forests and sandbanks within the coastal fragments of the Atlantic Forest biome.

The latest data on the distribution of the species was reported by Rocha and Simabukuro (2008) and Rocha (2010). The following table shows the municipalities where natural populations of Pau-brasil have been confirmed to occur.

Table 1. Areas with botanical records of natural populations of Pau-brasil.

State	Occurrence area
Rio Grande do Norte	Baía Formosa, Extremoz, Natal, Nísia Floresta, Parnamirim, and Tibau do Sul
Paraíba	Camaratuba, Mamanguape, and Rio Tinto
Pernambuco	São Lourenço da Mata until Vitória de Santo Antão, Nazaré da Mata, Tracunhaém, Pau d'Alho, Timbaúba, and Goiana
Alagoas	Junqueira and Coruripe
Bahia	Barrolândia, Camacan, Caraíva, Eunápolis, Guaratinga, Ibirapitanga, Ipiau, Itamaraju, Itapé, Jussari, Mascote, Pau-Brasil, Piraí do Norte, Porto Seguro Santa Luzia, Tapera, Ubaitaba, Una, and Vitória da Conquista
Espírito Santo	Aracruz and Vila Velha
Rio de Janeiro	Araruama, Arraial do Cabo, Búzios, Cabo Frio, Duque de Caxias, Iguaba Grande, Itaipuaçu, Japeri, Miguel Pereira, Niterói, Nova Iguaçu, Rio de Janeiro, São Pedro da Aldeia, and Saquarema

The Rio de Janeiro Botanic Garden and others have identified and mapped 13 representative areas where Pau-brasil occurs in the state of Rio de Janeiro. Among these, ten are located within legally protected conservation

units. The total area of the 13 regions is 13,250 ha, with individual areas ranging from 72 ha to over 5,800 ha. Surveys from 2005 identified 1,754 individual trees on 130 different properties in the cocoa-growing region in southern Bahia. Of these, 85 had been planted and the rest were native. Moreover, isolated trees have been cultivated as ornamental plants in streets and parks throughout the country and sometimes can be found in commercial plantations too.

The historical geographical distribution of Pau-brasil has severely decreased due to deforestation, logging, exploitation for its wood, the development and expansion of urban centres, and changes in land-use for agriculture and forestry operations. At present, the largest populations of Pau-brasil are situated in forested areas within fully protected conservation units and in cocoa-cabruca agroforestry systems, where they are used as shade trees for growing crops of *Theobroma cacao*.

C) Decline in number of wild individuals

Deforestation accounted for the loss of over 14,000 ha of the Mata Atlântica between 2018 and 2019, approximately 13,000 ha between 2019 and 2020, and more than 21,600 ha between 2020 and 2021. As previously mentioned, the Atlantic Forest currently extends for less than 100,000 km² (or 10,000,000 ha), which represents about 7% of its historical range. Due to deforestation and the dismantling of the cocoa-cabruca agroforestry system, as well as intensive exploitation for the species' wood for international trade, the native population of *P. echinata* is inferred to be strongly declining.

Trade criteria for inclusion in Appendix I

The species is or may be affected by trade

Paubrasilia echinata was initially overexploited for the extraction of red dyes (brazilein) during the Portuguese occupation. *Intense harvesting continued until synthetic dyes became available in 1875, by which time extensive population declines had already taken place (IUCN, 1998).* Starting from the mid-18th century, the species' wood has been used to build stringed musical instrument bows and is still internationally sought after due to its high levels of resonance, density and durability. *According to Rocha (2010), approximately 527,000 mature specimens have been removed over the last 500 years. However, the International Pernambuco Conservation Initiative (IPCI) states that one mature tree can supply all bow makers in the USA or in France for a year, highlighting the notion that the amount of* P. echinata *wood used by the bow making industry (and therefore the amount of newly harvested wood the industry requires each year) is relatively small.*

When P. echinata *was listed in CITES Appendix II in 2007, wood owners in Brazil were required to register their supplies with national management authorities. In the USA, bow makers apparently have approximately 60 years' worth (approximately 60 trees) of registered wood (IPCI,* in litt.*, 2022).*

The USA, Japan, Belgium, Germany, the Netherlands, Portugal, Italy, and France currently represent the largest consumers of raw *P. echinata*. IBAMA has reported that over 127,000 pieces of bow blanks and bows were sold abroad in the last 20 years. *US data report a total of 452 pieces being imported between 2009 and 2018 into Belize (70%), Brazil (20%), Mexico (5%), Austria (4%), Republic of Korea (0.7%) and Canada (0.2%). Over 95% of the pieces were labelled as wild-sourced and the rest as unknown. However, only about 24% were registered as having originated from Brazil. One instance of 316 pieces (approximately 70% of total pieces traded) being traded for commercial purposes was reported to have originated in Belize.* No international trade of seedlings, seeds or bark is known. *According to Cumine (2007), the term "Brazilwood" has also been used in trade to describe lower quality timber that is not* P. echinata*, but probably Massaranduba (*Manilkara *spp.).*

Following the Appendix II listing in 2007, CITES data include a total of 129 instances of P. echinata *trade, totalling more than 15,000 kg and approximately 35 m^3 of sawn wood reported as being exported and over 25,500 kg and more than 15 m^3 reported as being imported. The top importer countries included the USA (17% of total imports), Japan (12%), China (11%), Switzerland (10%), Germany (9%), Hong Kong SAR (5%), Republic of Korea (5%), France (4%), Italy (4%), and Canada (4%). The top exporters were the USA (34% of total exports), Brazil (20%), France (9%), Germany (8%), Italy (6%), and the UK (4%).*

A July 2022 survey by IPCI sent to international professional organisations and bow makers recorded the average number of bows produced per year by each bow manufacturer. Approximately 25,000 bows are manufactured every year worldwide by the 337 different bow makers who responded to the survey. Among them, approximately 91% produce fewer than 50 bows per year and nearly 44% produce fewer than ten (IPCI, in litt.*, 2022).*

More than 200,000 bow blanks and bows made with wood that had no proof of legal origin have been seized in Brazil since 2018. Illegally harvested wood is mainly used to supply the international market for musical instrument bows in the USA, Europe and Asia. Selective logging of mature trees inside Pau-brasil National Park in Porto Seguro has also recently been curtailed.

Investigations have found that many companies and independent bow makers have been making false declarations to source illegal timber and make it appear to have a legal origin. According to the Federal Police, smugglers made more than USD46 million from international trafficking.

The proposal includes the following annotation:

All parts, derivatives and finished products, including bows of musical instruments, except musical instruments and their parts, composing travelling orchestras, and solo musicians carrying musical passports in accordance with Res. Conf 16.8 (now Resolution Conf 16.8 (Rev. CoP17)).

The inclusion of an annotation to an Appendix I listing for a plant species is unusual.

An annotation was adopted in 2007 along with the species listing in Appendix II at CoP14, which designated: "Logs, sawn wood and veneer sheets, including unfinished wood articles used for the fabrication of bows for stringed musical instruments." Since the annotation did not include finished musical instruments, these are not currently regulated under CITES. Therefore, at present, any finished bows exported from Brazil or otherwise in trade are exempted from the Convention. This is the only species currently in the Appendices with Annotation #10. The intention of the proposed annotation is not entirely clear. The use of musical passports in accordance with Res. Conf. 16.8 (Rev. CoP17) is possible only for Appendix I specimens acquired before the species was included in the Appendices, which in this case would be 2007 (the species was listed at CoP14). Any trade not covered by a "musical passport", unless recognised as from artificially propagated trees, would need to be permitted on a case-by-case basis in compliance with Articles III and VII of the Convention (for example personal and household effects or pre-Convention specimens). This burden on enforcement will still remain, whichever annotation is used.

Taking into account that the inclusion of an annotation to an Appendix I listing proposal for a plant species is unusual, if the intention of the proponent is to include finished products, while allowing for the use of musical passports in accordance with Res. Conf. 16.8 (Rev. CoP17), this could be achieved by amending the proposal to retain the species in Appendix II with a change to Annotation #10 to this effect.

Additional information

Threats

In addition to large volumes of harvest and trade, *P. echinata* is threatened by habitat loss and fragmentation due to continued deforestation, urban development, tourist development and agriculture. *90% of the historical extent of the species' native habitat, i.e. the Atlantic Forest, has been lost due to extensive urban and agricultural development (IPCI,* in litt., *2022).* Fragmented populations are causing a decrease in genetic variation of the species. Further pressures on the species include illegal logging activities and large volumes of timber being discarded as waste by manufacturers.

Conservation, management and legislation

The Atlantic Coastal Forest encloses at least 28 Private Natural Heritage Reserves (RPPN), as well as many protected areas (Table 2). Landowners within the Reserves guarantee protection of local animals and plants in exchange for tax reductions.

Table 2. Protected areas with recorded occurrence of natural populations of *P. echinata*.

State	Protected Area
Rio Grande do Norte	Parque Estadual das Dunas; RPPN Mata da Estrela; Parque Ecológico Água das Dunas; Parque Estadual Mata de Pipa
Paraíba	ESEC Pau-brasil; REBIO Guaribas
Pernambuco	ESEC Tapacurá
Alagoas	ESEC Serra do Ouro; RPPN Usina Coruripe
Bahia	ESEC Pau-brasil, RPPN Estação Veracruz, PARNA do Descobrimento, PARNA do Monte Pascoal, PARNA do Pau-brasil, REBIO de Una, RPPN Serra do Teimoso
Espírito Santo	APA Lagoa Grande
Rio de Janeiro	APA Serra da Capoeira Grande, REBIO Tinguá, APA Massambaba, RESEC Estadual de Jacarepiá, APA Serra de Sapiatiba, APA do Pau-brasil, Parque Estadual Serra da Tiririca; Parque Municipal da Boca da Barra; Reserva Ecológica Darcy Ribeiro

Specific national regulations and governance measures are in force to protect *P. echinata* (Table 3**).**

Table 3. List of national legal instruments that govern the exploitation of native Brazilian plants (including *P. echinata*).

Law	Description
Federal Law No. 6.607/1978	Declares Brazilwood as the national tree with an associated campaign about the relevance of the species to the history of Brazil together with measures to encourage the planting, across the entire national territory, of Brazilwood tree nurseries, aimed at promoting the species' conservation.
Federal Decree No. 750/1993	Prohibits harvesting in Mata Atlântica
CONAMA Resolution No. 278/2001	Allows IBAMA to suspend authorisations on harvesting
CONAMA Resolution No. 317/2002	Establishes the necessary criteria for conservation of genetic material and sustainability of the harvest of plant species threatened with extinction found in Mata Atlântica that need to be included in State Plans for Conservation and Use.
Federal Law No. 11,428/2006	Prohibits the exploitation of native species included in the Official List of Threatened Species of Brazilian Flora in the Atlantic Forest.
Federal Decree No. 6,600/2008	Regulates Federal Law No. 11,428 of 2006
Federal Law No. 12,651/2012	Creates the National Program for Pau-Brasil Conservation
MMA Ordinance No. 320/2012	Creates the National Program for Pau-Brasil Conservation
MMA Ordinance No. 443/2014	Lists *P. echinata* as threatened with extinction in Brazil. It imposes full protection for species in the categories Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), and Vulnerable (VU), including prohibition of collection, harvesting, transportation, storage, handling, processing, and commercialisation, among others.

As listed in the table above, Federal Law No. 11,428 of 2006 and the Federal Decree No. 6,600 of 2008 prohibit the exploitation of native species included in the Official List of Threatened Species of Brazilian Flora in the Atlantic Forest. Therefore, *P. echinata* cannot be extracted from its natural habitat. However, enforcement of national legislation is believed to be weak in the Atlantic Forest region and protection of forest fragments varies across the country.

The Document of Forest Origin (DOF) has been used for the transaction of wood between bow makers and companies within Brazil since 2006. However, the origin of the stocks registered in the system is believed not to be reliable and bows, as finished products, are exempted from being declared to the authorities. Therefore, the transportation and commercialisation of bows does not require environmental documents and Brazilian authorities do not know the number of bows that are sold each year. Moreover, this system does not request information on by-product waste (e.g., defective bow blanks). *A new domestic permit requirement for the export of finished bows became effective in June 2022—however reports from Brazil indicate that the permit application is currently unobtainable (IPCI,* in litt.*, 2022).*

At the international level, *P. echinata* has been listed in CITES Appendix II since 2007, with Annotation #10 designating logs, sawn wood, veneer sheets, including unfinished wood articles used for the fabrication of bows for stringed musical instruments as needing a CITES permit. Finished bows are exempted from needing a CITES permit.

Bow makers represent the community most involved in current conservation and plantation efforts, despite most of them living outside Brazil (Lichtenberg et al.*, 2022). Since 2000, the IPCI has partnered with government agencies from Brazil, non-governmental organisations, several universities, local cacao farmers and regional science and conservation organisations among others to carry out activities aimed at the conservation of* P. echinata*. These include growing and planting of seedlings, developing and implementing replanting strategies in farm and forest locations, funding inventories and the study of the distribution and dynamics of the species, mapping forest fragments and investing in studies into the genetic, anatomy and growth of the species, as well as silviculture and pernambuco propagation methods (IPCI,* in litt.*, 2022). Over 250,000* P. echinata *seedlings have been planted in five states (Bahia, Espiritu Santo, Pernambuco, Rio Grande do Norte, and Paraiba) to date (IPCI,* in litt.*, 2022). Approximately half of all replanting occurred in natural preserves and urban areas, whereas the remainder were planted on farms and small-scale plantations for potential commercial use once the trees reach maturity at 30–40 years (IPCI,* in litt.*, 2022).*

No monitoring programme for natural populations of *P. echinata* is currently in force. According to Santana *et al.* (2020), a number of plantations in the northeastern states of Pernambuco, Rio Grande do Norte, and Alagoas are being monitored by a Brazilian non-governmental organisation called Associação Plantas do Nordeste.

Artificial propagation
No large-scale commercial plantations of *P. echinata* exist. Wood from small commercial plantations and conservation initiatives is not traded. The majority of the plantations do not meet the requirements established by national laws, which determine that: a) existing plantations must be registered in a timely manner with the environmental agencies, and b) technical projects prepared by legally qualified professionals must be submitted. Most plantations are not listed in IBAMA's National System of the Control of Origin of Forest Products (SINAFLOR) either.

Little information on the success or failure of propagation efforts or forestry experiments is available. Several partnerships carry out planting of Pau-brasil seedlings in privately owned areas for future commercial exploitation. However, the ideal age for harvesting planted P. echinata trees for the production of bows remains largely unknown. A study by Rolim and Piotto (2018) on a 24-year-old plantation found that the species needs long cycles (40–50 years) to reach at least 30 cm dbh. *According to the IPCI (IPCI, in litt., 2022), the tree begins to produce the dark heartwood for which it is renowned at 10 years old, and the heartwood becomes dominant after 20 years.* Moreover, timber traders prefer wild-grown wood as it is considered to be superior to that grown in plantations. *A paper by Lichtemberg* et al. *(2022) reports that the timber quality of planted trees compared to high-quality timber from trees in natural habitats has been seriously questioned, as have regulations for their commercial use.*

There is no available information on plantations of *P. echinata* outside of Brazil.

Implementation challenges (including similar species)
Paubrasilia echinata has no similar species listed in CITES. The wood can be easily identified by its orange/reddish colouration, storied rays on the tangential face, and the presence of brazilein, which appears as a reddish dye when in contact with a basic solution. The general aspect and colour help distinguish *P. echinata* from similar species (such as *Brosimum rubescens*, *Centrolobium spp*. and *Manilkara spp.). Handroanthus spp.* and *Dialium guianense* are also harvested for the production of bows for musical instruments—these may be distinguished from *P. echinata* by the deposits in heartwood vessels (*Handroanthus spp.*) and by axial parenchyma in narrow bands (*Dialium guianense).*

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Inclusion of all African populations of *Pterocarpus* species in Appendix II of CITES with Annotation #17, including already listed species *P. erinaceus* (CoP17, no annotation) and *P. tinctorius* (CoP18, Annotation #6) in accordance with Article II, paragraph 2 (a) of the Convention

Proponents: Côte d'Ivoire, European Union, Liberia, Senegal, Togo

Summary: *Pterocarpus* is a genus of around 40 species native to tropical and subtropical regions worldwide of which 12 are native to Africa. In addition there are disputed reports of a South American species occurring also in Democratic Republic of the Congo (DRC) and one additional African native species is accepted by some botanists. African species are an important source of highly valued timber traded internationally, exported mainly in the form of logs and sawn timber. Commonly used trade names for the timber include "mukula", "rosewood", "African Padauk" or "African Padouk". African species that produce rosewood or other precious hardwoods include *P. angolensis*, *P. erinaceus*, *P. lucens*, *P. soyauxii, P. tessmannii* and *P. tinctorius. P. erinaceus* is the only African species of the genus officially recognised in China as a "Hongmu" species (formally accepted for the production of rosewood furniture), but others are also considered desirable for furniture production. There has been a major growth in consumption of Hongmu and other "rosewoods" in China since 2010 leading to dramatically increased levels of exploitation in range States. Other genera are also traded with the name rosewood including species of *Dalbergia* (genus listing at CoP18) and *Guibourtia* (three African species listed at CoP18).

Two African species of *Pterocarpus* are already listed in Appendix II. The Endangered species *Pterocarpus erinaceus* was added to Appendix II at CoP17 with no annotation. *P. tinctorius* which is evaluated as Least Concern was added to Appendix II at CoP18 with Annotation #6 (Logs, sawn wood, veneer sheets and plywood). Most of the remaining African *Pterocarpus* spp. are widespread and may be locally common. The exception is the very rare *P. zenkeri.* The taxonomic status of this species is still debated but it is assessed as Endangered. Most other African *Pterocarpus* have been assessed as globally Least Concern since 2018, although several of these species are in significant decline in parts of their range. Species considered to be overexploited for their timber, with unsustainable harvest rates and some local stocks now exhausted include *P. angolensis*, *P. soyauxii*, and *P. tessmannii*.

Pterocarpus angolensis is one of the most valuable timber species in southern Africa harvested for local use and international trade. Intensive harvesting and the lack of natural regeneration have been causes for concern across parts of its range. Current levels of timber harvesting are thought to be unsustainable in various countries, almost certainly exceeding the rate at which harvestable-sized trees are being replenished in the population.

Pterocarpus soyauxii has a wide distribution. It has not yet been evaluated at a global level but has been evaluated as nationally threatened in DRC. The timber is harvested for international trade and it is one of the main species currently recorded in Chinese and Vietnamese markets.

Pterocarpus tessmannii occurs in DRC, Equatorial Guinea, and Gabon. It is exploited for timber and is now listed as globally Near Threatened.

Pterocarpus zenkeri was assessed as Endangered in 2015. It is endemic to Cameroon and is considered to be very rare. Although it is not known to be in trade currently, the similarity with *Pterocarpus soyauxii* may lead to it being harvested either intentionally or accidentally.

Of the other species, some are harvested for timber (*P. lucens, P. mildbraedii,* and *P. osun),* but this is uncertain for *P. brenanii*, *P. rotundifolius,* and *P. santalinoides*. The presence of *P. officinalis* in Africa is disputed.

In general, very little species-specific trade data are available for African *Pterocarpus*, and it is

unknown how much harvest in each species is for domestic versus international markets. There is evidence of continuing increases in export of processed and unprocessed timber from some range States, largely to meet demand in China for furniture-making. A proportion of this export appears to be unauthorised or illegal. The expansion of demand for Hongmu and other "rosewoods", has led to an unprecedented interest in Mukula timber in the main producer countries notably Zambia and DRC; with exponential development of logging leading to cumulative extractions estimated as several tens of thousands of m³ in countries including Zambia, DRC, Mozambique, Malawi, and Angola.

There are reports that since the listing of *P. erinaceus*, traders are redirecting attention to other, non-CITES species of *Pterocarpus*. Timber traders appear to be continually searching for substitute species for international trade, working both within and outside the law. Trade generally shifts between African *Pterocarpus* spp. depending on availability and multiple species are commonly traded under the same names. It is difficult to determine trade levels for individual species. In Customs data, most importing countries record imports of "rosewood" as tropical hardwood "not elsewhere specified".

The timber of African *Pterocarpus* spp. is hard to distinguish. Even the most commonly logged species of African *Pterocarpus* are not easy to identify by loggers, local botanists and forest managers. There are, for example, similarities of appearance between the timber of the CITES-listed *P. erinaceus* and *P. tinctorius*. The sawn timber of *P. tinctorius* is commonly confused with that of *P. angolensis* and *P. soyauxii* and there may be confusion between *P. soyauxii* and *P. tessmannii*.

The Proposal is to list all African populations of *Pterocarpus* species in Appendix II of CITES with annotation #17, including already listed species *P. erinaceus* (CoP17, no annotation) and *P. tinctorius* (CoP18, Annotation #6) in accordance with Article II, paragraph 2 (a) of the Convention. There has been negligible trade of timber products of *P. erinaceus* and *P. tinctorius* reported as originating outside Africa and neither are known to be in plantations outside Africa. One species of Asian *Pterocarpus* would remain in the Appendices with Annotation #7.

Analysis: *Pterocarpus* is a tropical tree genus that produces valuable timber. Twelve species occur in Africa. Based on available information *P. angolensis*, *P. soyauxii,* and *P. tessmannii* appear to meet Criterion B in Annex 2a of Res. Conf. 9.24 (Rev. CoP17). The rare species, *P. zenkeri* appears to meet Criterion A in Annex 2a of Res. Conf. 9.24 (Rev. CoP17).

The most commonly logged species of African *Pterocarpus* are considered to be difficult to distinguish from one another by people involved in the trade, including loggers and forest managers, and by local botanists. Some African species can be distinguished using chemical and anatomical approaches, but it is extremely difficult, if not impossible, to distinguish African *Pterocarpus* species based on the wood anatomical features alone. As *P. erinaceus* is currently listed in Appendix II and believed to be affected by trade, all other African species therefore meet the lookalike criteria for listing in Appendix II provided in Annex 2b of Res. Conf. 9.24 (Rev. CoP17).

Previously listed species of the genus (*P. erinaceus* and *P. tinctorius*) are included in the Appendices regardless of where their populations are so that plantations outside their natural range are included. Were this proposal to be accepted, populations outside their natural range would no longer be included in the Appendices. Neither *P. erinaceus* nor *P. tinctorius* are known to be in plantations outside Africa this amendment to their listing should have no conservation impacts.

Annotation

Pterocarpus erinaceus was listed in CITES Appendix II without annotation. Almost all trade in the species since then has been reported by exporters in terms that are covered by Annotation #17. Experience with CITES listings of other rosewood species (e.g., see CoP17 Prop 53) has demonstrated that other annotations have been circumvented through minimal transformation of wood products. Inclusion of transformed wood would prevent this.

The current annotation for *P. tinctorius* is Annotation #6: **"**Logs, sawn wood, veneer sheets and plywood". The change in annotation would mean that transformed wood would also come under CITES controls, again ensuring against circumvention seen with *Dalbergia cochinchinensis*.

The proposal to apply the Annotation #17 to all African populations of *Pterocarpus* spp. (including *P. erinaceus* and *P. tinctorius*) appears to be appropriate given that logs and sawn wood are the main products that are traded internationally and the inclusion of other forms of worked wood would prevent loopholes. If all African *Pterocarpus* spp. were covered by the same annotation, this would be an aid to enforcement. One species of Asian *Pterocarpus* would remain in the Appendices with Annotation #7.

Summary of Available Information

Text in non-italics is based on information in the proposal and Supporting Statement (SS), text in italics is based on additional information and/or assessment of information in the SS.

Taxonomy

There are 12 African species of the genus *Pterocarpus* according to the African Plant Database. An additional species, *Pterocarpus zenkeri* Harms, is not recognised by some taxonomists. According to the African Plant Database. "P. zenkeri is a doubtful species very similar to *P. osun*". Pterocarpus zenkeri *has however been assessed for the IUCN Red List. The presence of* P. officinalis *in Africa is disputed.*

IUCN Global Category, Range and Population Trend

Table 1. IUCN assessment, distribution range and population status for African *Pterocarpus* species (Sources Supporting Statement, IUCN Red List Assessments and GlobalTreePortal)**.**

Species	IUCN Global Category	Range	Population trend	Harvested for timber
Pterocarpus angolensis	LC (2018)	Angola, Botswana, Congo, DRC, Eswatini, Malawi, Mozambique, Namibia, South Africa, Tanzania, Zambia, Zimbabwe	Decreasing in parts of its range	Yes
Pterocarpus brenanii	LC (2018)	Malawi, Mozambique, Zimbabwe, Zambia *(Malawi is not included in GlobalTreePortal)*	Unknown	Unknown
Pterocarpus erinaceus	EN (2020)	Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Sierra Leone, Senegal, Togo *(Gabon is also included in GlobalTreePortal)*	Decreasing	Yes
Pterocarpus lucens	LC (2012)	Angola, Botswana, Cameroon, Chad, Congo, DRC, Ethiopia, Ghana, Guinea, Guinea-Bissau, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Senegal, Sudan, Uganda, Zambia, Zimbabwe *(Congo, Guinea-Bissau, Malawi, Nigeria and Zimbabwe are not included in GlobalTreePortal whereas Burkina Faso and South Africa are included)*	Stable	Yes
Pterocarpus mildbraedii	LC *(2022)*	Benin, Cameroon, Côte d'Ivoire, Equatorial Guinea, Gabon, Ghana, Liberia, Nigeria, Sierra Leone, Tanzania. Records for DRC are based on misidentification. *The distribution given in GlobalTreePortal also includes the Central African Republic, Congo, Togo*	Unknown	Yes
Pterocarpus officinalis	*Presence in Africa is disputed. The published assessment for the species, native to the*	DRC (pantropical as Plants of the World Online suggests "Mexico to tropical America"). *The distribution of this species does not include Africa (GlobalTreePortal, Barstow and Klitgård, 2018)*	Presence in Africa is disputed. Decreasing elsewhere	Yes

Species	IUCN Global Category	Range	Population trend	Harvested for timber
	Caribbean, Central and South America, is NT (2018).			
Pterocarpus osun	LC (2020)	Cameroon, Equatorial Guinea, Nigeria. *The distribution of this species does not include Equatorial Guinea (Global Tree Portal, Barstow, 2020)*	Unknown	Yes
Pterocarpus rotundifolius	LC (2019)	Angola, DRC, Malawi, Mozambique, Tanzania, Zimbabwe, Zambia. *The distribution includes Botswana, Eswatini, Namibia, South Africa (Global Tree Portal, Botanic Gardens Conservation International (BGCI) & IUCN SSC Global Tree Specialist Group, 2019a)*	Stable	Unknown
Pterocarpus santalinoides	LC (2019)	Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Nigeria, Senegal, Sierra Leone, Togo. Also widespread in South America. *This species also occurs in Gambia (Global Tree Portal, Botanic Gardens Conservation International (BGCI) & IUCN SSC Global Tree Specialist Group, 2019b)*	Stable	Unknown
Pterocarpus soyauxii	Draft assessment LC	Angola, Cameroon, Central African Republic, Congo, DRC, Equatorial Guinea, Gabon, Nigeria		Yes
Pterocarpus tessmannii	NT (2022)	DRC, Equatorial Guinea, Gabon. *Also in Guinea (GlobalTreePortal)*	Unknown	Yes
Pterocarpus tinctorius	LC (2018)	Angola, Burundi, DRC, Malawi, Mozambique, Tanzania, Zambia	Decreasing	Yes
Pterocarpus zenkeri	EN (2015)	*Cameroon (GlobalTreePortal). This is a Cameroon endemic known only from two localities: Yaoundé (Central Region) and Dikop near Eseka (South Region) (Cheek, 2015)*	Decreasing	Possibly

Biological and trade criteria for inclusion in Appendix II (Res. Conf. 9.24 (Rev. CoP 17) Annex 2a)

A) Trade regulation needed to prevent future inclusion in Appendix I

B) Regulation of trade required to ensure that harvest from the wild is not reducing population to level where survival might be threatened by continued harvest or other influences

Africa has 12 *Pterocarpus* species; the presence of one, *P. officinalis*, is disputed. An additional species is recognised by some botanists. Various species produce rosewood or other precious hardwoods, including *P. angolensis*, *P. lucens, P. mildbraedii, P. osun, P. soyauxii, P. tessmannii,* and *P. tinctorius*. Several species are traded under the same common name "Padouk" (*P. mildbraedii*, *P. soyauxii*, *P. tessmanii,* and *P. tinctorius*). Currently two African *Pterocarpus* species (*P. erinaceus* and *P. tinctorius*) are listed in CITES Appendix II. Between 2010 and 2014, China registered a 700% increase in the import of African rosewood logs and sawn wood. Rosewood is a commercial term encompassing hardwood species harvested to produce Chinese traditional Hongmu furniture. Trade in rosewood has been characterised by a shifting supply between different countries and species. African rosewood imports comprised nearly half of these rosewood imports. High-value rosewood was traditionally produced from *Dalbergia* species, but the overwhelming demand from China and the increasing rarity of Asia's Hongmu species combined with stricter conservation measures and enforcement of logging regulations forced the trade to turn progressively towards similar alternative species and in particular the *Pterocarpus* genus.

Pterocarpus erinaceus
This species is the only African species of Pterocarpus *on the list of 29 species officially designated as Hongmu under China's National Hongmu Standard (2017). The Standard can be legally enforced in relation to product marketing claims, and has played a key role in guiding the choice of materials in rosewood product manufacturing and consumption (Forest Trends, 2020). Viet Nam has also historically been a key market for rosewood, but imports dropped dramatically between 2015–2020, then stopped altogether in 2021. Viet Nam is the world's second-largest importer of African timber after China, with imported* P. erinaceus *largely processed into rosewood furniture for export to China. There are reports that following the listing of* P. erinaceus*, traders are redirecting their attention to other, non-CITES species (Wilmé* et al.*, 2020). Timber traders appear to be continually searching for substitute species to exploit internationally, working both within and outside the law (UNODC, 2020). At the same time, harvesting of* P. erinaceus *continues to cause population declines. There has, for example, been a decline of about 50% in the population of* P. erinaceus *outside conservation areas between 2013–2021 (Forestry Commission of Ghana, 2021).*

Other species considered to be over-exploited for their timber with many local stocks now exhausted include P. soyauxii, P. tinctorius, *and* P. tessmannii, *which is now listed as Near Threatened. The very rare and Endangered* P. zenkeri, *endemic to Cameroon, is potentially harvested for its timber either intentionally or due to mistaken identity with* Pterocarpus soyauxii.

Pterocarpus angolensis
This species is among the most important indigenous timber species in southern Africa. Its wood is known under many local names, such as umbila, muninga, mukwa, kiaat, and girassonde. It is sought after for carving, furniture and flooring because of its grain, colour, durability and stability, and is the most widely exploited wood in southern Africa (De Cauwer et al.*, 2017). The extensive trade in this wood on national and international markets has caused it to become depleted from some areas. Across parts of its range the largest and most mature trees are at risk from overexploitation for timber causing decline in some subpopulations outside of protected areas and sometimes inside protected sites due to both legal and illegal logging activity. In areas of extraction the size structure of subpopulations has become truncated, with smaller trees (often under 30 cm dbh) being much more common than those of larger size. This reduces the amount of seed being produced by the population causing concern about the impact this might have on regeneration at some sites (Barstow and Timberlake, 2018). Harvesting in Tanzania has been at a rate that could reach "economic extinction". There is little trade data available for this species: 5,000 m^3 are reported to have been exported from Zambia. The biggest importers of the timber are Thailand and China. This tree can also be used for medicinal purposes (Barstow and Timberlake, 2018).*

The species is threatened by land-use changes, overharvesting and/or frequent intense fires in many countries. In addition, climate change is expected to decrease the distribution range, especially where climate projections predict a decrease in summer rainfall. These threats affect the species' wood availability as the tree grows only in natural mixed forests. In contrast to the importance of its timber, information on P. angolensis *is not sufficient to support forest management, especially data on population dynamics and productivity. More knowledge on the productivity of* P. angolensis *would allow improved forecasts of its growth, mortality, recruitment, and timber yield (De Cauwer* et al.*, 2017).*

Pterocarpus angolensis *has been evaluated as of national concern in Angola. This dry forest species has a large proportion of its global range concentrated in Angola where it occurs in areas that are affected by high and increasing deforestation rates and relatively low tree cover. It has been proposed as one of 11 timber species of high priority for conservation attention in Angola (Romeiras* et al.*, 2014).*

While unsustainable or illegal logging only accounts for 9% of the net annual deforestation rate in Mozambique, there are also concerns over the potentially complete depletion of commercial species over the next 15 years. For example, more than half the volume of the commercial species harvested belong to just three species including Pterocarpus angolensis *(umbila). Based on customs import and export data, the rate of harvesting for this species exceeds the higher limit of Mozambique's annual allowable cut (Macqueen, 2018). In the first quarter of 2014, Mozambique became the largest African supplier of imported timber to China. China was the destination for 93% of Mozambique's timber exports (Macqueen, 2018). Most exports of the main timber species exported are logs or low value-added products. Trees larger than the minimum permitted diameters have become difficult to find due to the pressure on logging, which incentivises cutting trees below those limits. Lack of information is also a problem since local tree fellers simply cut trees first and try to sell to those who show interest afterwards. Any wood not bought by Chinese operators is bought by local carpenters for furniture production—except curved or split wood, which is often abandoned in the forest (Macqueen, 2018).*

Pterocarpus angolensis *(Kiaat) was declared a protected species in Namibia in 1952. Its status as a protected species was listed in the regulations to the Forest Act 2001. Within Namibia, permit data indicate that Kiaat is used to produce planks, blocks, sawn timber and wood carvings. Its status as a protected species was listed in the*

regulations to the Forest Act 2001. This species is also protected in Botswana, Malawi, Zimbabwe, Eswatini, Zambia, and South Africa (Nott et al.*, 2020).*

Pterocarpus angolensis *is considered to be vulnerable in Malawi, when considering wild populations, and vulnerable in Namibia and Zimbabwe when considering the species as an economic entity. However, in Zimbabwe the species as a whole is considered at low risk of extinction and within South Africa the species is assessed as least concern (Barstow and Timberlake, 2018).*

In Tanzania, an 80% decline in population is estimated based on seed collection data between 2000–2020 with an estimated 85% decline in use and trade in 94 local timber yards surveyed (Mashimba, in litt.*, 2022).*

Pterocarpus lucens
This species has a wide distribution in two bands across tropical Africa from Senegal to Ethiopia and Angola to Mozambique. It was evaluated as Least Concern globally in 2012 with a stable population. It is not recorded as nationally threatened for any country (GlobalTreePortal, 2022), but has been recorded as threatened at the population level in Burkina Faso, Niger, and Senegal (Winfield et al.*, 2016). It is apparently widely exploited both for a variety of local uses and the international timber trade.*

Pterocarpus soyauxii
This species was among the first timber species to be exported from Gabon. Between 2000–2003, Gabon exported 120,000 m³ of *P. soyauxii* logs annually. Since 2010 the export of logs has been banned by Gabon.

Padouk was the second most important timber exported from Gabon by volume 2007–2017 (all commodities combined) with a volume of 1,194,407 m³ (Mahonghol et al.*, 2020). Much of this is presumably* P. soyauxii, *which is listed as one of the 24 species currently harvested (Timber Trade Portal, 2022).* Pterocarpus soyauxii *is one of the main timbers produced in DRC and in the Congo (Timber Trade Portal, 2022).*

The timber of P. soyauxii *is one of the main African* Pterocarpus *species currently recorded in trade within China. In Kunming it is recorded with other rosewood species such as* P. erinaceus*,* P. tinctorius *and* Guibourtia *spp. and is traded as hewn logs and squared timber having been brought into China mainly through Zhangjiagang (Zhang and Chen, 2022b). This species also comprised around 80% of African rosewood imports to Viet Nam during 2018–2022 with a value of USD62 million (Panjiva, 2022).*

A draft global conservation assessment has been undertaken for P. soyauxii *that is unlikely to raise conservation concerns (Barstow,* in litt.*, 2022). Despite the potential threat to the species from timber use, the species has a wide range and large population and regenerates well (Doucet,* in litt.*, 2022). Nevertheless,* P. soyauxii *has been evaluated as nationally threatened in DRC with threats including logging, shifting agriculture and other forms of land degradation (Kiyulu and Rodrigues, 2014).*

Pterocarpus tessmannii
This species is exploited for timber and traded with other Pterocarpus *species as "African padauk". More research is needed into the extent and impact of this (Hills, 2021). There is no known information on its conservation status at a national level in DRC, Gabon, or Equatorial Guinea.*

Other species
Very limited information appears to be available on levels of trade and the impact of exploitation for Pterocarpus brenanii. P.lucens, P. osun, P. rotundifolius *and* P. santalanoides*. Bans on exports of* P. lucens *are however in place in several countries giving possible indications of concerns about levels of exploitation.*

*In the Central African Republic, only 34 "species" found in the closed forest area are typically harvested including Padouk (*Pterocarpus *spp.) but these are not amongst the most heavily traded (Timber Trade Portal, 2022).*

International trade in Pterocarpus *spp. is poorly documented by importing countries. Because there is no universal definition of "rosewood", there are no global statistics on the rosewood market. In most national systems, imports are typically registered as tropical hardwood "not elsewhere specified". Most of the rosewood species used for Hongmu come from the* Dalbergia *and* Pterocarpus *genera (UNODC, 2020).*

Inclusion in Appendix II to improve control of other listed species

A) Specimens in trade resemble those of species listed in Appendix II under Res. Conf. 9.24 (Rev. CoP17) Annex 2 a or listed in Appendix I

Despite their listing in CITES Appendix II, P. erinaceus *and possibly* P. tinctorius*, are still subject to illegal logging and trade, notably because existing exports are mislabelled as other non-CITES species of the genus.*

A paper submitted by the Scientific Authorities of Germany and Belgium at CITES PC24 in 2018 noted that the expansion of Hongmu demand has led to an unprecedented interest in Mukula timber in the main producer countries notably (but not exclusively) Zambia and DRC; with exponential development of the logging marketing chain leading to cumulative extractions estimated as several tens of thousands of m³ in countries including Zambia, DRC, Mozambique, Malawi, and Angola, although no precise assessment of the volumes involved is available. In some places, there may be problems regarding the legality and sustainability of the logging operations. Although the extraction of Mukula timber affects several species in the genus Pterocarpus*, they are not differentiated or are poorly differentiated by loggers and traders in the international markets. Empirical observations indicate that several of these species are in critical decline in numerous regions of the countries within their range (PC24 Doc. 19.2, 2018).*

Even the most commonly logged species of African *Pterocarpus* are often not easily distinguishable from one another by loggers, local botanists and forest managers. There are reported confusions between *P. soyauxii*, *P. tessmannii,* and *P. castelsii*. The latter, not accepted by taxonomists but anyway recorded in the field, refers to *P. soyauxii* or *P. tessmannii*, adding even more confusion. Although some of the species have recently been distinguished from one another thanks to a combination of chemical and anatomical approaches, it is extremely difficult, if not impossible, to distinguish African *Pterocarpus* species based on the wood anatomical features alone.

As some of the *Pterocarpus* species are not clearly distinguishable, and there is evidence that two currently CITES-listed *Pterocarpus* species might be traded under the label of non-CITES listed species, it is also proposed that the African species in the genus are included in Appendix II under Criterion A of Annex 2 b of Resolution Con. 9.24 (Rev. CoP17), or the lookalike provisions.

There are similarities of appearance between the timber of P. erinaceus *and* P. tinctorius*. Trade shifts between African* Pterocarpus *spp., depending on availability, and multiple species are commonly traded under the same names as has been seen with other rosewoods such as* Dalbergia *spp. and* Guibourtia *spp.*

Although the extraction of Mukula timber affects several species in the genus Pterocarpus*, they are not differentiated or are poorly differentiated by loggers and traders in international markets (PC24 Doc. 19.2, 2018). In Zambia more research is needed to clarify the botanical characteristics of what goes under the name Mukula. The mechanisms underpinning the market in this timber move away from targeted species and countries, targetting instead lesser known species or new geographies altogether. The recent documented cases of Mukula harvesting in DRC, Malawi and other countries illustrate this (Cerutti* et al*., 2018). The sawn timber of* P. tinctorius *is similar in appearance to that of* P. angolensis, P. soyauxii *or* P. castelsii*. All these species are referred to locally as Mukula as reflected in the Namibian Department of Forestry in-transit permit data. Many consignments of this timber are transported through Namibia from Zambia and the DRC for export to China (Nott* et al.*, 2020).*

Background to annotation amendments

P. erinaceus was listed at CoP17 with no annotation meaning that all readily recognisable parts are included in the listing. *The majority of trade reported by exporters has been in logs (>204,000 m³), sawn wood (1,106,000 m³) with only 550 kg and 45 m³ of wood products. Significantly higher quantities have been reported by importers but with the same products dominating the trade. No trade has been reported of transformed wood by exporters although importers have reported around 200 m³.*

P. tinctorius was listed at CoP18 with Annotation #6, including logs, sawn wood, veneer sheets and plywood. Since then, exporters have mostly reported exports of timber, sawn wood and logs. *Only 2 kg of wood products have been reported by importers and no trade in transformed wood has been reported, although this would not have been covered by the current annotation.*

Additional information

Threats

African Pterocarpus *spp. also provide a range of medicinal products harvested for local use. Overharvesting may be a threat locally. The viability of existing wild* P. angolensis *populations is threatened, not only due to extensive harvesting of its bark for medicinal purposes or as fuel wood, but also owing to establishment problems resulting from seedling failure after germination. It has been estimated that only 2% of fruits produce seedlings in a given year, with just half of those seedlings surviving the first year of growth. Successful seed germination appears to depend on wildfires that remove the wings and bristles from pods, crack the seed and improve contact with the soil* (*Sadiki* et al., *2018).*

De Cauwer et al. *(2016) considered the environmental drivers of change in the transition zones of woodlands in Namibia. Their study concluded that while Kiaat communities were better able to withstand high fire frequency than other communities, they show a higher vulnerability to climate change.*

Pterocarpus mildbraedii *is reported to be threatened by deforestation and urbanisation.*

Conservation, management and legislation
In Cote d'Ivoire, Decree No. 2013-508 of 25 July 2013 bans the exploitation, cutting, transport, marketing and export of all Pterocarpus *spp. (UNEP-WCMC, 2020).*

Benin has prohibited the export of all timber species in their raw form, including Pterocarpus erinaceus*, a protected species since 2005, with only finished products permitted in trade. Burkina Faso has prohibited the export of all logs and processed products of* Pterocarpus erinaceus *and* P. lucens *since 2005. Cameroon has banned log exports of rosewood species found in the country since 1999. Ghana has banned the harvesting and export of* P. erinaceus *and* P. lucens *since 2014 (Zhang and Chen, 2022a).*

In view of the rapid increase in the trade of P. erinaceus*, Ghana has established domestic regulatory mechanisms to manage and monitor the populations of* P. erinaceus*. This includes the adoption of a quota system to regulate the harvest and trade and ensure sustainable trade and conservation of the species in the wild. Enforcement of a national ban on harvesting and export of* P. erinaceus *and plantation development programmes have been put in place.*

Artificial propagation
Attempts to establish plantations of P. angolensis *have been largely unsuccessful. More knowledge on the productivity of* P. angolensis *would possibly assist in establishment of plantations as well as allowing improved forecasts of its growth, mortality, recruitment and timber yield for sustainable management in natural forests (De Cauwer* et al.*, 2017).*

Implementation challenges
The CITES listing of P. erinaceus *has led to significant implementation challenges. In October 2018, the CITES Standing Committee decided to suspend trade in* P. erinaceus *from Nigeria until the Party made a scientifically based non-detriment finding (NDF) to the satisfaction of the Secretariat and PC Chair. Given the high volumes of trade, a Significant Trade Review was carried out for the species. UNEP-WCMC was commissioned to undertake reviews of* P. erinaceus *trade for all 17 range States for consideration by the CITES Plants Committee. All range States were consulted and asked to provide information on the scientific basis by which they had established that exports were non-detrimental and compliant with Article IV, including details on the population status and threats to the species within their country, together with information on trade, legal protection, and management actions. The study concluded that no range State of* P. erinaceus *demonstrated that the provisions of Article IV were being met. Further guidance and capacity building in relation to timber NDFs are therefore required across all range States to ensure that any future exports are science-based and that ongoing adaptive management is in place (UNEP-WCMC, 2020).*

Subsequently at the March 2022 Standing Committee, the Secretariat was asked to open an Article XIII procedure for P. erinaceus *for all range States based on the exceptional circumstances due to pervasive documented illegal trade. As a consequence of this and analysis of the responses from the range States, a suspension was put in place in June 2022 for all commercial trade in* P. erinaceus *from those Parties that did not reply or did not provide a satisfactory justification while other range States adopted a voluntary zero quota (See: Notification to the Parties No. 2022/045).*

It is not clear to what extent range States currently have inventory data for Pterocarpus *spp. but partial information is available as highlighted in Winfield et al. (2016) to guide NDF decisions. This report notes that a surprising amount of information was available for a number of* Pterocarpus *species in Africa, mainly the highly exploited species* P. erinaceus, P. lucens, *and* P. angolensis*. However, even these studies were restricted to selected populations, thus leaving large data gaps. Without even a basic understanding of existing standing stocks and their structure it is difficult to ascertain what a sustainable level of harvest would or could be for any of these species. Some Inventory data are available: for* P. angolensis *in Namibia and large-scale inventories for* P. soyauxii *have been carried out in central African countries.*

Law enforcement in the forest sector in various African countries is perceived as in need of strengthening. The forest sector in Mozambique, for example, has about 630 inspectors, which is far below the ideal minimum of 1,800 to allow adequate monitoring. Despite recent purchases of more vehicles for inspectors, agent recruitment and training, and more fixed inspection posts, only a small number of transgressors, vehicles and containers have been seized in recent years (Macqueen, 2018).

There is a risk that consignments of African Pterocarpus *timbers will be mislabelled as species not included in the CITES Appendices, such as the Asian species* P. macrocarpus *and* P. indicus*, which are both listed on the IUCN Red List as Endangered with the main threat being overexploitation for timber. There is potential for mixing of different species in the process of transhipment involving various countries in Africa and Asia.*

Potential risk(s) of a listing
The timber sector is of major importance to African economies in terms of employment and socio-economic development. All aspects of forestry and sustainable wood utilisation are important within the range States. Livelihood implications need to be considered. In parts of Africa. the uncontrolled expansion of logging of Pterocarpus *spp. has been made possible by the extreme poverty of the rural populations, for whom the purchase prices proposed by intermediaries are an unparalleled windfall, despite being very low (PC24 Doc. 19.2, 2018).*

There is a potential risk of the trade shifting to other non-CITES species that produce similar timber. Furthermore, a significant proportion of the range of Pterocarpus santalinoides *is in South America where populations would not be included in the listing. Although* Pterocarpus officinalis *is considered within the listing proposal as an African species, the range is actually Caribbean, Central, and South America. Trade in these populations would not be included in the listing.*

Potential benefit(s) of listing for trade regulation
The two African species of Pterocarpus *currently listed in CITES do not have overlapping distributions. The range States for the two species include 25 countries. The inclusion of all African species of the genus would increase the number of range states (notably adding Eswatini, Ethiopia, Namibia, South Africa, and Zimbabwe) and potentially strengthen trade controls on cross-border trade within Africa. Currently illegal Mukula extraction is considered a regional issue with significant extraction in southeastern DRC, Zambia, and northeastern Angola. Trucking routes are documented towards ports on the Atlantic (Angola, Namibia, and South Africa) and Pacific (Tanzania and Mozambique).*

Efforts to improve sustainable forest management and promote certification are underway at a national and regional level in African countries. CITES listing could reinforce these efforts. Furthermore, it could establish necessary controls required for more effective data gathering on trade and support regional collaboration in data sharing and transparency as recommended by Mahonghol et al. *(2020).*

In China, the implementation of laws, regulations and administrative measures relating to rosewood (including Pterocarpus *spp.) is ultimately guided by the species listed in the CITES Appendices. Listing of all African* Pterocarpus *species in Appendix II will strengthen the legislation and policy framework for* Pterocarpus *use in China, the main importing country. The Chinese rosewood industry has already initiated some informal discussions around the listing of all* Pterocarpus *in the CITES Appendices.*

China has adopted stricter domestic measures than CITES to strengthen the trade control of imported CITES wood species by requiring a CITES import permit certificate for Appendix II species. Exporters are obliged to obtain a CITES export permit issued by the Management Authority of the exporting country in accordance with the requirements of CITES. They must also apply to the China CITES Management Authority in advance and obtain the CITES import permit certificate. These documents are checked by China customs. Before issuing the import permit, the CITES Management Authority will contact the CITES Secretariat or the CITES Management Authority of the exporting country for verification of the authenticity and validity of any CITES permit/certificate prior to the issuance of the import permit certificate (Zhang and Chen, 2022a).

CITES listing would provide a clearer picture of the international trade in African Pterocarpus *timber as part of the global rosewood market. Currently, because there is no universal definition of "rosewood", there are no global statistics on the rosewood market. In most national systems imports are typically registered as tropical hardwood "not elsewhere specified". While traditional rosewoods have many uses, today most of the trade refers to tropical hardwoods suitable for making traditional furniture in the Asian style, typically referred to as Hongmu. Most of these rosewood species come from the* Dalbergia *and* Pterocarpus *genera (UNODC, 2020).*

Other comments
Pterocarpus *is within the scope of certification schemes: the FSC Certificates Public Dashboard records certificates for the genus relating to Cameroon and Gabon.*

Viet Nam is the second-largest importer of African timber beyond China, with imported P. erinaceus *largely processed into rosewood furniture for export to China. In 2019, Viet Nam signed a bilateral trade agreement, the Forest Law, Governance, Enforcement and Trade Voluntary Partnership Agreement (FLEGT-VPA), with the EU, which contained a commitment to ensure that wood products are legally sourced. In 2020, a Decree was issued on the Viet Namese Timber Legality Assurance System (VNTLAS), stipulating that for countries and species deemed "high-risk," importers must provide additional documentation demonstrating legal compliance and undertake due diligence (Treanor, 2022).*

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