

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



Fourteenth meeting of the Conference of the Parties
The Hague (Netherlands), 3-15 June 2007

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Inclusion of *Caesalpinia echinata* Lam. in Appendix II, including all its parts and derivatives, in accordance with Article II, paragraph 2 a), of the Convention, and Resolution Conf. 9.24 (Rev. CoP13), Annex 2 a, paragraphs A and B.

B. Proponent

Brazil

C. Supporting statement

Inclusion of *Caesalpinia echinata* in CITES Appendix II is necessary because it is the only species used to make bows for musical instruments. Trade in this species must be regulated in order to avoid the need to list it in Appendix I in the near future.

1. Taxonomy

- 1.0 Division: Magnoliophyta
- 1.1 Class: Magnoliopsida
- 1.2 Order: Fabales
- 1.3 Family: Leguminosae/Fabace
- 1.4 Genus, species or subspecies, including author and year: *Caesalpinia echinata* Lam.
- 1.5 Scientific synonyms: *Guilandina echinata* Spreng, *Caesalpinia obliqua* Vog.
- 1.6 Common names:
- | | |
|-------------|---|
| English: | Brazil wood, pernambuco wood |
| French: | bois de pernambouc |
| Spanish: | palo brasil, brasil, palo pernambuco, pernambuco, palo rosado |
| German: | pernambuckholz |
| Portuguese: | pau-brasil, ibirapitanga, brasileto, orabutá |
- 1.7 Code numbers: ---

2. Overview

Brazil wood or pernambuco wood, *Caesalpinia echinata*, is a slow-growing, medium-sized tree in the Leguminosae family. It essentially ranges throughout the "Mata Atlântica" or Atlantic coastal

rainforest of Brazil. The growth rate of these trees depends on various factors, such as soil composition, climate and geographical location.

Exported to Europe for dye approximately up to 1850, Brazil wood began to be used for making violin bows in the middle of the 18th century. The Tourte brothers were among the first bow-makers to demonstrate the exceptional features of this wood. In the beginning, bow-makers used several qualities of "tropical timber". They all had remarkable density and hardness, so they were commonly called "iron wood".

As it gained favour with musicians thanks to its sound quality, while its physical and mechanical characteristics made it an ideal material for manufacturing curved rods, pernambuco wood shortly supplanted all other species. Two hundred and fifty years after its introduction, when it comes to building quality bows, bow-makers and musicians throughout the world have found it unsurpassed for resilience, density, beauty, or its ability to hold a fixed curve. All these properties make pernambuco wood an unparalleled material.

3. Species characteristics

3.1 Distribution

Brazil wood is only found at the heart of the Mata Atlântica, where rainforests are the predominant vegetation, but it is a typical element in seasonal forests. This means that the species developed and prospered during the glacial periods, always preferring an arid climate and dry soils (Lima *et al.* 2002). Although recognized as just one species, *Caesalpinia echinata* presents considerable variation throughout its range. At least three morphological patterns could be distinguished, showing differences in the leaves (leaf characteristics, leaflet shape and size) and in the anatomical structure of the wood. Recent genetic studies support these anatomical and morphological differences from one population to another, but no subspecies or variety has been officially recognized to date (Cardoso *et alii* 1998; Lima 2003).

The remaining areas where the species occurs are generally located along the coast, typically in woodlands. It may be noted that these stretches sometimes appear as dry thickets, forming a mosaic with the characteristic varied sandbar physiognomy, chiefly over the vast coastal plains and lowlands, on sandy or sandy-clayey soil (Bueno & Lima 2002).

It is difficult to detect the current presence of Brazil wood in these areas or diagnose whether it may have occurred here in the past, largely because the original forest cover has been repeatedly altered.

Caesalpinia echinata occurs exclusively on Brazilian territory. Table 1 shows the locations where the presence of natural populations has been confirmed over the last 10 years (Lima, H.C. 2004).

Table 1: Locations with botanical records where Brazil wood occurs

| State | Locations where Brazil wood occurs |
|--------------------------|---|
| Rio Grande do Norte (RN) | Extreme south to near Cabo de Touros |
| Paraíba (PB) | Mamanguape and Camaratuba |
| Pernambuco (PE) | São Lourenço da Mata to Vitória de Santo Antão, Nazaré da Mata, Tracunhaém, Pau d'Alho, Timbaúba and Goiana |
| Alagoas (AL) | Junqueira |
| Bahia (BA) | Porto Seguro, Eunápolis, Itamaraju, Barrolândia, Jussari, Ipiau, Caraíva, Camacã, Pau-Brasil, Ubaitaba, Tapera and Guaratinga |
| Espírito Santo (ES) | Aracruz |
| Rio de Janeiro (RJ) | Cabo Frio, Búzios, São Pedro da Aldeia, Araruama, Iguaba, Saquarema, Itaipuaçu and Rio de Janeiro |

3.2 Habitat

Forests of the coastal plains and the Mata Atlântica terraced jungles.

3.3 Biological characteristics

It is a semi-deciduous, heliophyte or sciophyte plant, typical of the seasonal forest. In other words, the species developed and prospered through the glacial periods, always preferring an arid climate and dry soils.

3.4 Morphological characteristics

Caesalpinia echinata is a prickly plant, 8-12 m stem height and 40-70 cm in diameter. Its compound bipinnate leaves are 10-15 cm-long, with 5-6 pairs of 8-14 cm-long pinnae and 6-10 pairs of 1-2 cm-long leaflets per pinna (Lorenzi, 2002). Its flowers last from 10 to 15 days at the most, and only stay open for less than 24 hours. They give off a scent of slightly sweetened citrus fruit, and tend to cluster in small terminal racemes, rarely sprouting from the axils of the branches. The calyx is yellowish-green, and the petals intensely yellow, with faint shades of red at the base. The medium-sized petal stands out from the others with its deep red central spot that nearly covers the entire surface. The plant produces berry fruit with false prickles.

3.5 Role of the species in its ecosystem

C. echinata chiefly occurs on coastal plains and lowlands, on sandy or sandy-clayey soils. Its patchy distribution along the Atlantic shore reflects this preference. Little is known on the composition and structure of the plant community in which it lives. The floristic characteristics of three areas that contain the species (all in the State of Rio de Janeiro) were studied, but not in great detail, so these studies do not provide sufficient data to reach any generalized conclusion (Lewis *et al.* 1997).

4. Status and trends

4.1 Habitat trends

In general terms, the Mata Atlântica may be seen as a diversified mosaic of ecosystems, composed of differentiated floristic structures and compositions, depending on variations in the soil, ruggedness of the terrain, and climate conditions in the extensive area where this biome occurs in Brazil.

The Mata Atlântica originally covered the mountain chains and plains of the Brazilian Atlantic coast, from the State of Rio Grande do Norte to the State of Rio Grande do Sul. This used to be the second-largest tropical rainforest in Brazil, only comparable to the Amazonian Forest, covering an expanse of 1.3 million square kilometres. Prior to colonization, this biome extended over a practically continuous strip, from Rio Grande do Norte to Rio Grande do Sul, along the shore and occupying nearly 12 % of the national territory. Nowadays, almost 7.3 % of the original forest cover has been lost. This area is considered the fifth most endangered and richest in endemic species of the world.

Harvesting of the Mata Atlântica has taken place since the arrival of Portuguese colonists in Brazil. Their primary interest was the use of Brazil wood. The deforestation process continued through the successive cycles of sugar cane, gold, coffee plantations and pastures for grazing, paper, cellulose and tile production, settlement by colonists, construction of roads and dams, and broad, intense urban development that would establish the country's major cities, such as São Paulo and Rio de Janeiro, as well as various smaller towns and villages.

The current range is greatly reduced and fragmented, as the few remaining stands have been found chiefly in areas of difficult access. Preservation of these remnant populations has occurred to guarantee the containment of riverbanks, offer opportunities for enjoyment of lush landscapes and for activities associated with ecotourism, and also to shelter various traditional

populations, including indigenous nations. Furthermore, the springs located here are essential for the water supply of nearly 70 % of the Brazilian population.

In the State of Rio de Janeiro, the municipalities of Niterói, Araruama and Iguaba Grande have the largest fragments of forests with natural populations of *Caesalpinia echinata* ("*Projeto Pau Brasil*" – Final Report).

Table 2: Remaining Brazil wood areas in the State of Rio de Janeiro

| Remaining Locations | Area (ha) | Perimeter (m) |
|-----------------------------------|-----------|---------------|
| Niterói | 5,824 | 156,000 |
| Castellana | 3,253 | 77,000 |
| Baía Formosa | 1,546 | 68,000 |
| São Mateus / Aero-naval Base | 768 | 36,000 |
| Serra de Sapiatiba | 493 | 23,000 |
| Morro Mico/Piaçava | 369 | 23,000 |
| Guaratiba | 222 | 12,000 |
| Jacarepiá | 205 | 12,000 |
| Boca da Barra / Praia das Conchas | 196 | 12,000 |
| Leme / Pão de Açúcar | 125 | 17,000 |
| Ponta da Farinha | 96 | 6,000 |
| Morro do Milagre | 82 | 7,000 |
| Ponta Pai Vitório | 72 | 7,000 |

4.2 Population size

The Bahia "Brazil Wood Programme" undertook a series of inventories in 2005. Prospecting on biometric and phyto-sociological aspects uncovered data revealing the presence of the species at the southernmost tip of Bahia. The objective was to gather information on the occurrence of the species by consulting with institutions and social bodies (government environmental agencies, NGOs, rural unions, forest exploration and management firms, and sawmills) as well as professionals associated with forestry activities, to identify the locations where the species and its morphotypes prosper under natural (native) and cultivated conditions. In the course of inventory work, numerous rural properties in different edaphic-climatic and ecological areas were visited, and 1,754 individual Brazil wood trees were recorded on over 130 rural properties in the cocoa-growing region. Of the total trees recorded, 1,669 were native and the remaining 85 had been planted. These data include presence of three morphological variants of the species – the "rue-leaved," the "coffee-leaved" and the "orange-leaved" forms of pernambuco wood – in the southern part of Bahia where cocoa plantations are prevalent.

Projeto Pau Brasil, carried out by the Rio de Janeiro Botanic Garden and other institutions, mapped the 13 most representative remaining areas where Brazil wood was present in the State of Rio de Janeiro. Of these areas, only three are not enclosed in legally protected conservation units.

In the State of Pernambuco, besides the Tapacurá Ecological Reserve – currently managed by the Pernambuco Sanitation Company (COMPESA) – *C. echinata* plantations have been in existence for approximately 30 years. These include the Bosque de Alto del Morro in the Guararapes, in Recife/PE, and Glória del Goitá/PE.

4.3 Population structure

The population structure of this species is being determined under the "Brazil Wood Programme", with participation by several public and private institutions.

4.4 Population trends

C. echinata is known to be disappearing owing to the deforestation of its habitat and illegal logging of trees to produce violin bows and for other purposes. However, a recent study conducted by the Rio de Janeiro Botanic Garden (*Projeto Pau Brasil*) verified examples of regenerating populations. These results were found for individuals in a *Caesalpinia echinata* sample covering an area of 3.6 ha, within five remaining hectares of the semi-deciduous seasonal forest in the Cabo Frio Diversity Centre, and for a small remaining population in the city of Rio de Janeiro. This evidence indicates the typical inverse *J* curve, where the highest percentages of individuals in the sample were plants at the seedling or juvenile stage (coppices).

4.5 Geographic trends

The thin strip of the Mata Atlântica originally extended from the northeast tip near Cabo São Roque, in the State of Rio Grande do Norte, down to Torres, in the State of Rio Grande do Sul. Today, the forest area scarcely covers 7.3 % of its original expanse.

5. Threats

5.1 Generalized deforestation

The main reasons for deforestation of the Mata Atlântica have been urban sprawl, agriculture and timber harvesting. Some areas, however, especially those closest to the sea such as Cabo Frio, in the State of Rio de Janeiro, have suffered a considerable impact in recent years through tourist development. The same problem occurs in the other Brazilian States. These coastal areas are particularly important refuges for the remaining populations of *C. echinata*. Detailed figures on the proportion of deforestation in the remaining forest areas where *C. echinata* occurs are unavailable.

5.2 Illegal logging and exports of *C. echinata*

Under National Environmental Council (CONAMA) Resolution No. 278/2001, authorized concessions for felling and harvesting species threatened with extinction have been suspended, except temporary harvesting for no direct commercial purpose, to be consumed on the rural properties or holdings, or on indigenous peoples' landholdings and traditional settlements. While illegal logging of this species is known to exist, the extent of such practice has not been calculated (Lewis et al. 1997).

6. Utilization and trade

6.1 National utilization

Archaeological research shows that *C. echinata* was the wood favoured by the native peoples who inhabited the Mata Atlântica for thousands of years before the arrival of the Portuguese, in 1500. Between 1501 and 1850, large amounts of timber were exported for dye, which meant that major forest areas were cut down. Trade reached such a high volume that the region soon became known as "the Brazil wood coast". Around the mid-18th century, the wood of this species was found to be ideal for manufacturing bows for musical instruments, and since then, top quality bows have been made for violins, violas, cellos and basses. Most professional bows nowadays are made of pernambuco wood. Available information on the use of *C. echinata* for manufacturing bows is limited. Reliable figures on the amount of the species exported from Brazil for this purpose are lacking, and the amount used by Brazilian bow-makers is also unknown. Timber merchants are reluctant to divulge this information, but annual worldwide demand is estimated at around 200 m³, although it is probably higher, as a considerable amount of wood is wasted in the bow-making process. A violin bow typically requires approximately 1 kg of wood. Brazil wood is now mainly used to manufacture violin bows.

6.2 Legal trade

The Brazilian Institute for the Environment and Renewable Natural Resources – IBAMA – allows trade in material from property improvements (fences, sheds, houses), as long as a licence has been issued to this effect by the appropriate environmental agency. IBAMA may then authorize this product for export.

6.3 Parts and derivatives in trade

Caesalpinia echinata is currently used to manufacture high quality bows for musical instruments.

6.4 Illegal trade

IBAMA Resolution No. 37, of 3 April 1992, lists *C. echinata* among the plants considered threatened with extinction in Brazil. On the World List of Threatened Trees (Oldfield *et al.* 1998), *C. echinata* appears as endangered, and on the IUCN Red List of Threatened Species published in the year 2000, it falls under the category of Endangered, according to criteria A1 a, c, d.

Decree No. 750, of 10 February 1993, forbids felling, harvesting and any other activity that interferes with Mata Atlântica primary and secondary vegetation types. CONAMA Resolution No. 278/2001 published in 2001 empowers the IBAMA to suspend authorizations granted directly or by other bodies within the National Environmental System – SISNAMA – for cutting and harvesting species officially listed as threatened with extinction, in natural populations in the Mata Atlântica biome. The suspension is to remain in force until the establishment of scientifically validated technical criteria to guarantee sustainability of the harvest and conservation of genetic material from these populations.

In accordance with the document produced in February 2002 by the Federal Ministry of the Environment Department of Nature Protection and Nuclear Security of the Federal Republic of Germany, evidence shows widespread use of *C. echinata* in global production of violin bows. Since most violin bow-makers can be found in France, Germany, Italy and the United Kingdom of Great Britain and Northern Ireland, not to mention numerous manufacturers in the United States of America and in Canada, the result is significant trade in *C. echinata* for the manufacture of violin bows.

In 1997, information was gathered on international trade in and use of *C. echinata* for the production of bows (FFI 1997). In the United Kingdom there were between 12 and 15 professional bow producers and a similar number of amateurs who made bows for pleasure. Most of them are in business by themselves. A comparable situation exists in France, with 59 bow manufacturers, most of whom are professionals. In the United States, again, bow-makers largely work as individual artisans, running their own businesses. In Germany up to 50 companies and individuals employ nearly 150 bow manufacturers. Most of the German firms have one or two employees, while three companies employ over 10 people. In the United Kingdom and in Germany, most of the bows are for professional use, and are made with the best quality *C. echinata* wood. One professional bow-maker in the United Kingdom produced 30 to 50 bows per year, and in Germany, this figure reached nearly 100 bows. Manufacturers in the United States produced 30 to 50 bows per year. A handful of companies manufacture a much higher number of bows. The largest American business has 20 employees, who make 1,700 bows per year (including those made at a factory in China). The largest manufacturer in Europe is a Swiss firm that produces 3,000 bows per year. This firm had been producing bows for 20 years, selling them throughout the world. Up to 20 employees work for this firm, which has five permanent bow factories and others outsourced to prepare pieces of wood. The Republic of Korea, Japan, and recently China also produce bows. Some bow manufacturers in Asia have relatively large staffs, such as that of a Japanese company with 30 employees. China is said to be the largest consumer of *C. echinata*, mostly of inferior quality.

6.5 Amounts of *C. echinata* used

Research carried out in 2002 by the International Pernambuco Conservation Initiative / Confédération des Métiers et des Utilisateurs des Ressources de la Nature – IPCI/COMURNAT –

indicated values in the order of 200 m³ to supply national and international markets. Although this may seem a small value, it should not be taken as a reference because the population of Brazil wood is constantly decreasing. The largest consumers of pernambuco wood are the United States and Europe, while Germany and France are the countries with the main reserves (*CPI Biopirataria*, 2006).

6.6 Actual or potential trade impacts

We have no official information on the actual impact of trade on Brazil wood. Export is only allowed under authorization by the environmental agency. Clandestine trade is known to exist, but we do not have data on the amount leaving the country, as exporters declare another timber species instead of Brazil wood.

It is estimated that 70 % to 90 % of the wood is wasted in transforming logs into bows. Another estimate indicates that of 1,500 kg of cut timber, only 100 to 200 kg are suitable for high quality bows, owing to flaws in the wood (cracks, knots, graininess, variations in resilience, density, etc.). Between 70 % and 80 % is supposedly lost during the manufacturing process, from the tree in the wild to the bow itself. Measures to reduce the percentage of wasted timber would not only be beneficial for the species, lessening the amount harvested, but would also benefit bow manufacturers, lowering the cost of their raw material. Alternatively, small-scale artisans could take advantage of the discarded wood.

Brazil already has a programme to control and combat illegal harvest. A draft law expected to be passed shortly aims to protect the Mata Atlântica biome, the habitat of Brazil wood.

7. Legal instruments

7.1 National

The legislation to preserve *C. echinata* consists of a series of specific legal instruments, along with more general measures governing harvest and transport of native Brazilian plants. These are as follows:

- IBAMA Order No. 37, of 3 April 1992, lists *C. echinata* among the plants considered threatened with extinction in Brazil.
- Law No. 4771, of 15 September 1965, Art. 14, point "b", empowers federal and State authorities to prohibit or restrict felling endangered species.
- Decree No. 750, of 10 February 1993, forbids cutting and harvesting, or any other activity that interferes with Mata Atlântica primary or secondary vegetation types.
- Ministerial Order No. 113, of 29 December 1995, mentions that harvest from primitive forests and other forms of tree cover for the primary purpose of gaining economic profit with forest products will only be allowed under sustainable forestry management.
- CONAMA Resolution No. 278/2001 empowers IBAMA to suspend authorizations granted directly or by other bodies within the National Environmental System – SISNAMA – for cutting and harvesting species officially listed as threatened with extinction, in natural populations in the Mata Atlântica biome. The suspension is to remain in force until establishment of scientifically validated technical criteria to guarantee sustainability of the harvest and conservation of genetic material from these populations.
- CONAMA Resolution No. 317/2002 sets the necessary criteria for conservation of genetic material and sustainability of the harvest of Mata Atlântica plant species threatened with extinction to be included in State Plans for Conservation and Use, which must be based on technical, scientific studies.

- Regulation No. 17/2004 determines categories for exporting timber products and by-products from natural or planted stands of native or alien forest species.
- Regulation No. 112, of 21 August 2006 governs transport of IBAMA-regulated native forest products (*DOF*).

7.2 International

Caesalpinia echinata is not covered under any international agreement subscribed by Brazil.

8. Species management

8.1 Management measures

With the continuous destruction of wooded areas where *C. echinata* occurs, and the difficulty of establishing new protected areas in the Mata Atlântica, it may prove necessary to propagate the species in locations outside its native range, in order to ensure its long-term survival. Owing to constant fragmentation and reduction of remaining forest areas, the genetic diversity of the species – which can only be maintained through *ex situ* conservation measures – is decreasing.

There is little information on the success or failure of earlier propagation efforts, or on forestry experiments with *C. echinata*. Technical knowledge of how to cultivate and manage the species is therefore limited. Research indicates that it is relatively easy and economical to collect seeds and produce seedlings, and that enrichment planting seems feasible. Specific aspects that require further study are pruning, prominence and enhancement of planting techniques, spacing arrangements and use of fertilizers, as well as other relationships among plant species and symbiotic interactions.

C. echinata has been grown in plantations, but the quality of the wood and whether it is suitable for manufacturing bows for string instruments remains to be studied. Timber traders are reluctant to buy cultivated *C. echinata* because they claim it is of inferior quality, based on their experience with other species. They therefore concentrate their efforts on harvesting from native forests.

8.2 Population monitoring

Definition of measures to control and monitor Brazil wood populations must be based on the results of the inventories currently underway as part of *Projeto Pau brasil*.

8.3 Control measures

8.3.1 International

Caesalpinia echinata is not covered under any international agreement joined by Brazil.

8.3.2 Domestic

See Point 7.1.

8.4 Artificial propagation

Pernambuco wood is a species that has always been harvested, over all these years, whether as raw material for dyes, for fence posts, or for violin bows and handicraft products, which has led to its total extinction in some parts of its natural range. Action to promote planting aims to meet future demand through commercial plantations, and to conserve the variability of the remaining genetic base. It also fosters enlargement and creation of protected areas and re-introduction in regions where the species had become extinct, as well as cultivation of a civic-cultural nature, such as planting trees in public squares or as elements of urban design, landscaping, or other events organized around tree-planting.

An example of an artificial propagation project for commercial plantations is that which currently exists in the State of Espírito Santo. "Project Verde Brasil" is a public-private alliance of the Brazilian Bow-Makers' Association (ABA), the Secretariat for Agriculture, Supply, Aquaculture and Fisheries (SEAG), the Capixaba Institute of Research, Technical Assistance and Rural Extension Services (INCAPER), and the Espírito Santo Agro-Forestry Protection Institute (IDAF). Through this project, over 100,000 Brazil wood seedlings have already been planted in privately-owned areas belonging to participating growers, and Brazil wood forests have been established in Espírito Santo municipalities. Plantings in "green corridors" have also taken place in the State ("Project Ecological Corridors"). In the northern part of the State, in the region around the municipality of Aracruz, a 29-ha plantation of Brazil wood that has existed for some 28 years produces material for the Active Gene Bank, which houses different morphological types.

In Bahia, *Projeto Pau Brasil* (PPB-BA) reported that some 24,000 Brazil wood seedlings were planted in 2005, of which 14,851 were earmarked for commercial cultivation, 6,257 for conservation of the genetic base, and 2,879 to encourage planting of a civic-cultural nature.

In the State of Pernambuco, the National Brazil Wood Foundation (FUNBRASIL) has spent over 30 years promoting Brazil wood, distributing around 2,700,000 seedlings of the species. Data are lacking on plantations for commercial purposes in the State of Pernambuco, but it is known that the Pernambuco Sanitation Company (COMPESA) and other firms have an excellent nursery with seeds for future commercial planting.

8.5 Habitat conservation

There are 189 federal protected areas within the Mata Atlântica region, including 17 national parks, 15 biological reserves, 12 environmental protection areas, five ecological stations, three areas of relevant ecological interest, seven national forests, six harvesting reserves and 124 private natural heritage reserves (source: IBAMA, 2006).

Pernambuco wood occurs in various federal and State reserves. Two protected areas – the *Palo Brasil* Ecological Station in the State of Bahia, and the *Tapacuri* Ecological Reserve in Pernambuco – were partly established to protect local populations of *C. echinata*. The species also exists in the *Jacarepii* State Ecological Reserve in the State of Rio de Janeiro. Other reserves that contain *C. echinata* – the *Camaratuba* Reserve in the State of Paraíba, the *Morro Branco* Reserve in the State of Rio Grande do Norte, and the *Bocó de la Barra* and *Palo Brasil* Reserves in the State of Rio de Janeiro – are not on the official list of federal- and State-protected areas, and their status is not clear. This explains the belief that *C. echinata* is not being protected in some areas as it is supposed to be. Another point to bear in mind is that municipal reserves are not usually listed among the "officially" protected areas of Brazil, and some of these smaller local areas may very well be providing good protection for *C. echinata* populations.

Furthermore, there are at least 28 private reserves called Private Natural Heritage Reserves (*RPPN*) in the Mata Atlântica. A growing number of people with rural estates, livestock holdings and other individuals in Brazil set aside areas of lower agricultural value within their property, for the preservation of animals and plants, under the federal government *RPPN* plan established by Decree No. 98.914/90. The landowners guarantee protection of the animals and plants in these reserves in exchange for tax reductions. We can thus consider that some of these areas containing *C. echinata* are actually protected as *RPPN*, although the exact number is unknown. It should be noted that Brazil already has a programme to control and fight illegal harvest, and a draft law for protection of the Mata Atlântica biome is expected to be passed shortly.

8.6 Safeguards

Existing legislation must be enforced, and technical staff need capacity-building in timber identification.

9. Information on similar species

Caesalpinia echinata has no similar species.

10. Consultations

Since the species only occurs inside the borders of Brazil, there was no need for consultations with other countries. Nevertheless, in April of 2004, the IBAMA organized a workshop with the aim of discussing the need to list *Caesalpinia echinata* on the CITES Appendices. Twenty-four members representing seven national institutions of renowned expertise on the subject of Brazil wood participated in the workshop and concluded that it was very important to include the species in Appendix II.

11. Additional remarks

Tests have been performed with different timber species, including *Tabebuia* spp. (local common name: ipê), as alternatives to pernambuco wood for manufacturing bows, but none of them was accepted by professional musicians. *C. echinata* is highly valued for its exclusive properties. Therefore, only a few species were thoroughly tested. One reason for the popularity of *C. echinata* is the colour of its wood, but preferences based on aesthetic criteria should be considered of secondary importance. The IBAMA Laboratory of Forest Products is researching several species so that one may replace pernambuco wood on the musical instrument market in the near future. These species, with their local common names, are *Tabebuia* spp. (ipê), *Swartzia* spp. (braúna, gombeira and coração-de-negro), *Brosimum paraense* Huber (muirapiranga), *Caesalpinia ferrea* Mart. ex Tul. (pau-ferro), *Zollernia paraensis* Huber (muirapinima-preta), *Brosimum guianense* (Aubl. Huber) (pau-cobra), *Brosimum rubescens* Taub. (pau-rainha), and *Manilkara elata* (Allemao ex Miq.) Monach (maçaranduba).

12. References

- Bueno, E. & Lima, H.C.de. 2002. Epilogo: Raízes do Futuro. In: Bueno, E. Pau-Brasil, São Paulo, Axis Mundi Editora.
- Cardoso, M.A., Provan, J., Powell, W., Ferreira, P.C.G. & Oliveira, D.E. 1998. *Molecular Ecology* 7: 601-608.
- CPIBIOPI – Comissão Parlamentar de Inquérito Destinada a Investigar o Tráfico de Animais e Plantas Silvestres Brasileiros, a Exploração e Comércio Ilegais de Madeira e a Biopirataria no País – Relatório Final. 2006. Câmara dos Deputados, Brasília-DF.
<http://www2.camara.gov.br/comissoes/temporarias/cpi/encerradas.html/cpiopi/relatoriofinal.html>
- Cunha, M.W., Lima, H.C. 1992. Travels to the Land of Brazilwood. Agência Brasileira de Cultura/Una Cultura.
- Cunha, M.W., Lima, H.C. 1992. Viagem à Terra do Pau-Brasil. Agência Brasileira de Cultura, Rio de Janeiro.
- Cardoso, M.A. 1997. Estudo da Estrutura e Diversidade Genética em Populações Remanescentes de *Caesalpinia echinata* Lam., Utilizando Marcadores RAPD. Rio de Janeiro, Instituto de Biologia – Departamento de Genética, UFRJ. Tese (Doutorado). 99p.
- FFI (Fauna & Flora International). 1997. The International Trade and Utilization of Pau-Brasil (Pernambuco) for Bows. FFI, Cambridge.
- Fundação SOS Mata Atlântica, INPE. 2002. Atlas dos Remanescentes Florestais da Mata Atlântica, período: 1995-2000. Fundação SOS Mata Atlântica, Instituto Nacional de Pesquisas Espaciais.
- Heringer, H., Montenegro, M.M. (eds). 2000. Avaliação e Ações Prioritárias Para a Conservação da Biodiversidade da Mata Atlântica e Campos Sulinos. Conservation International do Brasil, Fundação SOS Mata Atlântica, Fundação Biodiversitas, Instituto de Pesquisas Ecológicas, SEMAD/IEF-MG. MMA/SBF, Brasília. 44p.
- Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA. 2006. On line. www.ibama.gov.br.

- IUCN. 1986. *Plants in Danger. What Do We Know?* Cambridge.
- Lewis, G., Lima H.de, Cardoso, M., Wellner, P., Martinelli, G., Richter, M., Varty, N., Jenkins, P. 1997. *Conservation and Management of Pau-Brasil (Caesalpinia echinata) – An Action Plan*, Fauna & Flora International, UK, Botanical Gardens of Rio de Janeiro, Brazil, and Margareth Mee Foundation, Brazil.
- Lima, H.C.de, Lewis, G.P. & Bueno, E. 2002. *Pau-Brasil: Uma Biografia*. In: Bueno, E. *Pau-Brasil*, São Paulo, Axis Mundi Editora.
- Lima, H.C.de. 2003. *Taxonomia e Distribuição Geográfica Atual de Caesalpinia echinata Lam.* Simpósio "Pau-Brasil: Ciência e Arte". São Paulo.
http://www.tobanicasp.org.br/pau-brasil_index.htm.
- Lima, H.C.de. 2004. *As Pesquisas Sobre Pau-Brasil (Caesalpinia echinata Lam.) no Instituto de Pesquisas Jardim Botânico do Rio de Janeiro: Situação Atual e Perspectivas. Oficina de Trabalho Sobre Conservação do Pau-Brasil*. IBAMA, Diretoria de Florestas.
- Lorenzi, H. 2002. *Árvores Brasileiras: manual de identificação e cultivo de plantas arbóreas do Brasil*, vol. 1, 4ª ed., Nova Odessa, SP: Instituto Plantarum.
- Oldfield, S., Lusty, C., MacKinven, A. 1998. *The World List of Threatened Trees*. World Conservation Press, Cambridge.
- Projeto Pau-Brasil – Relatório Final. *Pau-Brasil (Caesalpinia echinata Lam.) no Estado do Rio de Janeiro, Brasil*.
- O que é pau-brasil? <http://www.ipci-comurnat.org/por02.htm>.