

Early warning macroscopic guide

to timbers listed in CITES
- Convention on International Trade in Endangered
Species of Wild Flora and Fauna -



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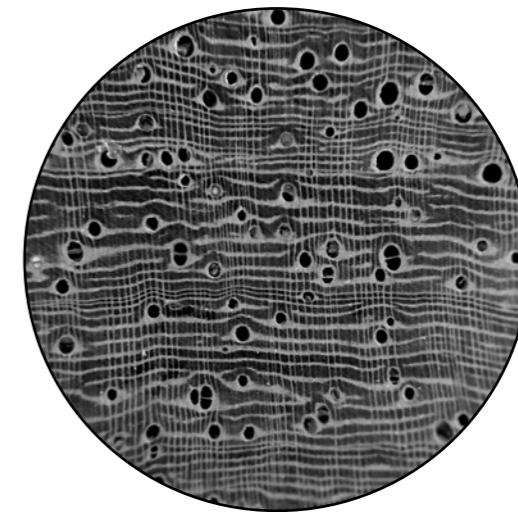


Royal
Botanic
Gardens

Kew

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Royal
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INTRODUCTION

Trade in illegally harvested timber is a lucrative business that generates more than 22,000 million euros a year, according to the United Nations Environment Programme. Around 15 to 30% of all timber currently traded comes from illegal logging. In some tropical regions such as the Amazon Basin, the Congo Basin and Southeast Asia, the illegal timber trade can be as much as 50 to 90% of the volume of wood produced.

The solution to combat these illegal logging figures is to prevent international trade in illegally harvested timber. The European Union has instigated actions to control the illegal market. In 2003, the European Union's Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan was passed, proposing a range of measures to tackle illegal logging and the associated trade. In 2005, it passed Regulation (EC) No 2173/2005 on the establishment of a FLEGT licensing scheme requiring timber and timber products imported from countries with which a Voluntary Partnership Agreement (VPA) has been signed to be accompanied by a FLEGT licence issued by the producing country. The regulation prohibits the trade of such products unless the shipment is covered by a FLEGT licence.

In 2010, Regulation (EU) No 995/2010 of the European Parliament and of the Council, of 20 October, was passed to govern products that have no FLEGT licence because there is no valid Voluntary Partnership Agreement (VPA) or which are placed on the internal market for the first time. This regulation lays down the obligations of operators who trade timber and timber products, and is also known as the European Timber Regulation, or EUTR.

Spanish Royal Decree 1088/2015 developed the EU Regulation by determining a) the competent authorities in Spain to enforce the regulation, and the distribution of functions among them; b) the procedure for validating FLEGT licences; c) the minimum requirements for controlling the due diligence system; d) the basic contents of the Operator's Statement of Responsibility to be made by operators trading timber and timber products; e) the content of the national action plan for verifying the legality of traded timber; and f) the creation of the state timber trade information system in Spain.

Since 1975, the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES Convention) has imposed restrictions and/or specific requirements on the trading of timber listed in Appendices I, II and III, which signatory countries must also comply with.

All of these actions, which have certainly been beneficial so far, will be inoperable without the development of appropriate tools to inspect imports at the points of entry of timber. Customs officials and law enforcement officers need to be equipped with wood identification tools that have not previously been available to them.

The illegal timber market is well aware of this situation and the difficulty of identifying wood macroscopically, and most timber imports have no trouble passing through checkpoints.

In December 2015 Spanish Royal Decree 1088/2015 was published, establishing the provisions to enforce the EU regulations in Spain. It obliged all operators trading in timber and timber-based products to submit a statement of responsibility to the competent body of the Regional Government within six months of the entry into force of the decree.

With a regulatory framework in place and authority delegated to the Autonomous Communities and the Ministry, suspected infringements detected by customs officers can be addressed in two ways: a) as illegal timber (from forests with no sustainability plan, protected areas, illegal logging, conflict timber, etc.) and b) as timber from species listed in the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES Convention). For the first group of infringements, the inspections conducted by the competent authorities are based on documentary evidence, whereas for the second group, the only method is expert appraisal by competent bodies to examine traded timber on and off site (in the laboratory).

Due to the importance of this issue, in October 2015, on the recommendation of the United Nations Office on Drugs and Crime, the Executive Secretary of IAWA (International Association of Wood Anatomists) was invited to Vienna to discuss how wood anatomists could use macroscopic and microscopic techniques to help other specialists such as chemists, dendrochronologists and DNA experts to combat the traffic of illegal timber and, in particular, CITES-listed species. The general consensus was that wood anatomy is a key tool in controlling illegal logging.

Before any of these measures, in 1999 the Spanish authorities commissioned the first document for the identification of CITES-listed timbers for use by customs officers and law enforcement officials, written by university lecturers M.A. Vales, M. Clemente-Muñoz and L. García Esteban: *Fichas de identificación de especies maderables. CITES. CD-ROM. Edición del Servicio de Publicaciones de la Universidad de Córdoba. España* (Identification sheets for timber species. CITES. CD-ROM. University of Córdoba Publications Service. Spain).

In 2002, the Government of Canada published the CITES Identification Guide - Tropical Woods (Miller and Wiedenhoeft, 2002).

In 2008, H.G. Richter, K. Gembruch and G. Koch published the database CITESwoodID: descriptions, illustrations, identification and information retrieval, available at <https://www.delta-intkey.com/citeswood/en/intro.htm>.

The three sources cited, plus InsideWood (<http://insidewood.lib.ncsu.edu>), were used as general references on CITES timbers in the preparation of this guide.

Aware of the current situation and as part of its commitment to tackling illegal timber harvesting and trading, the Ministry for the Ecological Transition and the Demographic Challenge of the Government of Spain, in the framework of the “Spanish action plan against illegal trafficking and international poaching of wildlife species” (TIFIES Plan) and as a CITES Authority, decided to take steps to equip the competent authorities with a tool that would enable them to detect potentially illegal entries of CITES-listed timbers. The tool developed is this early warning guide, which the Ministry for the Ecological Transition and the Demographic Challenge is making available to other countries for use by their competent national authorities, not only in timber-importing countries, but particularly in timber-exporting countries, in order to prevent illegal timber logging and trafficking at origin.

This guide is not intended to be used for on-site wood identification, but to give customs officials and law enforcement bodies who deal with the timber trade sufficient knowledge so that, after inspection, they can issue an early warning when they suspect timber is CITES-listed and send samples to the corresponding laboratory for off-site identification. Some genera have all their species listed in CITES, e.g. *Aquilaria*, *Dalbergia* and *Gonystylus*, facilitating early warning, whereas others have only one or a few species listed. In all cases identification must be carried out at a specialised laboratory.

Unlike other identification guides, this guide was prepared using an image capture system comprising a smartphone and two lenses attached to the phone camera. In addition to the 24x and 400x optical zoom, the smartphone digital zoom can be used, with the corresponding programme, to observe the features indicated in the guide with greater clarity. Basically, users of this guide need only these two items (a smartphone and attachable lenses), which means it is a very easy tool to use for inspections and verifications in the field.

Each data sheet shows the scientific and common names, the number of species in the genus, the geographical distribution of the natural habitat of the species, typical uses of the wood, a macroscopic description of the sapwood and heartwood colour, the hardness of the wood and a comment on its density. Information is also provided about the most important macroscopic features captured using 24x and 400x lenses that officials need to recognise for each wood, as well as non-anatomical features such as fluorescence and the froth test.

This guide is intended to be a document under constant revision and will be updated as new timbers are listed in the CITES Convention.

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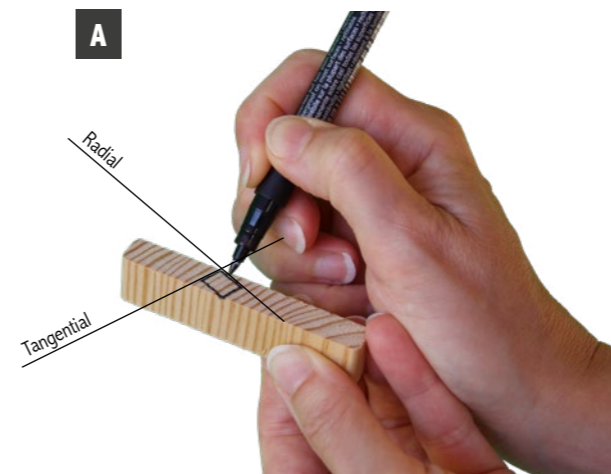
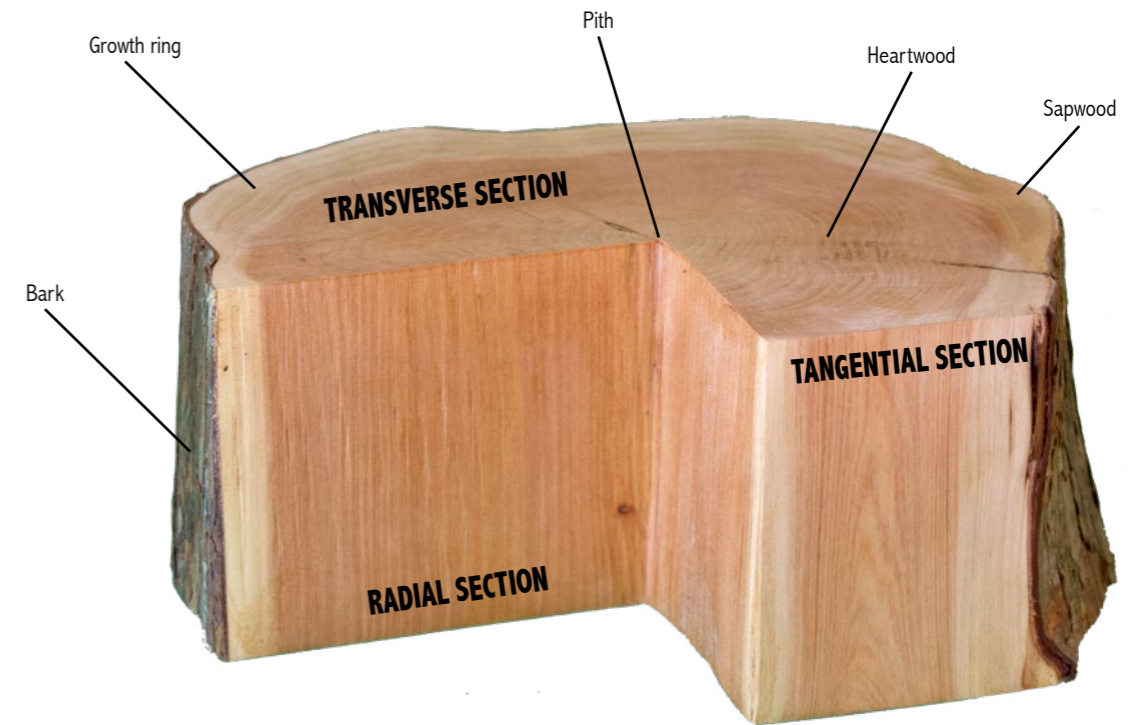
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PROCEDURE

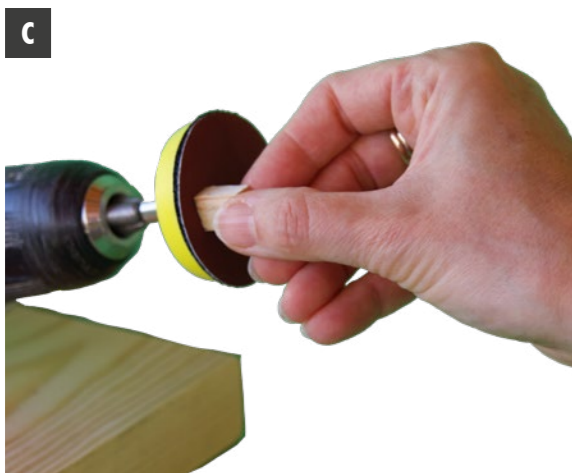
1 Obtaining the sample and sample orientation



On a piece obtained from the timber to be examined, mark a square measuring about 15x15 mm in the transverse section according to the direction of the main sections.



Obtain the 15x15 mm piece using a utility knife and a hammer.



To prepare the surfaces, either of the following methods may be used:
 1. sanding or 2. trimming with a utility knife.
 If sanding the wood, use a sanding sequence of 400, 800, 1200, 2000, 3000 grits, then submerge the sample in water with ultrasound for one minute to remove any sanding dust that has entered the wood elements. This method allows complete observation of the surfaces.

The surface for observation may also be prepared using a utility knife, but the field of observation is smaller and larger pieces are necessary for better handling and to avoid injury when trimming the wood.

2 Material for observation. Lenses

Use of this guide requires two lenses mounted on a smartphone: a 24x lens and a 400x microscopic lens, in the latter case by combining the magnification provided by the lens and the smartphone digital zoom.

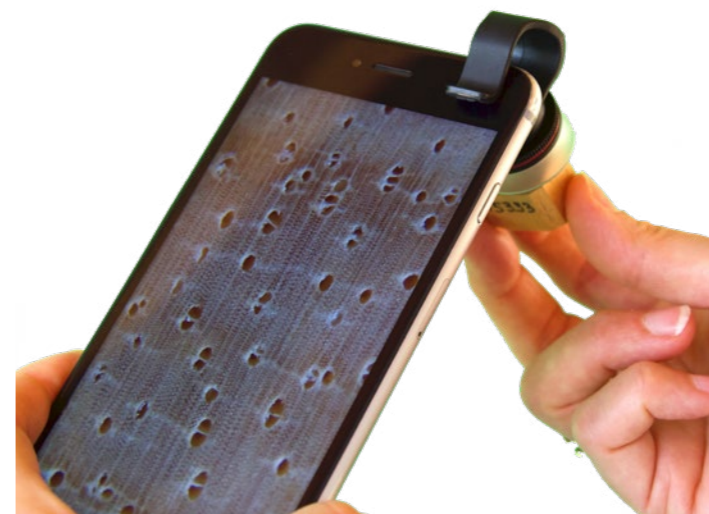
24x lens



400x lens

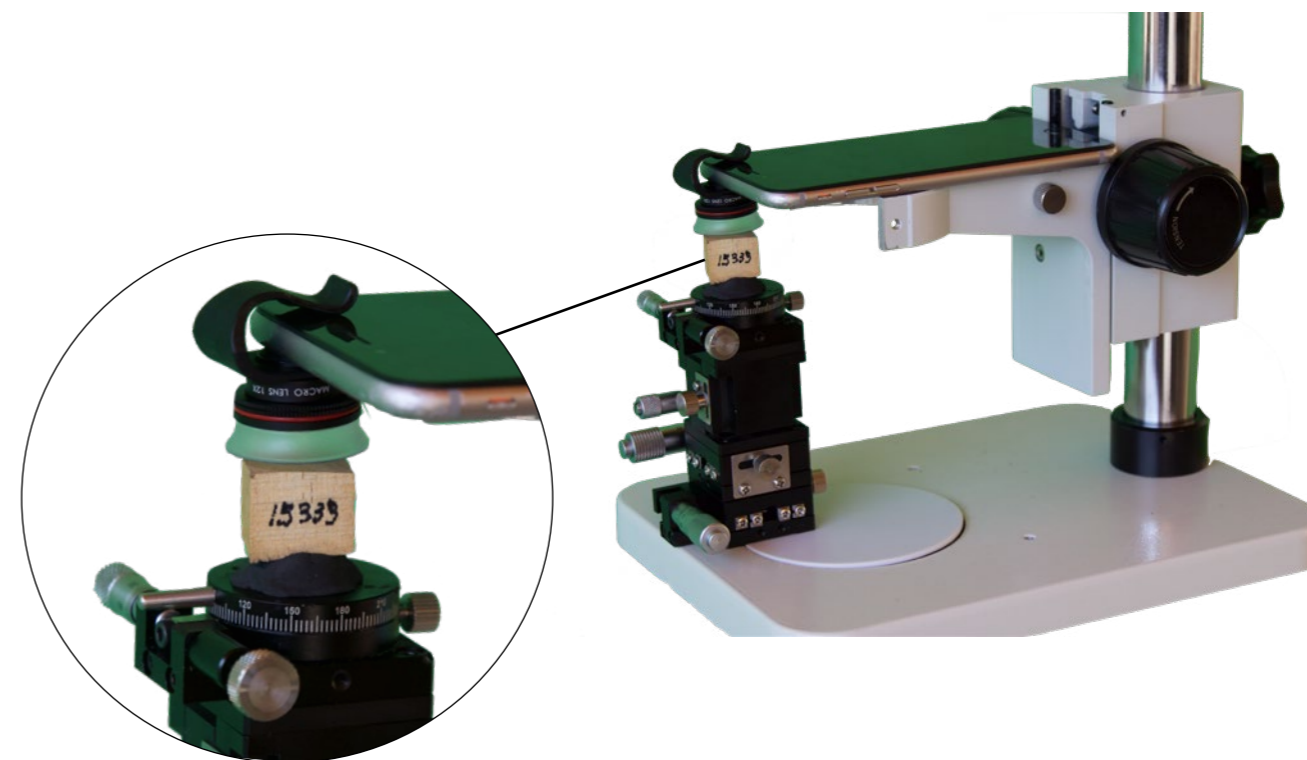


3 Performing an observation



After cleaning the surfaces, hold the lens up to the timber until the image is in focus. At this stage the corresponding photo can be taken.

When using the 400x lens, it is preferable to use a device to hold the phone in a horizontal position and attach the sample to a piece of plasticine to ensure the wood is as parallel as possible to the plane of the lens

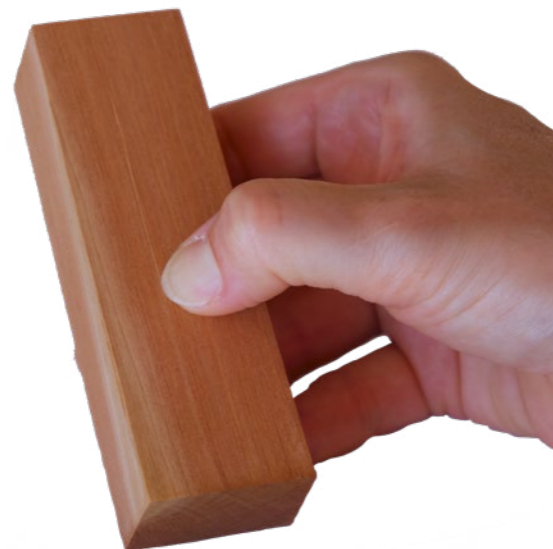


4

Non-anatomical features

Hardness

Wood is considered soft when it can be easily marked with a fingernail.



Fluorescence and froth test

Heartwood fluorescent: Trim the surface of the sample with a utility knife to reveal a fresh area of the wood. If the test is positive, exposure to ultraviolet light (365 nm) at a distance of about 10 cm produces fluorescence. Observation should be conducted in a darkened room.

Water and ethanol extracts: Water. Place thin heartwood shavings, not chips, in a vial. Cover the shavings with 20 mm water (pH 6.86). Shake vigorously for 15-20 seconds and leave to stand 1-2 minutes until the shavings and the water have settled. Apply ultraviolet light in a darkened room. If the test is positive, the fluorescent solution will be blue or sometimes greenish.

Ethanol. Same procedure using 95% ethanol.

Froth test: Following the same procedure for water extracts, shake for 15-20 seconds. If the wood contains saponins, tiny bubbles or froth will form, like the foam on a glass of beer. If the froth completely covers the surface after the vial has been left to stand for one minute, the test is positive. If the froth disappears or leaves a ring around the vial, the test is negative (IAWA Committee, 1989).

5

Observable features

SOFTWOODS

Features observable with 24x lens

- Verify it is a softwood by checking for the absence of vessels.
- Determine the presence or absence of axial and radial resin canals.
- Determine whether the growth ring boundaries are distinct and if the transition is abrupt.
- Determine the presence of axial parenchyma and its arrangement.
- Measure the ray height in the radial section to determine whether it is greater or less than 1 mm.

Features observable with 400x lens

- Determine the presence of helical thickenings in longitudinal tracheids in the tangential or radial sections.
- Determine the presence of alternate polygonal tracheid pits in the radial section.
- Determine whether cross-field pits are window-like.

In softwoods the presence of resin canals is restricted to the family Pinaceae. In the genera *Cathaya*, *Larix*, *Picea* and *Pseudotsuga* there are both axial and radial resin canals, with thick-walled epithelial cells. In *Pinus* resin canals are axial and radial, with thin-walled epithelial cells, while *Keteleeria* and *Nothotsuga* have only axial resin canals with thick-walled epithelial cells. No softwoods have exclusively radial resin canals. Traumatic resin canals occur in all the genera mentioned above, normally in tangential rows. In *Keteleeria* and *Nothotsuga* only axial traumatic resin canals occur, in tangential or diffuse arrangement.

The other genera in Pinaceae can also form traumatic axial resin canals (*Abies*, *Cedrus*, *Pseudolarix* and *Tsuga*), while in *Cedrus* traumatic resin canals can be axial and radial (Esteban and de Palacios, 2009).

In genera other than Pinaceae, traumatic resin canals have been reported in *Sequoia sempervirens* (Bailey and Faull 1934), *Sequoiadendron* (Jeffrey, 1903), *Microbiota* (Benkova and Schweingruber, 2004) and *Tetraclinis* (Esteban et al., 2015).

HARDWOODS

Features observable with 24x lens

- Verify it is a hardwood by checking for the presence of vessels.
- Measure the diameter of the vessels.
- Determine whether the growth ring boundaries are distinct and if the transition is abrupt.
- Determine the axial parenchyma types.
- Determine the presence of deposits in vessels.
- Determine the presence of tyloses.
- Determine the presence of storied structure.
- Measure the ray height in the tangential section to determine whether it is greater or less than 1 mm.

Features observable with 400x lens

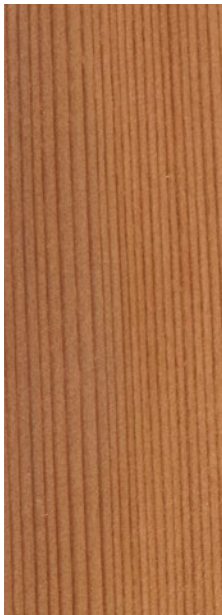
- Measure the diameter of the vessels.
- Determine the presence of deposits in vessels.
- Determine the presence of tyloses.
- Determine the presence of storied structure.
- Determine the presence of scalariform perforation plates.
- Determine the presence of scalariform intervessel pits.
- Determine whether rays are homocellular or heterocellular.
- Measure the ray height in the tangential section to determine whether it is greater or less than 1 mm.

Softwoods

ALERCE	<i>Fitzroya cupressoides</i> (Molina) I.M.Johnston
ASIAN YEW	<i>Taxus chinensis</i> (Pilg.) Rehder <i>Taxus cuspidata</i> Siebold & Zucc. <i>Taxus fuana</i> Nan Li & R.R.Mill <i>Taxus sumatrana</i> (Miq.) de Laub. <i>Taxus wallichiana</i> Zucc.
GUAITECAS CYPRESS	<i>Pilgerodendron uviferum</i> (D.Don) Florin
GUATEMALAN FIR	<i>Abies guatemalensis</i> Rehder
KOREAN PINE	<i>Pinus koraiensis</i> Sieb. & Zucc.
MONKEY PUZZLE	<i>Araucaria araucana</i> (Mol.) K.Koch
PODOCARP	<i>Podocarpus neriifolius</i> D.Don <i>Podocarpus parlatorei</i> Pilg.

	Date of listing	Current listing
- <i>Fitzroya cupressoides</i> (Molina) I.M.Johnston	01/07/1975 (I)	22/10/1987 (I) (All populations)
- <i>Taxus chinensis</i> (Pilg.) Rehder	12/01/2005 (II)	26/11/2019 (II)
- <i>Taxus cuspidata</i> Siebold & Zucc.		
- <i>Taxus fuana</i> Nan Li & R.R.Mill	12/01/2005 (II)	13/09/2007 (II)
- <i>Taxus sumatrana</i> (Miq.) de Laub.		
- <i>Taxus wallichiana</i> Zucc.	16/02/1995 (II)	13/09/2007 (II)
- <i>Pilgerodendron uviferum</i> (D.Don) Florin	01/07/1975 (I)	01/07/1975 (I)
- <i>Abies guatemalensis</i> Rehder	01/07/1975 (I)	01/07/1975 (I)
- <i>Pinus koraiensis</i> Sieb. & Zucc.	14/10/2010 (III)	14/10/2010 (III)
- <i>Araucaria araucana</i> (Mol.) K.Koch	01/07/1975 (II)	13/02/2003 (I) (All populations)
- <i>Podocarpus neriifolius</i> D.Don	16/11/1975 (III)	23/06/2010 (III)
- <i>Podocarpus parlatorei</i> Pilg.	01/07/1975 (I)	01/07/1975 (I)





CITES. Appendix I

Alerce

Fitzroya cupressoides (Molina) I.M. Johnston
Cupressaceae

Alerce de Chile, Alerce Chileno, alerce de la Patagonia, Alerzholz, Chilean false larch, ciprés de la Patagonia, fitzroy cypress, lahuán, lahuén, Patagonian cypress, Patagonian fitzroya, pioche, quíote, zongalica.



Distribution

Fitzroya Lindl. comprises only one species, *F. cupressoides*. Tree up to 50 m in height and 3,600 years of age. Conifer endemic to temperate forests of Chile and in smaller numbers to adjacent areas in Argentina. In Chile it occurs exclusively in Region 10 in the Coastal Range, normally below 1000 m, in the Intermediate Depression below 200 m, and in the Andes at around 1000 m (Donoso, 1993; Hechenleitner et al., 2005).

Features

Difficult to distinguish from other species such as *Sequoia sempervirens* y *Thuja plicata* by colour and macroscopic structure. The parenchyma in these two species is normally sparser than in *Fitzroya* and confined to the growth ring boundaries. A 24x lens allows differentiation of tangentially zonate axial parenchyma, but this feature is also visible in other genera, such as *Juniperus* and *Tetraclinis*. Sapwood yellowish and heartwood reddish. Growth ring boundaries distinct; rings very numerous, producing characteristic streaks. Transition abrupt. Wood soft and light weight. Indistinct odour.

Uses

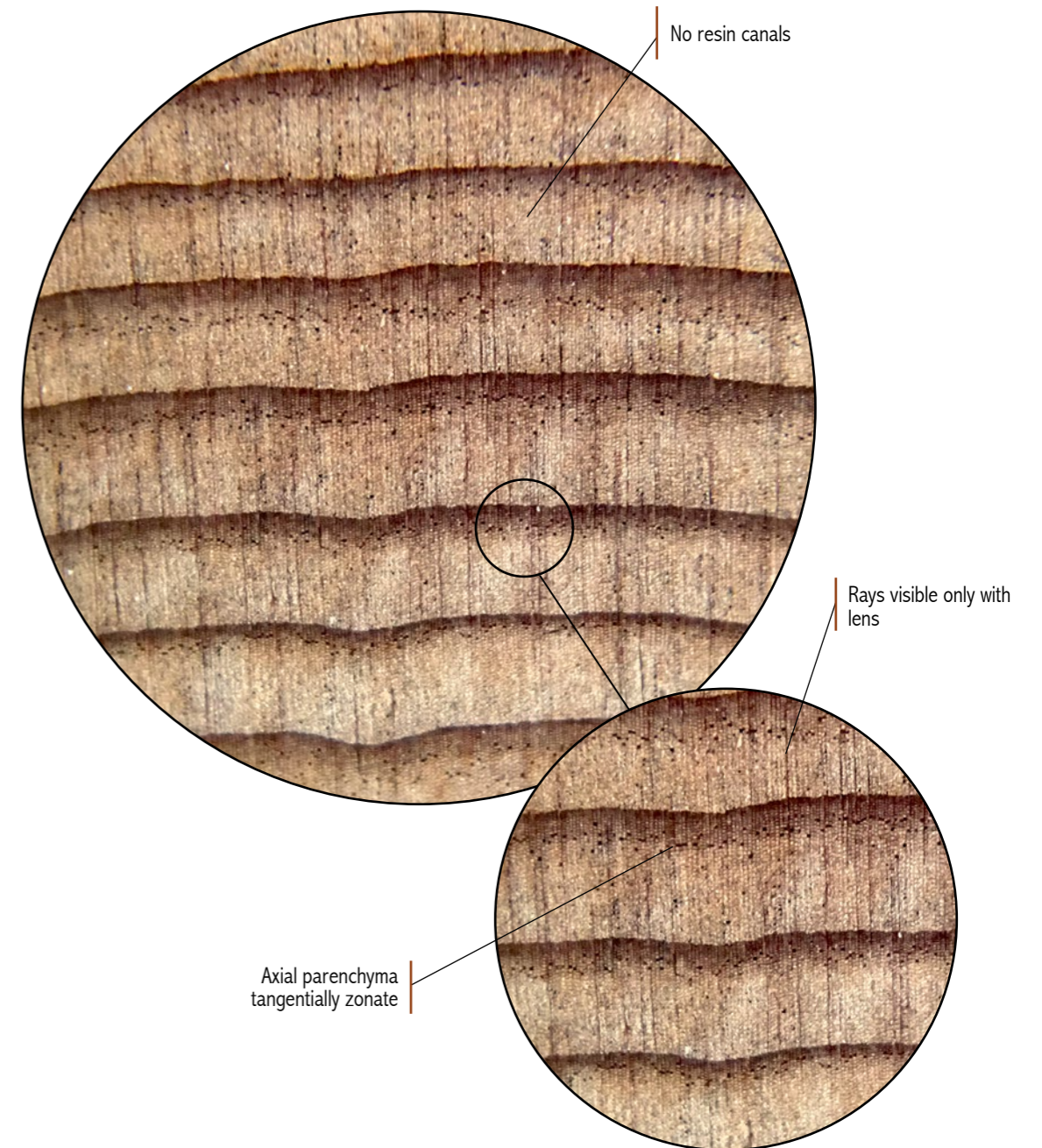
Wood used for centuries for its magnificent characteristics, particularly resistance to rot. It has been used for shipbuilding, masts, construction, to cover building façades and roofs with shingles, in carpentry, cabinetmaking, musical instruments, and to manufacture ornamental items and boxes.

Macroscopic description

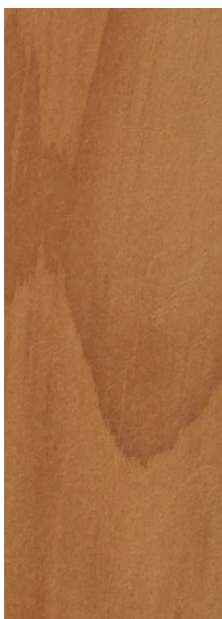
- Vessels.** Absent.
- Axial resin canals.** Absent.
- Axial parenchyma.** Tangentially zonate.
- Rays.** Visible only with lens. Ray height < 1 mm.
- Other.** Heartwood not fluorescent.



TRANSVERSE SECTION



Fitzroya cupressoides (Molina) I.M. Johnston
Cupressaceae



CITES. Appendix II

Asian yew

Taxus chinensis (Pilg.) Rehder, *T. cuspidata* Siebold & Zucc.,
T. fuana Nan Li & R.R.Mill, *T. sumatrana* (Miq.) de Laub., *T. wallichiana* Zucc.
 Taxaceae

***T. chinensis*:** Chinese yew, Chinesische Eibe, hong dou shan, if de Chine, thông do bắc. ***T. cuspidata*:** Araragi, chu mok, ichi-i, Japanese yew, Japanische Eibe, raramani, spreading yew, tejo japonés. ***T. fuana*:** Laudo, lauth, lautho, luinth, luith, mi ye hong dou shan, postil miye hongdoushan, postil, sang ga xing, Thuner, west Himalayan yew. ***T. sumatrana*:** Chinese yew, east Himalayan yew, kaju tadjii, Tampinur batu, yun nan hong dou shan, Taiwan yew. ***T. wallichiana*:** Amugauen, Asian yew, barme salle, basmi, birmi chogam, birmie, brahmi, burmie, cheongbu, deodar, dhengra salla, dhum, dingsableh, gallu, Himalayan yew, iichujhau, kyauk-tinye, manduparni, mountain yew, postil, rakhai, talis patra, tampinur batu, tassi d'Asia, tcheiraygulab, tcheiraysulah, tejo de Asia, tejo del Himalaya, thaner, thanh tùng, thông do lá dài, thông do Nam, Thuner, thuno, tingschi, tunki, xu mi hong dou shan, Yunnan yew, zimupbirmi.



Distribution

Taxus L. comprises 12 species distributed across the northern hemisphere and on both sides of the equator in Malaysia (Farjon and Filer, 2013). Five are listed in CITES. *T. chinensis*, in China and Vietnam; *T. cuspidata*, from the Russian Far East to northern China and Japan; *T. fuana*, in China, northern India, Kashmir, Nepal and Pakistan; *T. sumatrana*, in Sumatra, the Philippines and Sulawesi; *T. wallichiana*, from the Central Himalaya to China, southeast Vietnam, Sumatra, the Philippines and Sulawesi.

Features

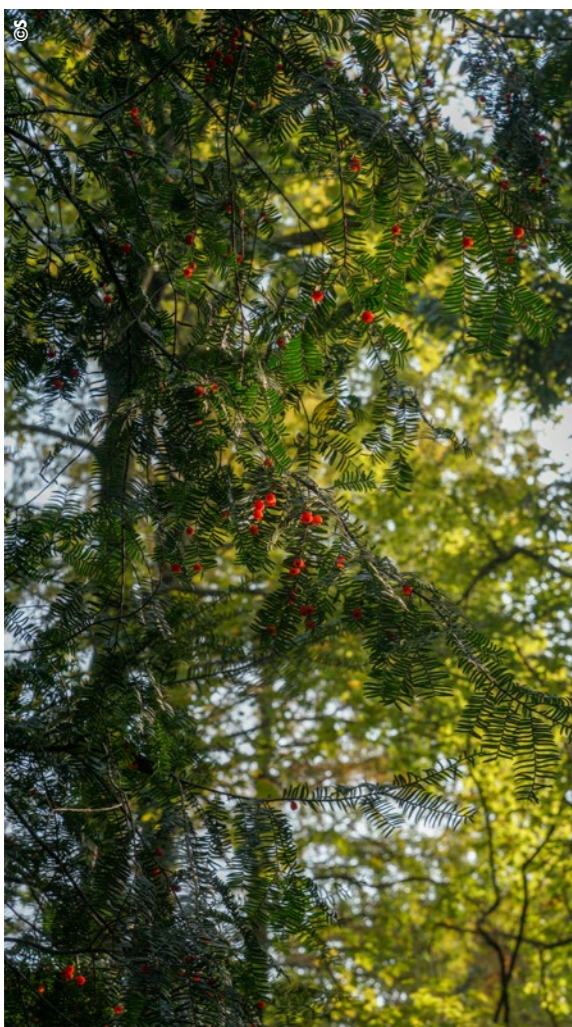
All *Taxus* woods are very similar, with helical thickenings in axial tracheids that are easily observed using a 400x lens. Similar thickenings occur in *Amentotaxus*, *Cephalotaxus*, *Pseudotaxus* and *Torreya*, all of which have no resin canals. Helical thickenings also occur in *Cathaya*, and some taxa of *Larix*, *Picea* and *Pseudotsuga*, but these have axial and radial resin canals. Sapwood and heartwood different in colour. Heartwood chocolate brown. Growth ring boundaries distinct. Transition typically abrupt. Wood moderately hard and medium weight. Indistinct odour.

Uses

T. cuspidata. In Japan it was previously valued for use as piles and foundations, cabinetmaking, finish carpentry, wood carving, water tanks, buckets, bath tubs, trays, chopsticks, clogs and bows. *T. fuana*: Ploughs, hoe handles, knife handles and cups. Highly valued for structural elements (columns, beams, lintels and window and door frames), particularly for use in temples and monasteries and for suspension bridge boards. It makes good firewood and is also burnt as incense. *T. wallichiana*. Used in construction of bedsteads, posts and bows (Earle, 2019).

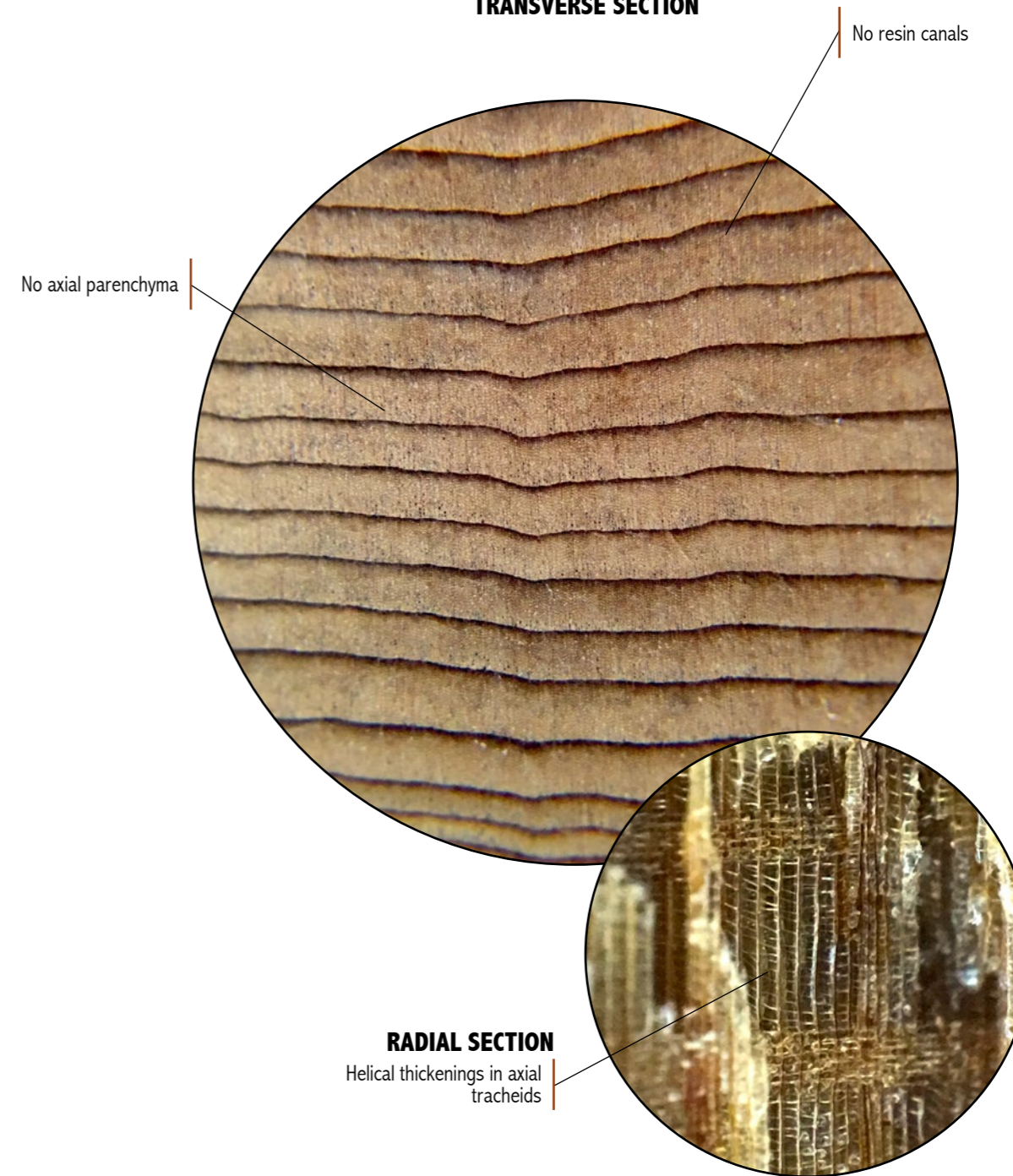
Macroscopic description

- Vessels.** Absent.
- Axial tracheids.** With helical thickenings.
- Axial resin canals.** Absent.
- Axial parenchyma.** Absent.
- Rays.** Visible only with lens. Ray height < 1 mm.
- Other.** Heartwood not fluorescent.



Taxus chinensis

TRANSVERSE SECTION

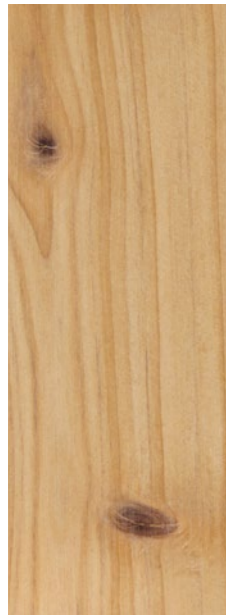


RADIAL SECTION

Helical thickenings in axial tracheids

Taxus chinensis (Pilg.) Rehder, *T. cuspidata* Siebold & Zucc.,
T. fuana Nan Li & R.R.Mill, *T. sumatrana* (Miq.) de Laub., *T. wallichiana* Zucc.

Taxaceae



CITES. Appendix I

Guaitecas cypress

Pilgerodendron uviferum (D.Don) Florin
Cupressaceae

Cèdre du Chile, cedro, Chilean cedar, Chilensk tall, ciprés chileno, ciprés de Chile, ciprés de cordillera, ciprés de las Islas Len, Ciprés de las Guaitecas, cipresso del Cile, cyprès du Chili, lahuan, libocedri dell'america meridion, Patagonian fitzroya, Patagonian pilgerodendron, ten.



Distribution

Pilgerodendron Florin is a monospecific genus, comprising the world's southernmost conifer. Slow-growing tree normally 15 to 18 m in height and 30 to 50 cm in diameter. Conifer endemic to the temperate forests of Chile and Argentina. In Chile it occurs in the Coastal Range and the Andes, and in Argentina it occurs in the west, in the provinces of Chubut, Neuquén, Rio Negro and Santa Cruz on the eastern side of the Andes.

Features

Wood anatomically very similar to most species of Cupressaceae and Podocarpaceae. A 24x lens will differentiate diffuse and tangentially zonate axial parenchyma. Sapwood and heartwood different in colour; sapwood slightly lighter, yellowish-brown. Growth ring boundaries distinct. Transition abrupt. Wood soft and light weight. Aromatic.

Uses

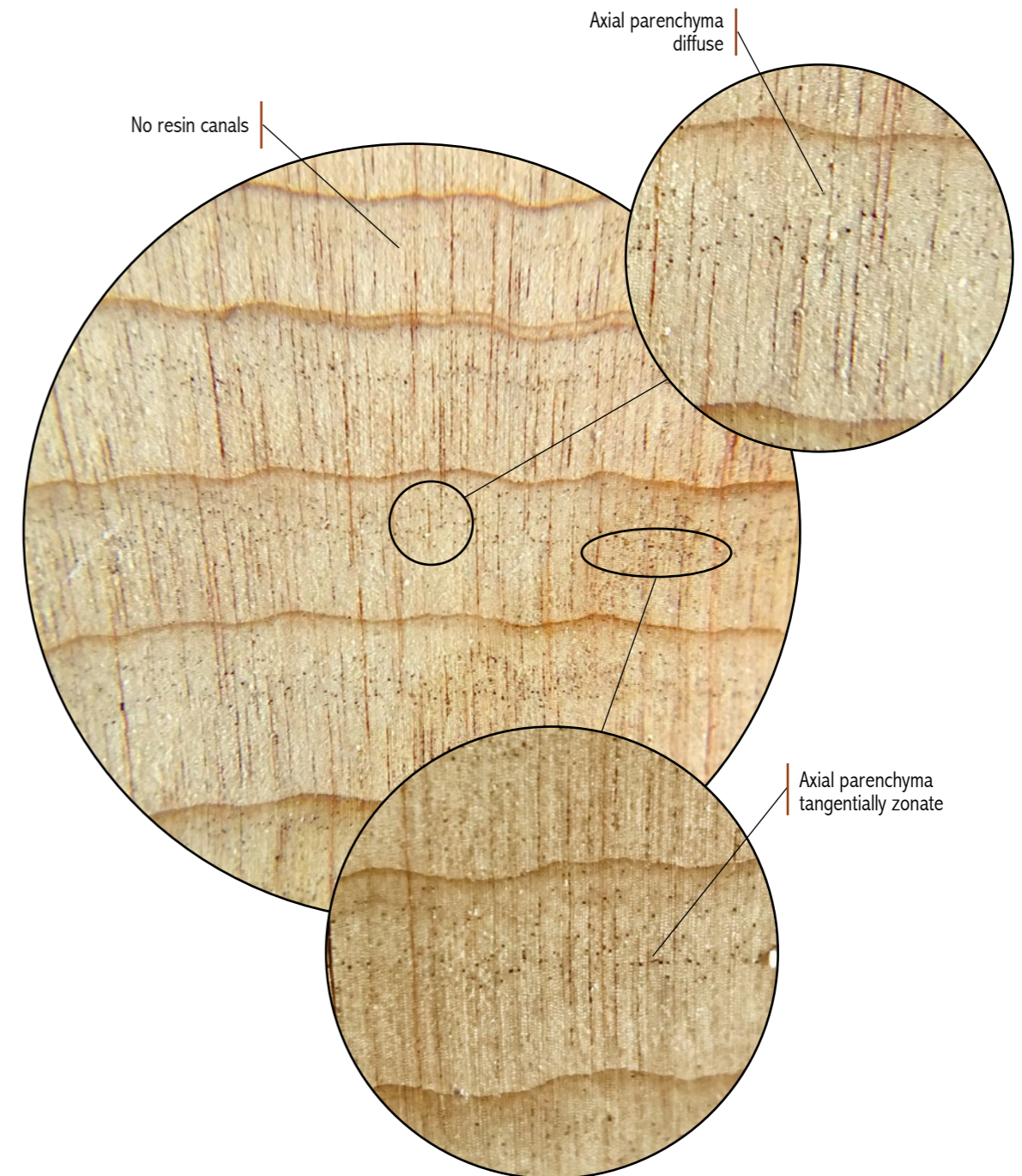
Wood used for construction, roof shingles, carpentry (doors and floors), bridges, posts, fencing, small boats, furniture and carvings.

Macroscopic description

- Vessels.** Absent.
- Axial resin canals.** Absent.
- Parénquima axial.** Diffuse and tangentially zonate.
- Radios.** Visible only with lens. Ray height < 1 mm.
- Otros.** Heartwood not fluorescent.



TRANSVERSE SECTION



Pilgerodendron uviferum (D.Don) Florin
Cupressaceae



CITES. Appendix I

Guatemalan fir

Abies guatemalensis Rehder
Pinaceae

Abeto, abeto de Guatemala, abeto guatemalteco, abeto mexicano, guayami, hallarin, Mexican fir, oyamel de Guatemala, oyamel oco petla, pacachaque, parchac, pashaque, pashaque fir, pinabete, plumajatzin, plumajillo de montaña, romerillo, sapin du Guatemala.



Distribution

The genus *Abies* Mill. comprises 48 species and 24 varieties and has the second highest number of species in Pinaceae after *Pinus* (Farjon, 2001).

A. guatemalensis is a conifer endemic to mountain forests of Central America (El Salvador, Guatemala, Honduras and Mexico).

Features

The wood of *Abies* species is so similar that is only possible to establish differences between certain groups of species through the biometry of some of their elements, such as ray height and other specific qualitative features (Esteban et al., 2009). Only *A. guatemalensis* listed in CITES, but it cannot be differentiated from the other *Abies*. Softwood and heartwood similar in colour. Growth ring boundaries distinct. Transition abrupt. Wood soft and light weight. Indistinct odour.

Uses

Wood historically used in construction and in the manufacture of tools and roof shingles. Young trees are felled for use as Christmas trees. In Guatemala and El Salvador there are commercial plantations of this species, mostly to supply domestic markets (Groves and Rutherford, 2015).

Macroscopic description

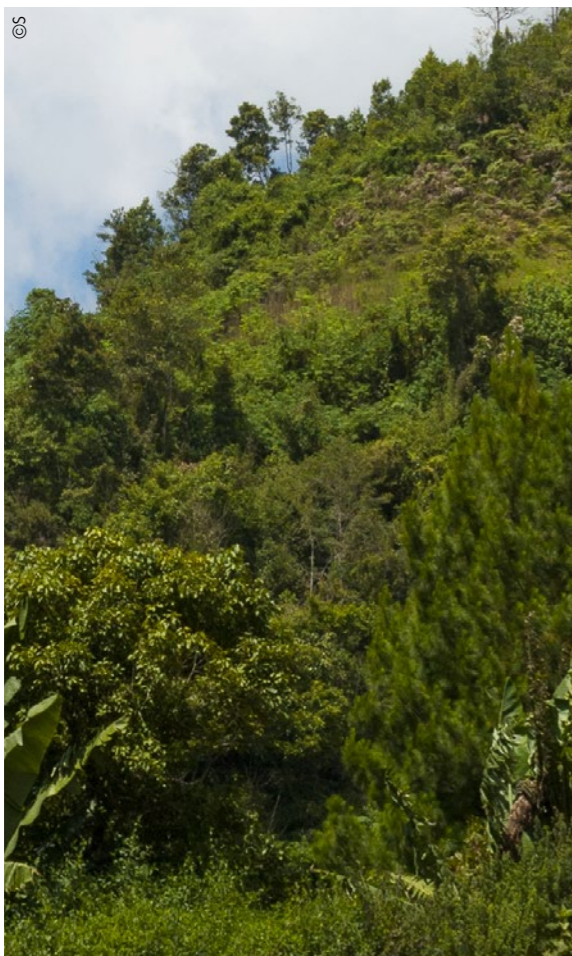
Vessels. Absent.

Axial resin canals. Absent, although traumatic resin canals may be present, grouped parallel to the growth ring boundary.

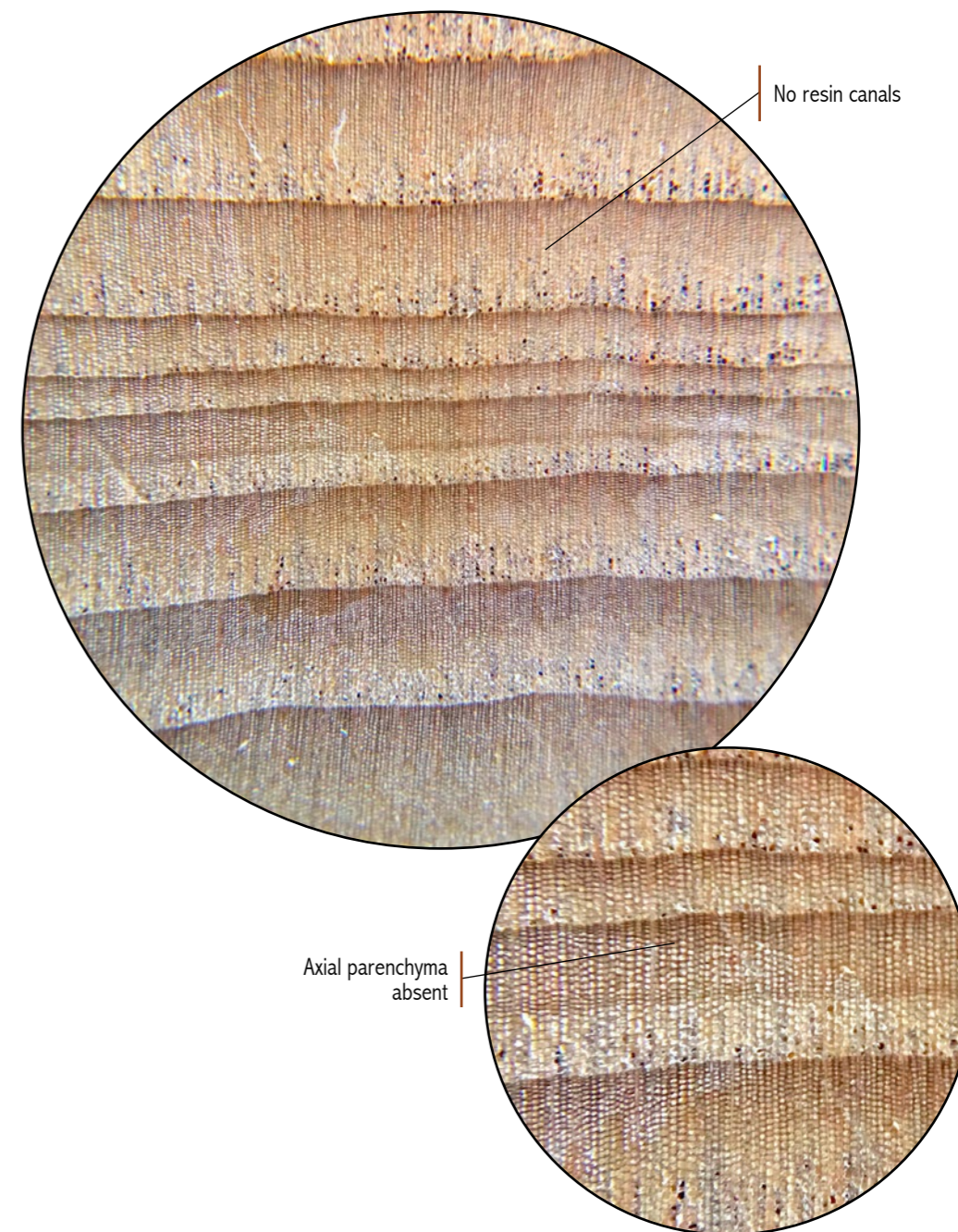
Axial parenchyma. Absent. The black dots in the photograph are not parenchyma cells.

Rays. Visible only with lens.

Other. Heartwood not fluorescent.



TRANSVERSE SECTION



Abies guatemalensis Rehder
Pinaceae

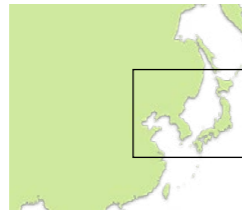


CITES. Appendix III

Korean pine

Pinus koraiensis Sieb. & Zucc.
Pinaceae

Chinese pinenut, chosen matsu, chosen-goyo, chosen-matsu, hong song, jat-namu, kedr, Korean cedar, Korean white pine, pin de Corée, pino de Corea, silver ray.



Distribution

Pinus L. is the largest genus of conifers (117 species) and also the most widely distributed of all the genera of Pinaceae globally (Farjon and Filer, 2013). It has been widely used for its wood, both from natural forests and plantations. *Pinus koraiensis* is a large-stemmed pine that can grow up to 50 m in height. Conifer from east Asia in regions around the Sea of Japan, in forests of deciduous hardwoods and mixed coniferous forests: Korea, Japan and the basin of the Ussuri River, in China and Russia. In China it occurs in Heilongjiang, Jilin and eastern Liaoning, from 500 to 1300 m, and in Russia it occurs in Primorye, from 200 to 600 m. In the Korean Peninsula it grows in North Korea and in the central mountains in South Korea. In Japan it is common in the central mountains of Honshu and as far as Hokkaido, growing at altitudes up to 2500 m (Farjon and Filer, 2013).

Features

Only genus in Pinaceae with axial and radial resin canals with thin-walled epithelial cells. Cannot be differentiated with a lens from other pines in the section *Strobus* (window-like cross-field pits and smooth ray tracheids) (e.g., *P. cembra*, *P. lambertiana*, *P. monticola*, *P. strobus*, etc.). Sapwood yellowish. Heartwood brown or even reddish. Growth ring boundaries distinct. Transition gradual. Wood soft and light weight. Resinous odour.

Uses

Construction of bridges, boats, posts, railway sleepers, interior carpentry (doors and floors), veneer, plywood and paper pulp. Also used for carvings and furniture making.

Macroscopic description

Vessels. Absent.

Axial resin canals. Axial and radial with thin-walled epithelial cells.

Axial parenchyma. Absent.

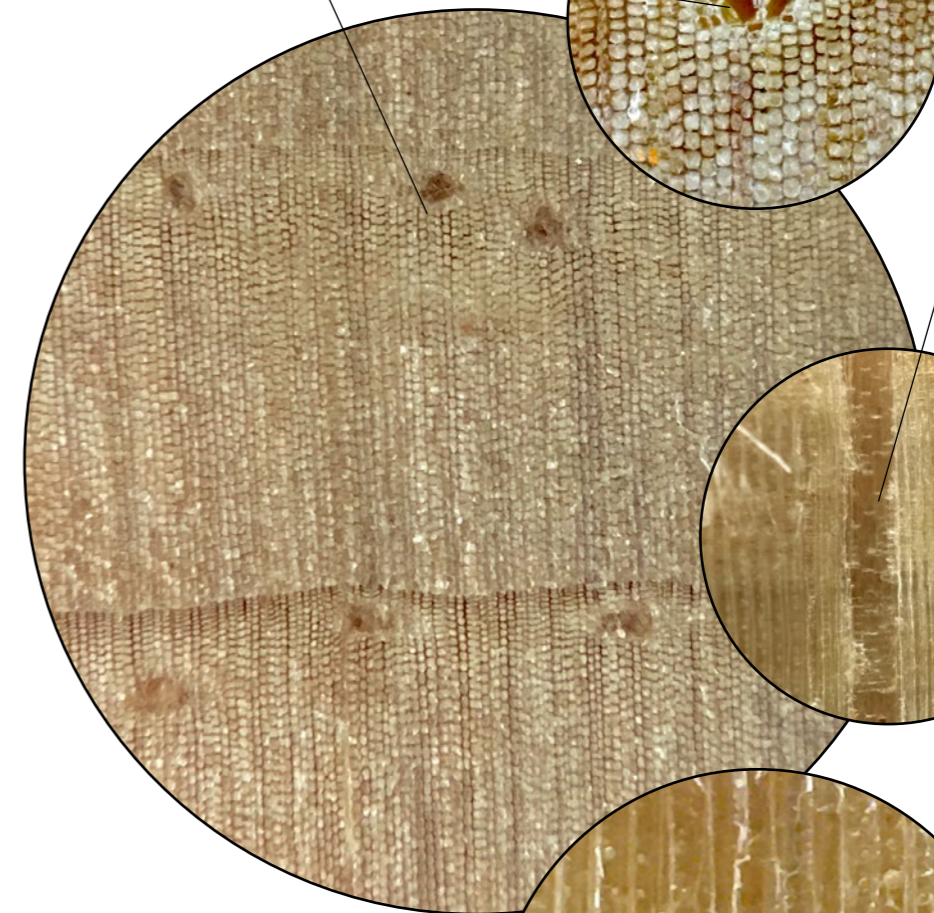
Rays. Visible only with lens. Ray height < 1 mm. Cross-field pits window-like.

Other. Heartwood not fluorescent.



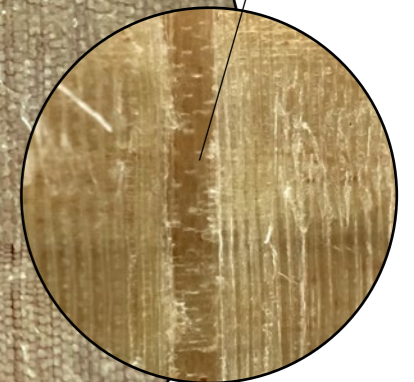
TRANSVERSE SECTION

Axial resin canal



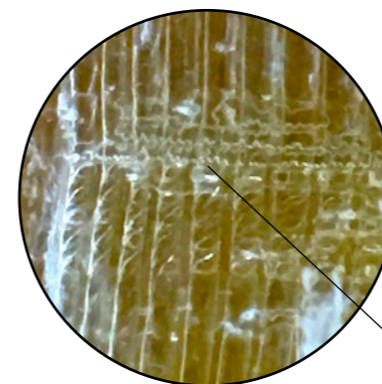
RADIAL SECTION

Axial resin canal



RADIAL SECTION

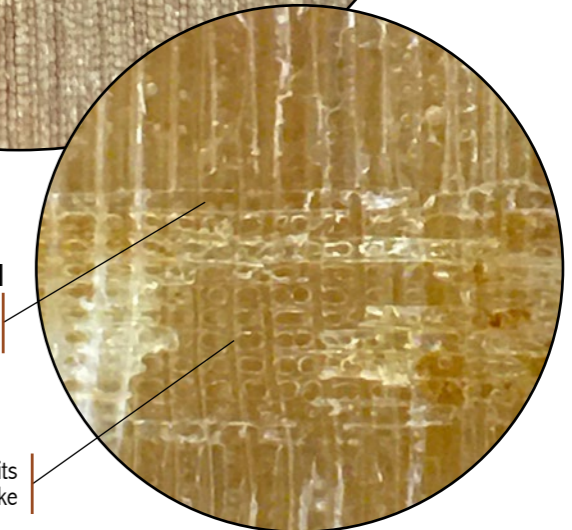
Pinus sylvestris L.



RADIAL SECTION

Ray tracheid smooth

Cross-field pits window-like



Ray tracheid dentate

Pinus koraiensis Sieb. & Zucc.

Pinaceae



CITES. Appendix I

Monkey puzzle

Araucaria araucana (Mol.) K.Koch
Araucariaceae

Andentanne, andesi délfenyo, apeboom, araucaria, araucaria de Neuquén, araucaria du Chili, chihuén, Chile pine, Chilean pine, Chilenische Araukarie, Chilensk tall, Chile-Tanne, Chili pine, Chile pine, Chile tall, Csilei araukária, kandelaaar spar, monkeypuzzle tree, Parana pine, pehuén, pehuén pino araucano, pilon, pin du Chili, pino, pino araucaria, pino chileno, pino de brazos, pino de Chile, pino de Neuquén, pino de Paraná, pino hachado, pino patagónico, pino pinon, pino piñonero, pino solo, piñón, piñonero, sapin du Chili.



Distribution

Araucaria Juss. comprises 20 species, two of which occur in South America (*A. araucana* and *A. angustifolia*) (Farjon and Filer, 2013). The genus is distributed throughout Australasia (including New Guinea) and South America. Only *A. araucana* is listed in CITES.

Tree growing up to 50 m, although some references report specimens of 80 m. Conifer endemic to the sub-Antarctic forests of Chile and Argentina. In Chile it grows in the Andes between Regions 8 and 10, from 900 to 1700 m. In Argentina it occurs in Ruca Choroy (Neuquén) and the neighbouring area of Pulmarí (Donoso, 1993; Hechenleitner et al., 2005).

Features

Wood similar to the other species of the genus *Araucaria* and *Agathis* spp. and *Wollemia*. Sapwood and heartwood similar in colour (yellowish brown). Growth ring boundaries indistinct. Transition gradual. Wood soft and light weight. Indistinct odour.

Uses

Because of its height and straightness, this wood has many uses: for heavy construction in bridges, beams in buildings, piers, pit props, and even for ship masts.

It was also previously used for interior carpentry (wooden doors and floors), exterior carpentry (doors and windows), furniture, pallets, veneer, plywood and paper pulp.

Macroscopic description

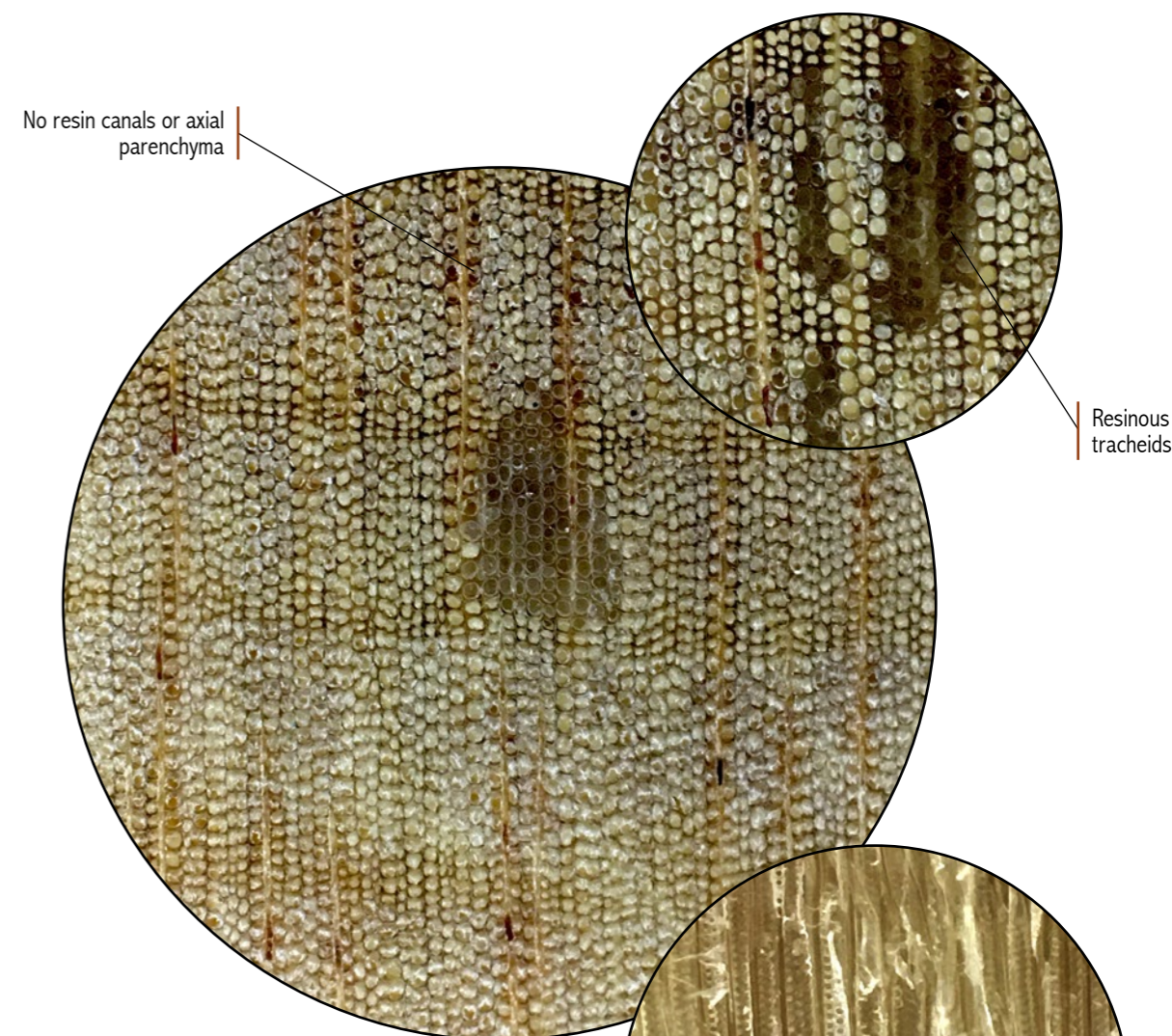
- Vessels.** Absent.
- Axial tracheids.** Alternate polygonal tracheid pits.
- Axial resin canals.** Absent.
- Axial parenchyma.** Absent.
- Rays.** Visible only with lens. Ray height < 1 mm.
- Other.** Heartwood not fluorescent.

Bark of *Araucaria araucana*



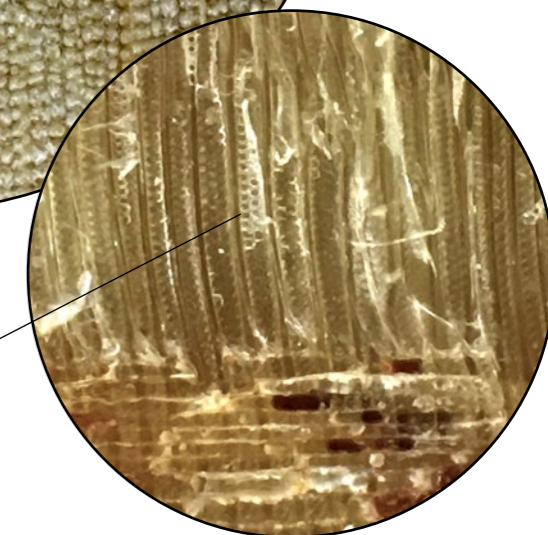
© Luis García Esteban/Paloma de Palacios

TRANSVERSE SECTION



RADIAL SECTION

Alternate polygonal tracheid pits



Araucaria araucana (Mol.) K.Koch
Araucariaceae



Podocarp

Podocarpus neriifolius D. Don
Podocarpus parlatorei Pilg.
 Podocarpaceae

***P. neriifolius*:** Amanu, amunu, asibolo, banuas, bau, beberas, bingkong, black pine, brown pine, bukiti, cachar, ciprés, cipresillo, ciprisillo loreto, dakua, dilang, dingsableh, dionai, djati, gagali, gunsí, igem, jamuju, jati, jati bukit, jiniari, kaya china, kayu cin, kayu tadji, kuasi, lampias, landin, lant, lempega, lohansung, low mountain podocarp, malaadelfa, malaalmaciga, manio, maniu, matai, melu, melur, merak, minanglas, mintrada, miro, mse, musenene, mushunga, naru dotan, nimcal, oleander podoberry, pasnig, payarimei, penedjuak, pine, pinho bravo, pino castaneto, pino chaquiro, pino del cerro, po, podo, podo bukit, podo de Asia, podo lant, podoc, prince-of-woods, putri, repayan, sampinur, sangching, seluang, sentada, sirigdig, sitobu hotang, slusalu, tadji, thitmin, thitmin-po, thong tre, welimada, wuluan, yellow wood.
***P. parlatorei*:** Argentijns podo, black pine, Bolivian podocarp, brown pine, monteromero, parlatore, parlatore podoberry, parlatore's podocarp, pinho bravo, pino blanco, pino castañeto, pino chaquiro, pino del cerro, pino del monte, pino montano, pino parlatorei, podocarpe d'Argentine, podocarp, podocarpo, white pine, yellow wood.



Distribution

Podocarpus L'Hér. ex Pers. is the second largest conifer genus, with 115 species. Two species are listed in CITES: *P. neriifolius*, a tree that grows up to 45 m in height and 1 m in diameter (de Laudenfels, 1988) and is the most widely distributed of the genus, occurring from northeast India and southern China to Fiji (CITES III); and *P. parlatorei*, a shrub or tree that grows up to 20 m in height (Farjon, 2010), with an almost continuous distribution over 1200 km on the eastern side of the Andes from central Bolivia to northern Argentina (CITES I) (Farjon and Filer, 2013).

Features

Macroscopically the wood is very similar to the other species of *Podocarpus* and to the genera included in Podocarpaceae (*Acmopyle*, *Afrocarpus*, *Dacrycarpus*, *Dacrydium*, *Falcatifolium*, *Halocarpus*, *Lepidothamnus*, *Manoao*, *Microcachrys*, *Nageia*, *Parasitaxus*, *Ptherosphaera*, *Prumnopitys*, *Retrophyllum* and *Saxegothaea*), except for three genera of this family from which it can be differentiated with a 400x lens because they have window-like cross-field pits (*Lagarostrobos*, *Phyllocladus* and *Sundacarpus*). Sapwood and heartwood similar in colour (yellowish brown). Growth ring boundaries distinct. Transition gradual. Wood soft, light to medium weight. Indistinct odour.

Uses

P. neriifolius. Construction of houses and boats, interior carpentry, cabinetmaking, furniture, turnery, carvings, musical instruments, oars, veneer, plywood and manufacture of paper.
P. parlatorei. Firewood and domestic uses (fencing, utensils) and to make pencils.

Macroscopic description

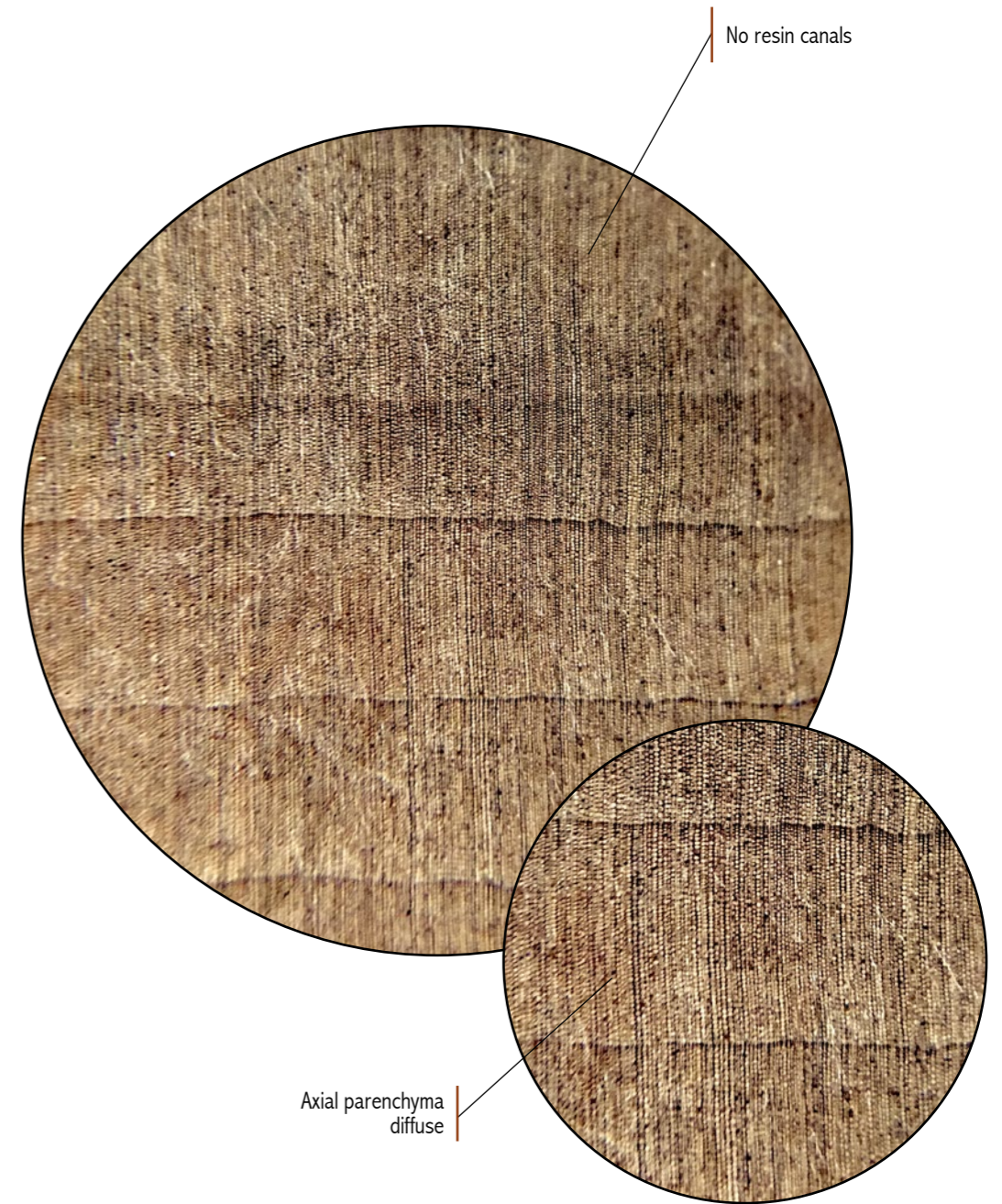
Vessels. Absent.
Axial resin canals. Absent.
Axial parenchyma. Diffuse.
Rays. Visible only with lens. Ray height < 1 mm.
Other. Heartwood not fluorescent.

CITES. Appendix III y I



Podocarpus neriifolius

TRANSVERSE SECTION



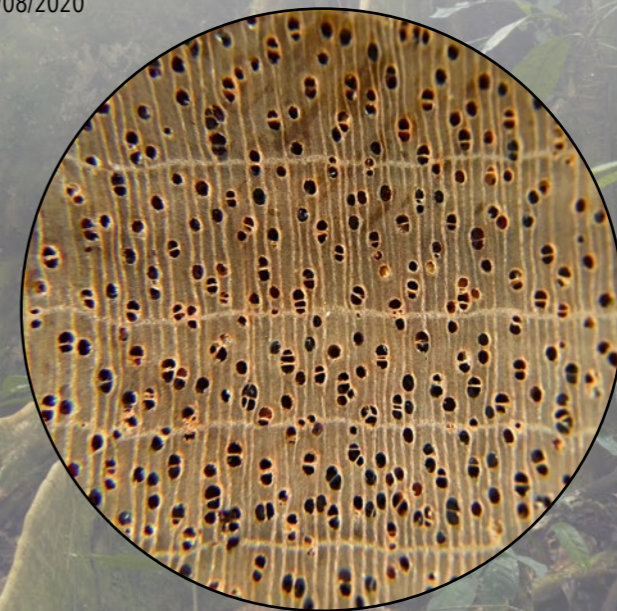
Podocarpus neriifolius D. Don; *P. parlatorei* Pilg.
 Podocarpaceae

Hardwoods

AFRICAN CHERRY	<i>Prunus africana</i> (Hook.f.) Kalkman
AFRORMOSIA	<i>Pericopsis elata</i> (Harms) Meeuwen
AGARWOOD	<i>Aquilaria</i> Lam. & <i>Gyrinops</i> Gaertn.
AJO	<i>Caryocar costaricense</i> Donn.Sm.
ALMENDRO	<i>Dipteryx panamensis</i> (Pittier) Record & Mell
CARIBBEAN WALNUT	<i>Oreomunnea pterocarpa</i> Oerst.
CHAMPAK	<i>Magnolia liliifera</i> var. <i>obovata</i> (Korth.) Govaerts
CRISTOBAL	<i>Platymiscium parviflorum</i> Benth.
HOLY WOOD	<i>Bulnesia sarmientoi</i> Lorentz ex Griseb.
LIGNUM VITAE	<i>Guaicum</i> Plum. ex L.
MADAGASCAR EBONY	<i>Diospyros</i> L.
MAHOGANY	<i>Swietenia humilis</i> Zucc. <i>Swietenia macrophylla</i> King <i>Swietenia mahagoni</i> (L.) Jacq.
MONGOLIAN OAK	<i>Quercus mongolica</i> Fisch. ex Ledeb.
PAU ROSA	<i>Aniba rosodora</i> Ducke
PERNAMBUCO	<i>Paubrasilia echinata</i> (Lam.) Gagnon, H.C. Lima & G.P. Lewis
RAMIN	<i>Gonystylus</i> Teijsm. & Binn.
RED SANDALWOOD	<i>Pterocarpus santalinus</i> L.f.
ROSEWOOD	<i>Dalbergia</i> L.f.
SPANISH CEDAR	<i>Cedrela</i> P.Browne

	Date of listing	Current listing
- <i>Prunus africana</i> (Hook.f.) Kalkman	16/02/1995 (II)	26/11/2019 (II)
- <i>Pericopsis elata</i> (Harms) Meeuwen	11/06/1992 (II)	26/11/2019 (II)
- <i>Aquilaria</i> Lam. & <i>Gyrinops</i> Gaertn.	16/02/1995 (II) (<i>A. malaccensis</i>)	02/01/2017 (II)
- <i>Caryocar costaricense</i> Donn.Sm.	01/07/1975 (I)	26/11/2019 (II)
- <i>Dipteryx panamensis</i> (Pittier) Record & Mell	13/02/2003 (III)	13/09/2007 (III)
- <i>Oreomunnea pterocarpa</i> Oerst.	01/07/1975 (I)	26/11/2019 (II)
- <i>Magnolia liliifera</i> var. <i>obovata</i> (Korth.) Govaerts	16/11/1975 (III)	23/06/2010 (III)
- <i>Platymiscium parviflorum</i> Benth.	01/07/1975 (I)	26/11/2019 (II)
- <i>Bulnesia sarmientoi</i> Lorentz ex Griseb.	12/02/2008 (III)	02/01/2017 (II)
- <i>Guaicum</i> Plum. ex L.	01/07/1975 (II) (<i>G. sanctum</i>)	13/09/2007 (II)
- <i>Diospyros</i> L.	22/12/2011 (III) Madagascar	12/06/2013 (II) Madagascar
- <i>Swietenia humilis</i> Zucc.	01/07/1975 (II)	26/11/2019 (II)
- <i>Swietenia macrophylla</i> King	16/11/1995 (III)	26/11/2019 (II)
- <i>Swietenia mahagoni</i> (L.) Jacq.	11/06/1992 (II)	18/09/1997 (II)
- <i>Quercus mongolica</i> Fisch. ex Ledeb.	24/06/2014 (III)	24/06/2014(III)
- <i>Aniba rosodora</i> Ducke	23/06/2010 (II)	12/06/2013 (II)
- <i>Paubrasilia echinata</i> (Lam.) Gagnon, H.C. Lima & G.P. Lewis	13/09/2007 (II)	13/09/2007 (II)
- <i>Gonystylus</i> Teijsm. & Binn.	06/08/2001 (III)	26/11/2019 (II)
- <i>Pterocarpus erinaceus</i> Poir	09/05/2016 (III)	02/01/2017 (II)
- <i>Pterocarpus santalinus</i> L.f.	16/02/1995 (II)	13/09/2007 (II)
- <i>Pterocarpus tinctorius</i> Welw.	26/11/2019 (II)	26/11/2019 (II)
- <i>Dalbergia</i> L.f.	11/06/1992 (I) (<i>D. nigra</i>)	26/11/2019 (II) <i>D. nigra</i> (I)
- <i>Cedrela</i> P.Browne	12/06/2001 (III) (<i>C. odorata</i>)	26/11/2019 (II)*

* Date of entry into force 28/08/2020





CITES. Appendix II

African cherry

Prunus africana (Hook.f.) Kalkman
Rosaceae

African plum, African prune, almond, alumty, bitter almond, bitter mueri, blackwood, cerisier Africain, chati, chiramati, chirumandi, ciruelo africano, engothe, gulumati, gumwirumari, gwame, gyabazito, Inyazango-ma-elimnyama, iron wood, kanda stick, kiburrahurra, kirah, lluo, mgambo, mkomahoyo, mkondekonde, mseneo, muchambati, muchati, mueni, mueri, mugote, muiri, entasesa, mukumbo, musuba, mwizi, namwini, ngote, ngoti, ngwabuzito, ngwabuzito, ntasera, ntasesa, nuwehout, omumba, oromoti, prunier d'Afrique, pygeum, red ivory, red stinkwood, rood stinkhout, rooistinkhout, stinkwood, tenduet, tikur inche, tikur inchet, umkakase, vern m'weri, vla, wotangue.



Distribución

Prunus L. comprises 311 species and only one, *P. africana*, is listed in CITES. Its distribution range covers Angola, Burundi, Cameroon, Comoros Islands, Democratic Republic of the Congo, Ethiopia, Ghana, Gulf of Guinea Islands, Kenya, Madagascar, Malawi, Mozambique, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Tree that can grow to 40 m in height and 1 m in diameter.

Features

Sapwood and heartwood different in colour. Heartwood dark brown. Growth ring boundaries indistinct. Wood hard and heavy weight. Indistinct odour.

Uses

Used locally for firewood, carvings and tool handles, but in particular there is a constant demand for its bark for medicinal purposes, to treat benign prostate hyperplasia.

Macroscopic description

Vessels. Present, diffuse-porous. Not visible without lens. Solitary and in radial multiples of 2, 3 or even 4 or more. Tyloses absent. Gum deposits. Vessel diameter 50-200 µm.

Axial canals. Absent.

Axial parenchyma. Diffuse. Scanty paratracheal not visible with lens.

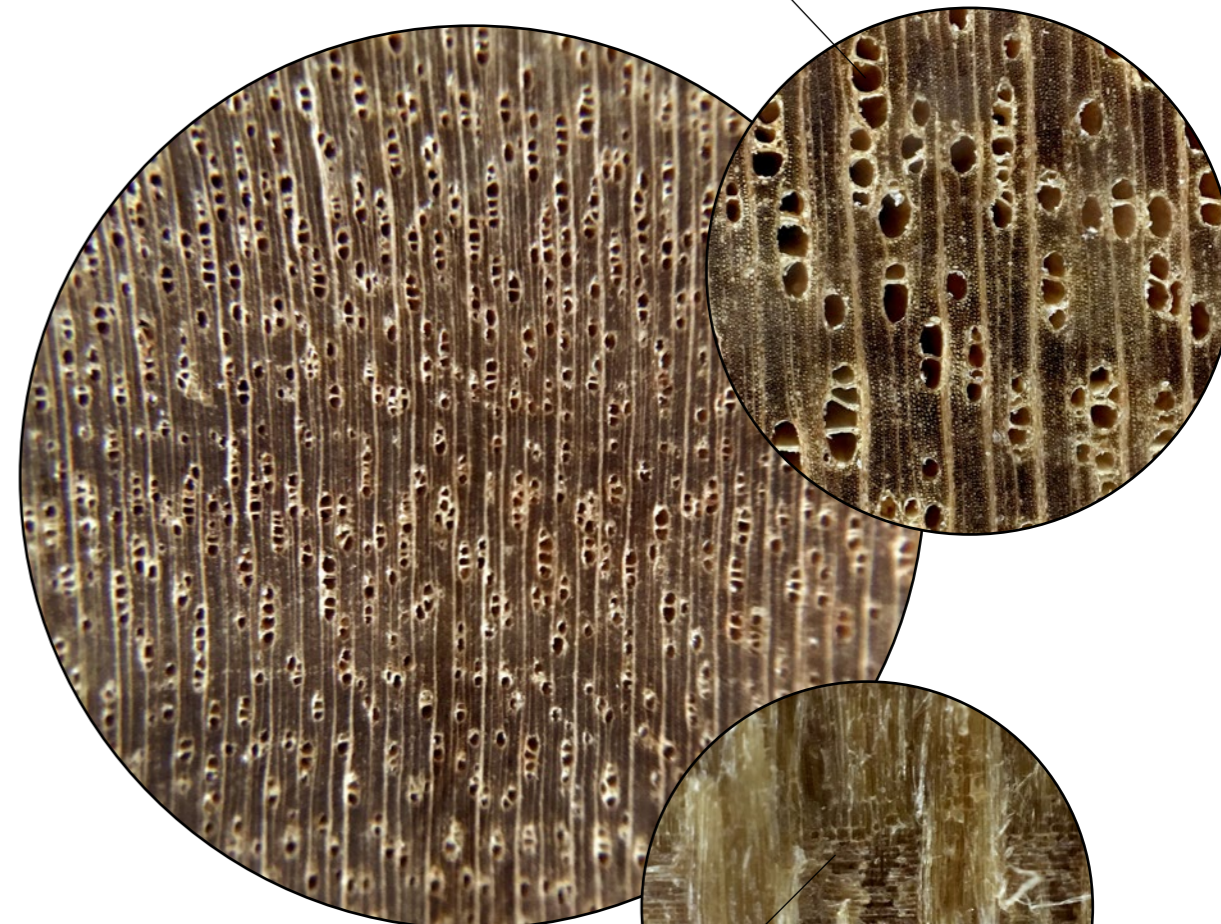
Rays. 4 to 10 cells wide, not visible without lens. Heterocellular. Ray height < 1 mm. Not storied.

Other. Heartwood not fluorescent.



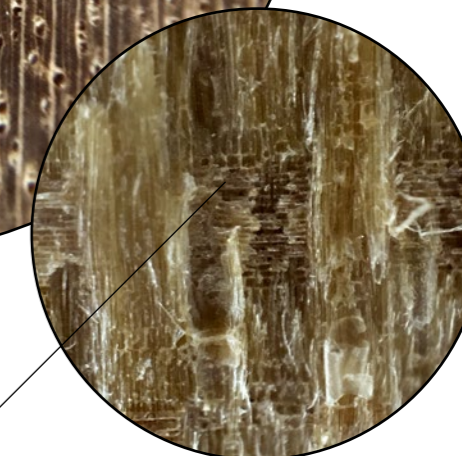
TRANSVERSE SECTION

Vessels in radial multiples of 2, 3 or 4



RADIAL SECTION

Rays heterocellular



Prunus africana (Hook.f.) Kalkman
Rosaceae



CITES. Appendix II

Afrormosia

Pericopsis elata (Harms) Meeuwen
Fabaceae (Leguminosae)

African teak, anyeran, asamela, awawai, ayin, baracara, benin satinwood, bohal, bohala, bohalala, bons-amdua, devils tree, duabay, duakobin, egbi, ejen, elo, elouta, ghana asamela, golden afrormosia, iatobahy do igapo, jatobaly do igapo, kokriki, kokrodua, liguminosae, mekoe, mohole, obang, ole, olel pardo, oleo pardo, peonio, redbark, satinwood, teca africana, tento, wahala, yellow satinwood.



Distribution

Pericopsis Thwaites comprises five species, three in Africa (*P. angolensis*, *P. elata*, *P. laxiflora*) and two in Southeast Asia (*P. mooniana*, *P. ponapensis*). Only *P. elata* is listed in CITES. It is restricted to dry areas of semi-deciduous forests in eastern Ivory Coast and western Ghana, Nigeria and southeast Cameroon, the Sangha-Ngoko basin in the Congo and the Central Basin in the Democratic Republic of Congo. Tree that grows up to 50 m in height and 2 m in diameter, normally with a somewhat irregular bole of 15 to 20 m.

Features

All the woods of the genus are very similar. The wood is also very similar to *Leptolobium* Vogel. Sapwood and heartwood different in colour. Sapwood yellowish brown and heartwood medium to dark brown. Growth ring boundaries distinct or indistinct. Moderately hard and medium weight. Indistinct odour.

Uses

Interior carpentry (doors, flooring, stairs, mouldings), cabinetmaking, veneer for decorative finishings, furniture, exterior carpentry, marine pilings, shipbuilding (bridges and decking) and turnery.

Macroscopic description

Vessels. Present, diffuse-porous. Not visible to the unaided eye. Numerous. Normally solitary, sometimes in radial multiples of 2 or 3. Tyloses absent. Deposits present, either dark or whitish. Vessel diameter 50-200 µm.

Axial canals. Absent.

Axial parenchyma. Paratraqueal vasicéntrico, aliforme y aliforme-confluente. A veces, marginal en finas líneas.

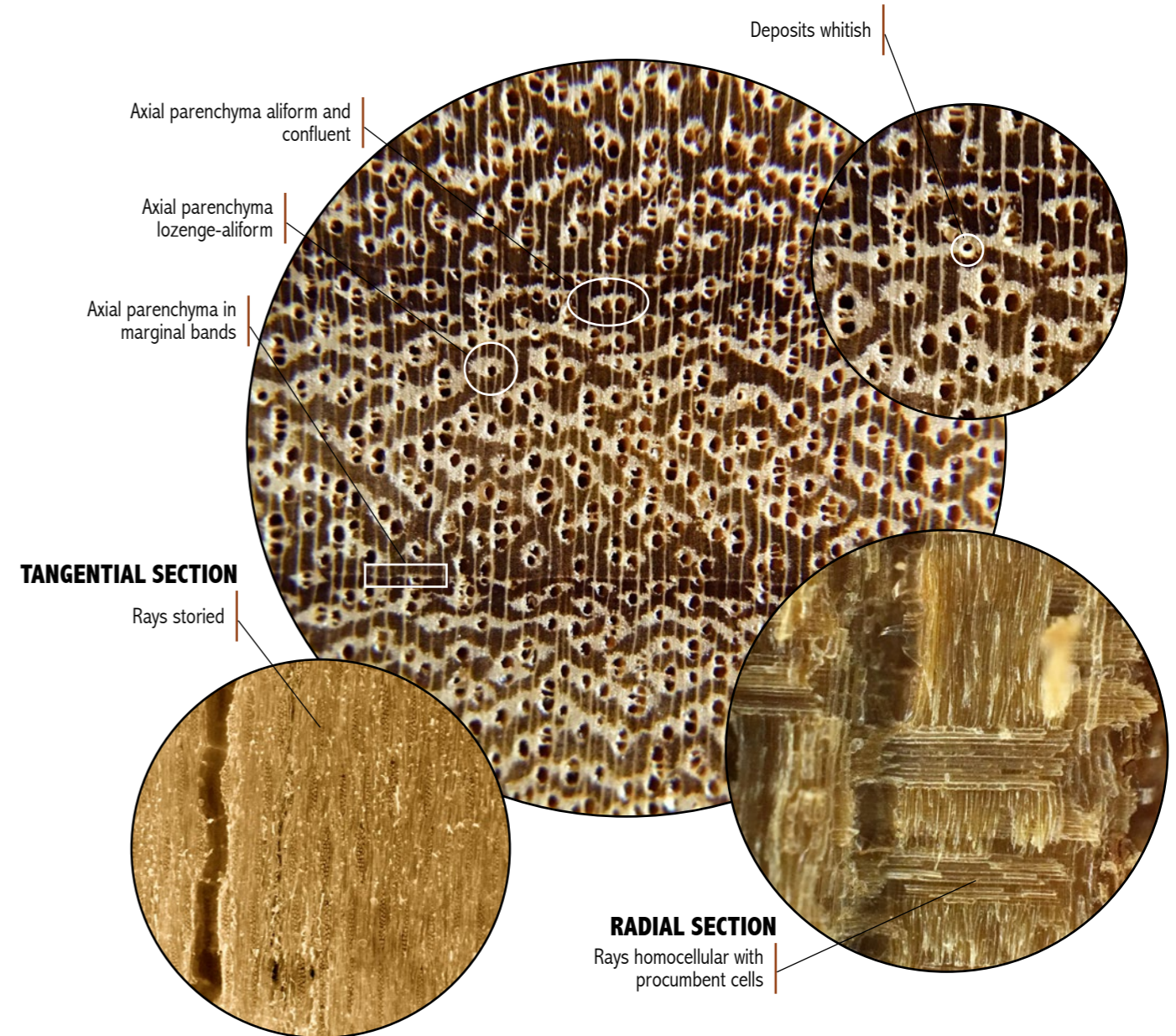
Rays. Narrow. 1 to 3 cells wide. Homocellular with procumbent cells. Sometimes with one row of upright and/or square marginal cells. Storied, but normally difficult to see. Ray height < 1 mm.

Other. Heartwood not fluorescent. Water and ethanol extract not fluorescent. Froth test negative.



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TRANSVERSE SECTION



Pericopsis elata (Harms) Meeuwen
Fabaceae (Leguminosae)



CITES. Appendix II

Agarwood

Aquilaria Lam. & *Gyrinops* Gaertn.

Thymelaeaceae

Adlerholz, agallocha black, agallochum, agalocco, agar, agar-agar, agarreal, agaru, agarwood, aggalichandanam, agilawood, agru, akyau, akyaw, alas, alim, aloe, aloes ling, aloewood, angkaras, aquilaria agallocha, aqulugin, augkaras, bari, bois d'aigle, bois d'aloès, calambac, calamboe, chau krasna, dhum, dó bâu, eaglewood, engkeras, gaharu mengkaras, gahuru buaya, garu, geharu, gewa, gia, gumbil, hasi, Indian eaglewood, ingkaras, kaju alim, kaju gaharu, kalambac, karas, kayu garu, kayu tulang, kekaras, klaw, kulambak, kumbil, lignaloes, lignum agallochi, lignum aloes, lignum aquilariae, lignum aspalathi, Linaloeholz, madera de agar, mengkaras, pao daguila, Paradiesholz, paradisewood, sasi, songgak, tanduk, tengala, tengkaras, trâm huong, tugge, udúr, ugar, xylaloe.



Distribution

Asia and Indomalesia. *Aquilaria* Lam. comprises 21 species (Assam to southern China and New Guinea) and *Gyrinops* Gaertn. comprises nine (Sri Lanka to New Guinea). All are listed in CITES Appendix II.

Features

Wood characterised by diffuse included phloem, common to all species of both genera. Sapwood and heartwood similar in colour. Growth ring boundaries indistinct. Wood soft and light weight. Indistinct odour.

Uses

Wood with very special uses. It is used to make carvings and beads (for prayer or decoration). Oil distilled from the wood is used in perfumes and cosmetics. Its wood chips are sold before and after distillation. After chips have been distilled, the exhausted powder is compressed and used to make statues and incense cones. Infection of *Aquilaria* y *Gyrinops* by fungal pathogens produces a resinous heartwood that is highly valued for its aromatic properties. Also used as an ingredient in traditional and patented medicines (Groves and Rutherford, 2015).

Macroscopic description

Vessels. Present, diffuse-porous. In radial multiples of 2, 3 or even 4. Tyloses absent; deposits absent. Vessel diameter 50-200 µm.

Axial canals. Absent.

Axial parenchyma. Not visible. Not to be confused with islands of included phloem.

Rays. Narrow and almost invisible because they are uniseriate or partially biseriate. Homocellular with all cells upright and/or square (*A. malaccensis* Lam.), heterocellular with procumbent body ray cells and one or more rows of upright and/or square marginal cells, and can even have procumbent, square and upright cells mixed throughout (*Gyrinops valla* Gaertn.). Ray height < 1 mm. Not storied.

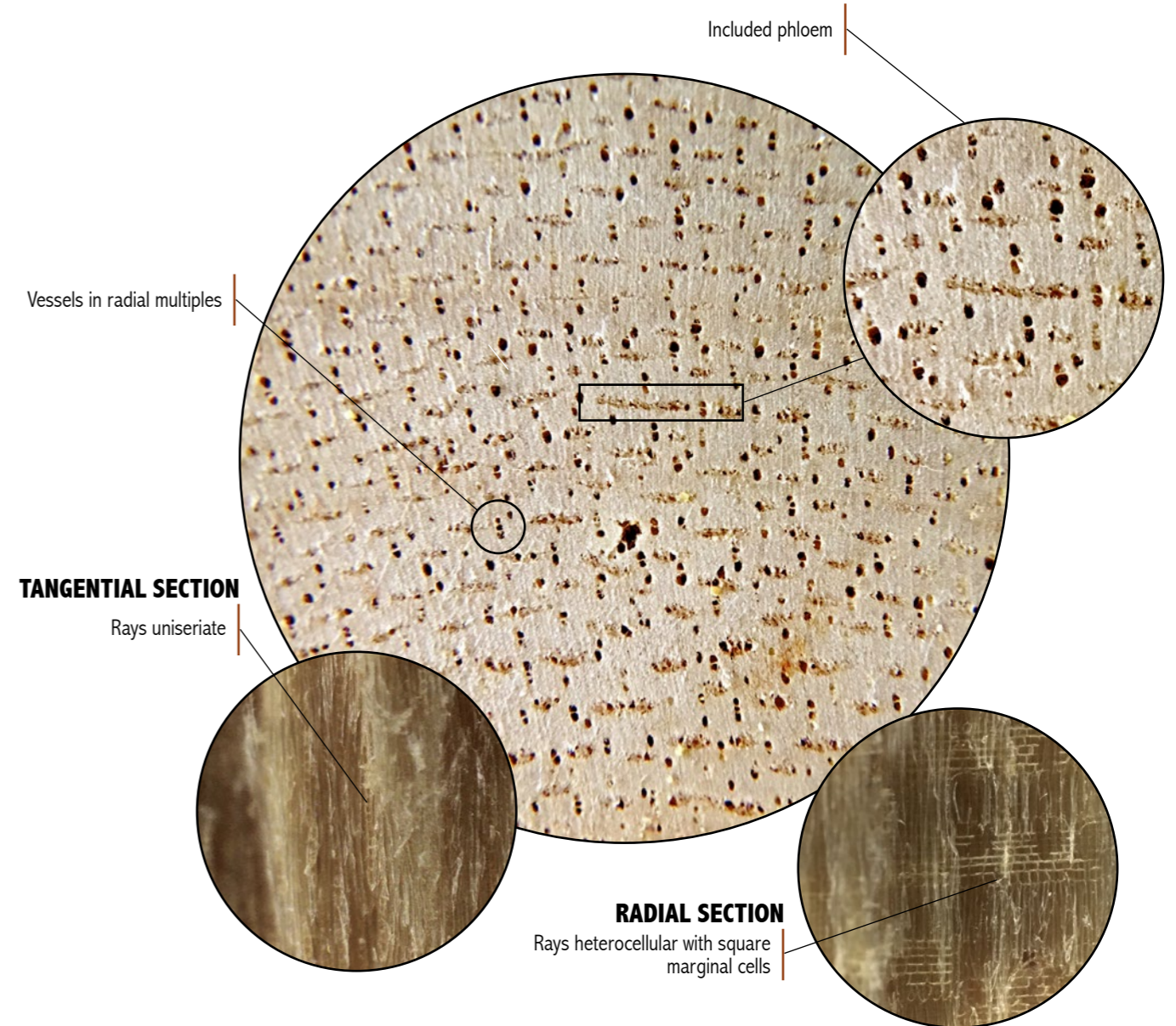
Cambial variants.

Included phloem, diffuse.

Other. Heartwood not fluorescent. Water and ethanol extract not fluorescent.



TRANSVERSE SECTION



Aquilaria Lam. & *Gyrinops* Gaertn.
Thymelaeaceae



CITES. Appendix II

Ajo

Caryocar costaricense Donn.Sm.

Caryocaraceae

Achiotillo, aji, ajillo, ajo, almendra con espinas, almendra de espinho, almendra, almendrillo, almendro de bajo, almendro, almendron cagui, almendrón, arbre de beurre, bat's souari, biquí, caballokup, cagui, cariocar du Costa Rica, chawari, firme, genene, grão de cavalo, huevo de burro, jigua, kassagnan, mani, manu, maqui-maqui, pequi, pequia brava, pequia, pete rana do terra firme, pete rana, peté, pete-rana, piquí, piquiá verdadeiro, piquia, piquiarana, plomillo, rana de terra firma, rana do terra, sawar, sawari, soari, sopo oedoe, sopo oedoe, suari.



Distribution

Caryocar L. comprises 16 species, all in tropical America. Only *C. costaricense* is listed in CITES. The traded *Caryocar* species are *C. brasiliense* Cambess., *C. edule* Casar., *C. glabrum* (Aubl.) Pers. and *C. villosum* (Aubl.) Pers. (Richter and Dallwitz, 2000). *C. costaricense* is native to Colombia, Costa Rica, Panama and Venezuela and grows in lowland evergreen tropical forests. It is distributed mainly in protected areas in Costa Rica and in the regions of Darién and San Blas in Panama. Tall-stemmed tree that can grow to 50 m in height and 1.5 m in diameter (Woodson and Schery, 1976).

Features

Sapwood and heartwood similar in colour (yellowish brown). Growth ring boundaries indistinct. Moderately hard and medium weight. Indistinct odour.

Uses

Construction in general, boatbuilding, bridges, railway sleepers, furniture, vehicle flooring, interior and exterior carpentry.

Macroscopic description

Vessels. Present, diffuse-porous. In radial multiples of 2 or 3. Tyloses present. Vessel diameter > 200 µm.

Axial canals. Absent.

Axial parenchyma. Apotracheal diffuse or diffuse-in-aggregates. Paratracheal scanty and vasicentric.

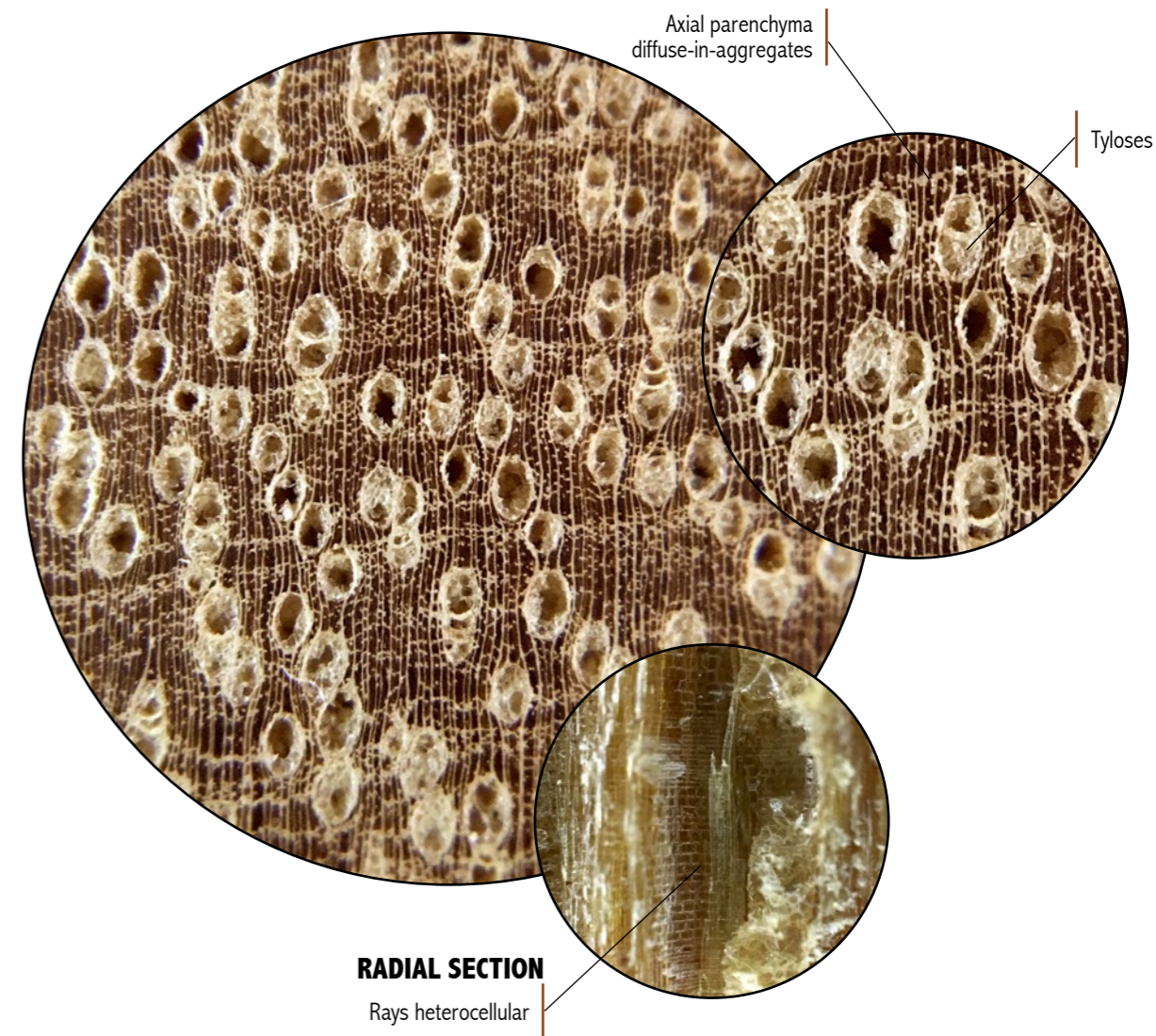
Rays. 1 to 3 cells wide. Heterocellular with 2-4 rows of upright and square marginal cells, or even more. Ray height > 1 mm. Not storied.

Other. Heartwood not fluorescent.



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TRANSVERSE SECTION



RADIAL SECTION

Rays heterocellular

Caryocar costaricense Donn.Sm.

Caryocaraceae



CITES Appendix III

Almendro

Dipteryx panamensis (Pittier) Record & Mell

Fabaceae (Leguminosae)

Almendrillo, almendro amarillo, almendro de montaña, champanha, charapilla, cumaru ferro, cumaru, cumarurana, ebo, eboe, gaiac de cayenne, koemaroe, kumaru, mountain almendro, sarrapia, shihuahuaco amarillo, tonka bean, tonka bean tree, tonka bean wood, tonka.



Distribution

Dipteryx Schreb. comprises 13 species distributed across Central America and tropical South America. Only *D. panamensis* is listed in CITES. It is distributed over Colombia, Costa Rica, Ecuador, Honduras, Nicaragua and Panama. Tree up to 50 m in height and 1.6 m in diameter.

Features

Wood very similar to *Dipteryx odorata*, commercially known as Cumarú. Sapwood and heartwood different in colour. Sapwood creamy and heartwood medium brown to dark coffee brown. Growth ring boundaries indistinct. Very hard and very heavy weight. Strongly interlocked grain. Indistinct odour.

Uses

Wood used for external construction (hydraulic works, bridges, railway sleepers, port installations, heavy construction), ship-building, small boats, flooring, turnery, decorative veneer and even gearing. Used locally to make tool handles.

Macroscopic description

Vessels. Present, diffuse-porous. Not visible to the unaided eye. Numerous. Normally solitary, sometimes in radial multiples of 2, 3, 4 or even more. Tyloses absent. Deposits whitish and honey-coloured. Vessel diameter 100-200 µm.

Axial canals. Absent.

Axial parenchyma. In marginal bands very subtle, almost imperceptible. Paratracheal lozenge-aliform, winged-aliform and confluent.

Rays. Clear thin lines on dark wood. 1 to 3 cells wide. Homocellular with procumbent cells. Ray height < 1 mm. Storied.

Other. Heartwood fluorescent. Water and ethanol extract not fluorescent. Froth test positive.



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TRANSVERSE SECTION

Axial parenchyma paratracheal aliform and confluent

Deposits whitish

TANGENTIAL SECTION

Rays storied

RADIAL SECTION

Rays homocellular

Dipteryx panamensis (Pittier) Record & Mell

Fabaceae (Leguminosae)



CITES. Appendix II

Caribbean walnut

Oreomunnea pterocarpa Oerst.
Juglandaceae

Campana, gavilán, gavilán blanco.



Distribution

Oreomunnea Oerst. comprises four species (*O. americana*, *O. mexicana*, *O. munchiquensis* and *O. pterocarpa*), all native to Central America. Only *O. pterocarpa* is listed in CITES. Its distribution range is Costa Rica, Mexico and Panama. Tree capable of growing to 35 m in height and 0.7 m in diameter, generally with large buttresses at the base.

Features

Heartwood light brown or reddish brown. Growth ring boundaries distinct or indistinct. Wood soft and light weight. Indistinct odour.

Uses

Wood sold locally for use in construction of houses and interior carpentry. Not very durable. Trees appear to suffer from internal decay near the base, which typically spoils the timber (Fern, 2014).

Macroscopic description

Vessels. Present, diffuse-porous. Visible without lens. Numerous. Normally solitary, sometimes in radial multiples of 2 or 3. Tyloses present. Deposits absent. Vessel diameter 100-200 µm.

Canales axiales. Absent.

Parénquima axial. In marginal bands. Diffuse variable and abundant diffuse-in-aggregates. Scanty paratracheal sometimes observable. Sometimes in bands more than three cells wide.

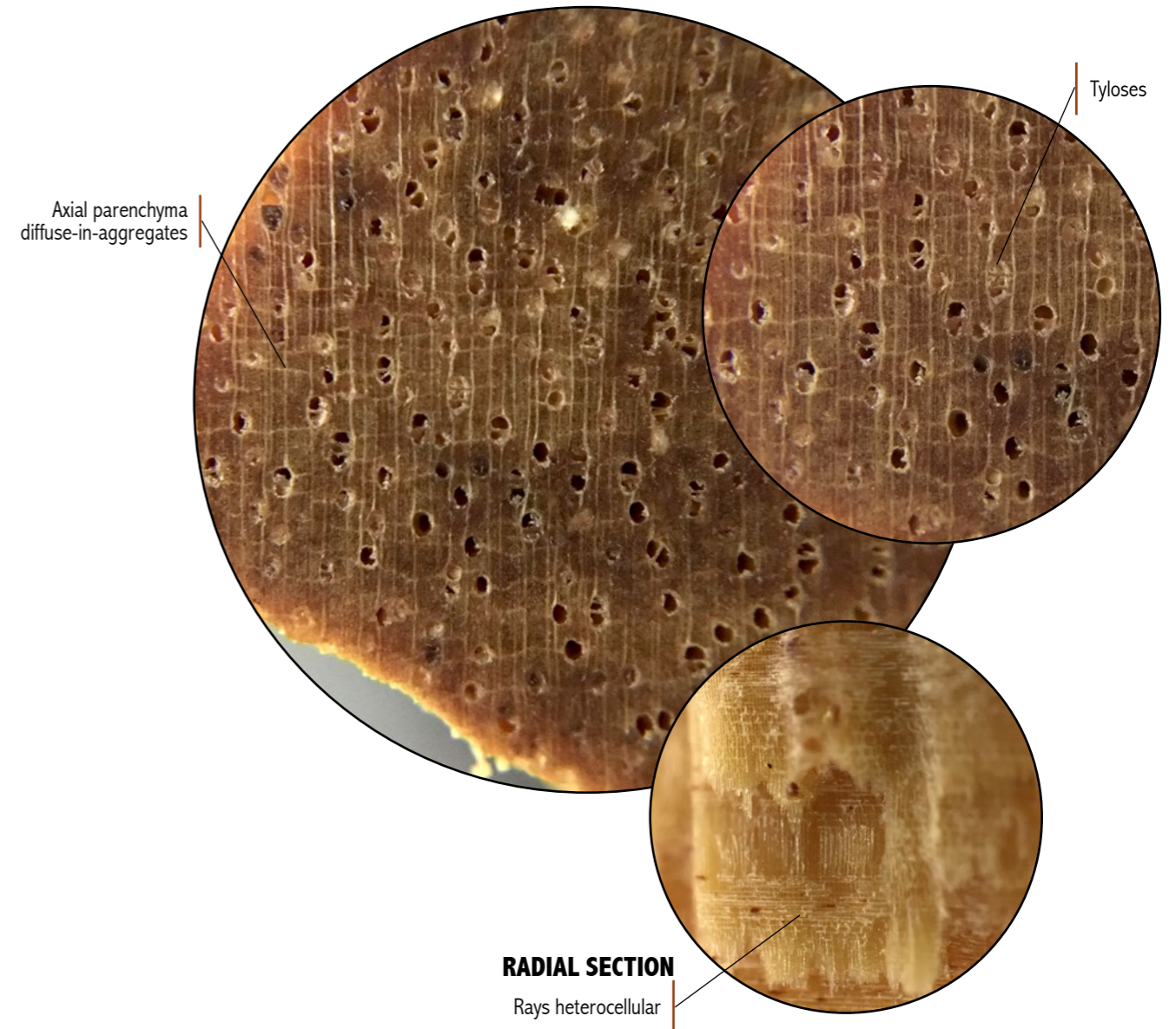
Rays. Narrow. 1 to 3 cells wide. Heterocellular. Ray height < 1 mm. Not storied.

Other. Heartwood not fluorescent.

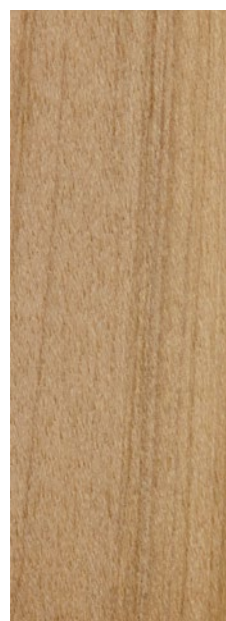


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TRANSVERSE SECTION



Oreomunnea pterocarpa Oerst.
Juglandaceae



CITES. Appendix III

Champak

Magnolia liliifera var. *obovata* (Korth.) Govaerts

Magnoliaceae

Balukhat, baranthuri, boramthuri, egg magnolia, giogi, harré, magnolia, pankakro, patpatta, afan, siffo, taungme.



Distribution

Magnolia Plum. ex L. comprises 320 species with a very broad distribution range, from Canada to Brazil, the Caribbean, India to the Kuril Islands and New Guinea. Only one species, *M. liliifera* var. *obovata* is listed in CITES. Native to Borneo, Malaysia and Thailand.

Tree up to 12 m in height and 30-40 cm in diameter (Nootboom and Chalermglin, 2009).

Features

Sapwood lighter than heartwood (light brown). Growth ring boundaries distinct, demarcated by axial parenchyma in marginal bands. Wood soft and light weight. Indistinct odour.

Uses

Wood used locally for construction.

Macroscopic description

Vessels. Present, diffuse-porous. Scalariform perforation plates with < 10 bars. Intervessel pits scalariform. Tyloses absent. Deposits absent. Vessel diameter 50-100 µm.

Axial canals. Absent.

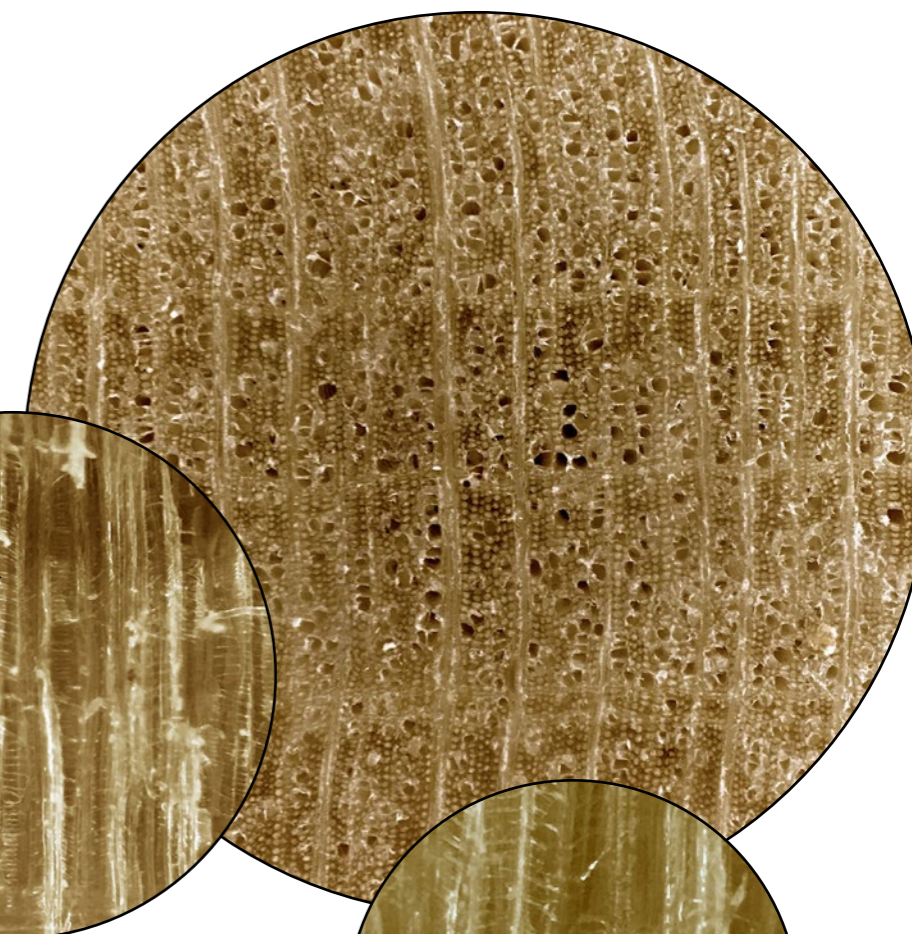
Axial parenchyma. In marginal or in seemingly marginal bands.

Rays. 4 to 10 cells wide. Heterocellular. Ray height < 1 mm. Not storied.

Other. Heartwood not fluorescent. Water extract not fluorescent. Ethanol extract fluorescent.

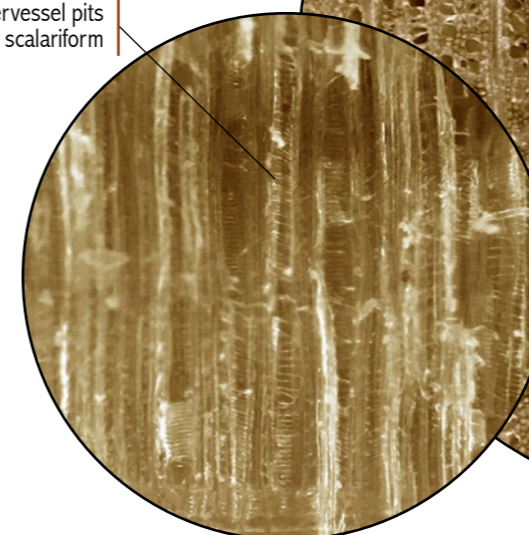


TRANSVERSE SECTION



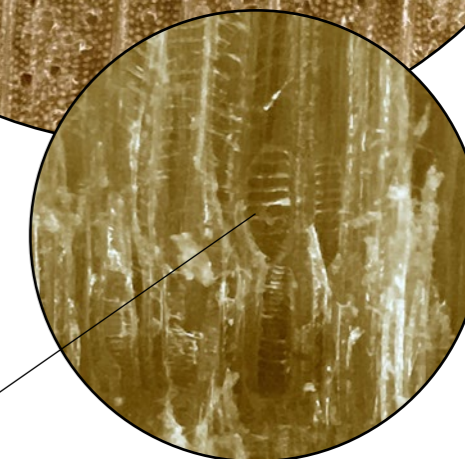
RADIAL SECTION

Intervessel pits
scalariform



RADIAL SECTION

Perforation plates scalariform



Magnolia liliifera var. *obovata* (Korth.) Govaerts

Magnoliaceae



CITES. Appendix II

Cristobal

Platymiscium parviflorum Benth.

Syn. - *P. pleiostachyum* Donn.Sm.

Fabaceae (Leguminosae)

Cachimbo, coyote, cristóbal, granadillo, guayacán trébol, jacaranda do brejo, koenatepi, macacauba, macawood, nambar, ñambar, roble colorado, trébol.



Distribution

Platymiscium Vogel comprises 19 species distributed in South America, Central America and Mexico. Only *P. parviflorum* is listed in CITES. Its distribution range covers Costa Rica, Guatemala, El Salvador, Honduras and Nicaragua.

Tree with spreading crown growing up to 15 m in height and 0.25 m in diameter, although some individuals 25 m in height and 1 m in diameter have been reported (Fern, 2014).

Features

Sapwood yellowish and heartwood variable, from reddish brown to coffee brown or purple, with distinct streaks.

Growth ring boundaries distinct or indistinct, demarcated when distinct by axial parenchyma in marginal bands. Wood very hard and very heavy weight. Indistinct odour.

Uses

Species highly prized locally for its timber. Used to build houses, in cabinetmaking, interior carpentry (panelling and flooring), decorative veneer, furniture and musical instruments (drums, marimbas, xylophones).

Also used as an ornamental tree.

Macroscopic description

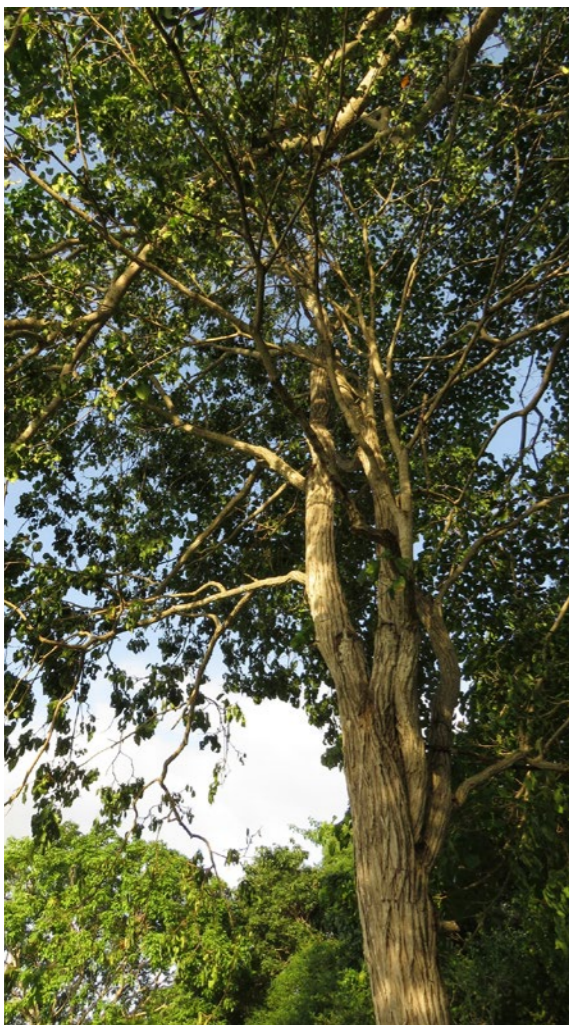
Vessels. Present, diffuse-porous. In radial multiples of 2 or 3. Tyloses absent. Deposits present. Vessel diameter 100-200 µm.

Axial canals. Absent.

Axial parenchyma. Lozenge-aliform, winged-aliform and confluent.

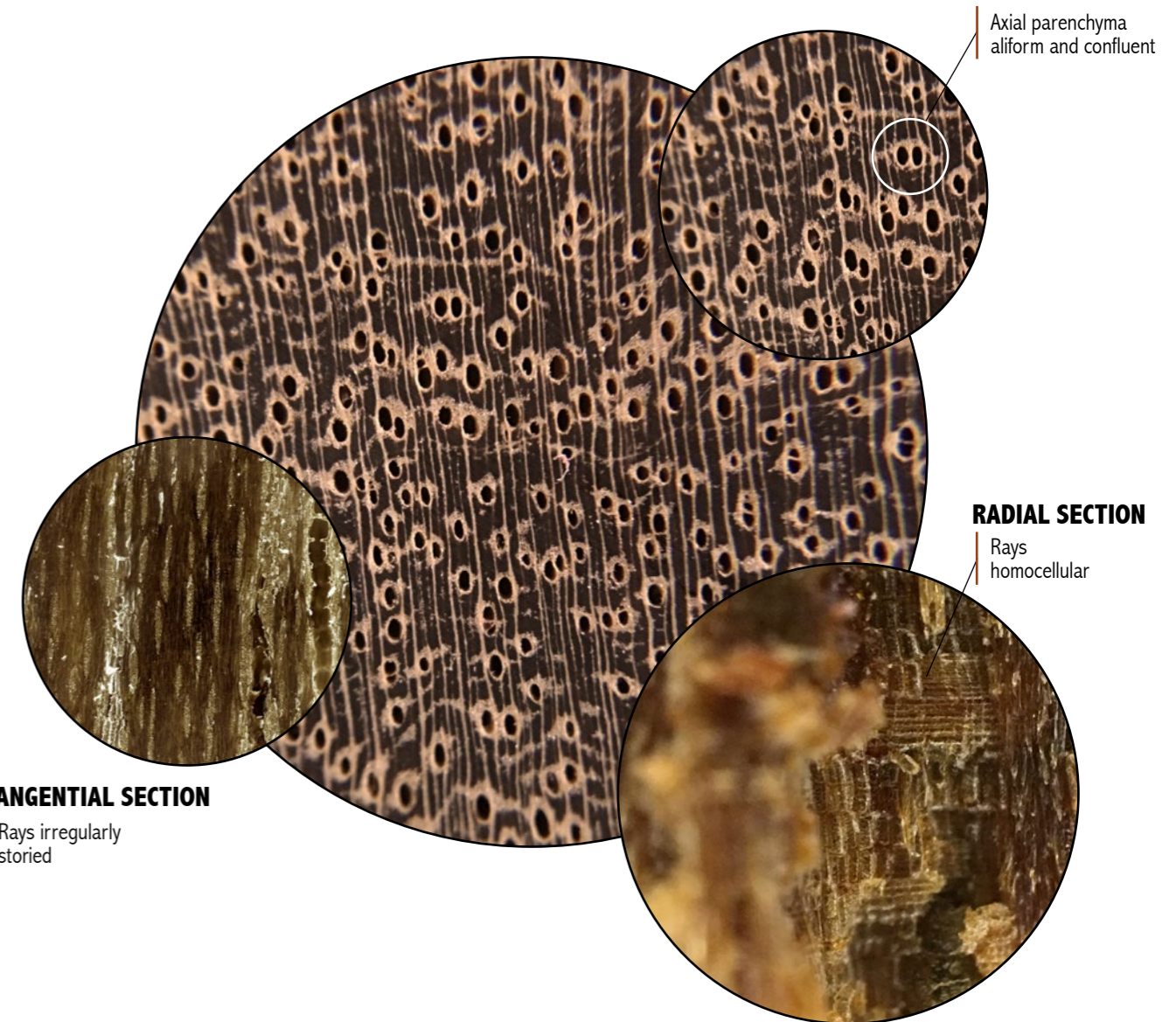
Rays. Narrow. Uniseriate. Sometimes 1 to 3 cells wide. Homocellular with procumbent cells. Ray height < 1 mm. Storied or not storied.

Other. Heartwood not fluorescent. Water and ethanol extract fluorescent. Froth test negative.



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TRANSVERSE SECTION



Axial parenchyma aliform and confluent

RADIAL SECTION

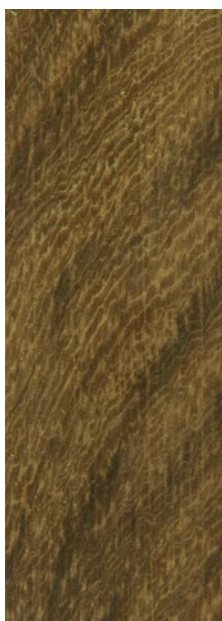
Rays homocellular

TANGENTIAL SECTION

Rays irregularly storied

Platymiscium parviflorum Benth.

Fabaceae (Leguminosae)



CITES. Appendix II

Holy wood

Bulnesia sarmientoi Lorentz ex Griseb.

Zygophyllaceae

Argentine lignum vitae, bois de gaic, guaiac, gaiacwood, guajaco, Guajakholz, guayacán, ibiocaí, jooc, meemong, palo balsamo, palo santo, Paraguay lignum vitae, ticiyuk, true guaiac, vera, verawood, ybyra ocaí.



Distribution

Bulnesia Gay comprises five species, distributed from Peru, northern Argentina, Bolivia and Brazil to Paraguay. Only one species, *B. sarmientoi*, is listed in CITES. Tree up to 18 m in height.

Features

Sapwood yellowish and heartwood coffee brown with greenish hues. Oily surface. Growth ring boundaries distinct or indistinct. Wood very hard and very heavy. Indistinct odour. Very similar macroscopically to *B. arborea* and *Guaiacum* spp.

Uses

Used in outdoor carpentry because of its durability. In interior carpentry for wooden flooring. Luxury items, handcrafts, cabinetmaking, tool handles and smoking pipes. Distilled wood produces guayacol, an essential oil used to manufacture perfumes, cosmetics and candles. Its sawdust is treated with solvents to make "palo santo" resin, which is used to manufacture paint and varnish. Cones or sticks made from compressed wood chips, oil and powder are found on the market (Groves and Rutherford, 2015). Because of its self-lubrication, it is used, like lignum vitae, in friction-driven mechanisms, e.g. propeller shaft bearings and pulley wheels.

Macroscopic description

Vessels. Present, diffuse-porous. In radial and diagonal multiples of 4 or more. Tyloses absent. Deposits present. Vessel diameter 50-100 µm.

Axial canals. Absent.

Axial parenchyma. Not visible. Diffuse, diffuse-in-aggregates and scanty vasicentric paratracheal.

Rays. Narrow. 1 to 3 cells wide. Homocellular with procumbent cells. Ray height < 1 mm. Storied.

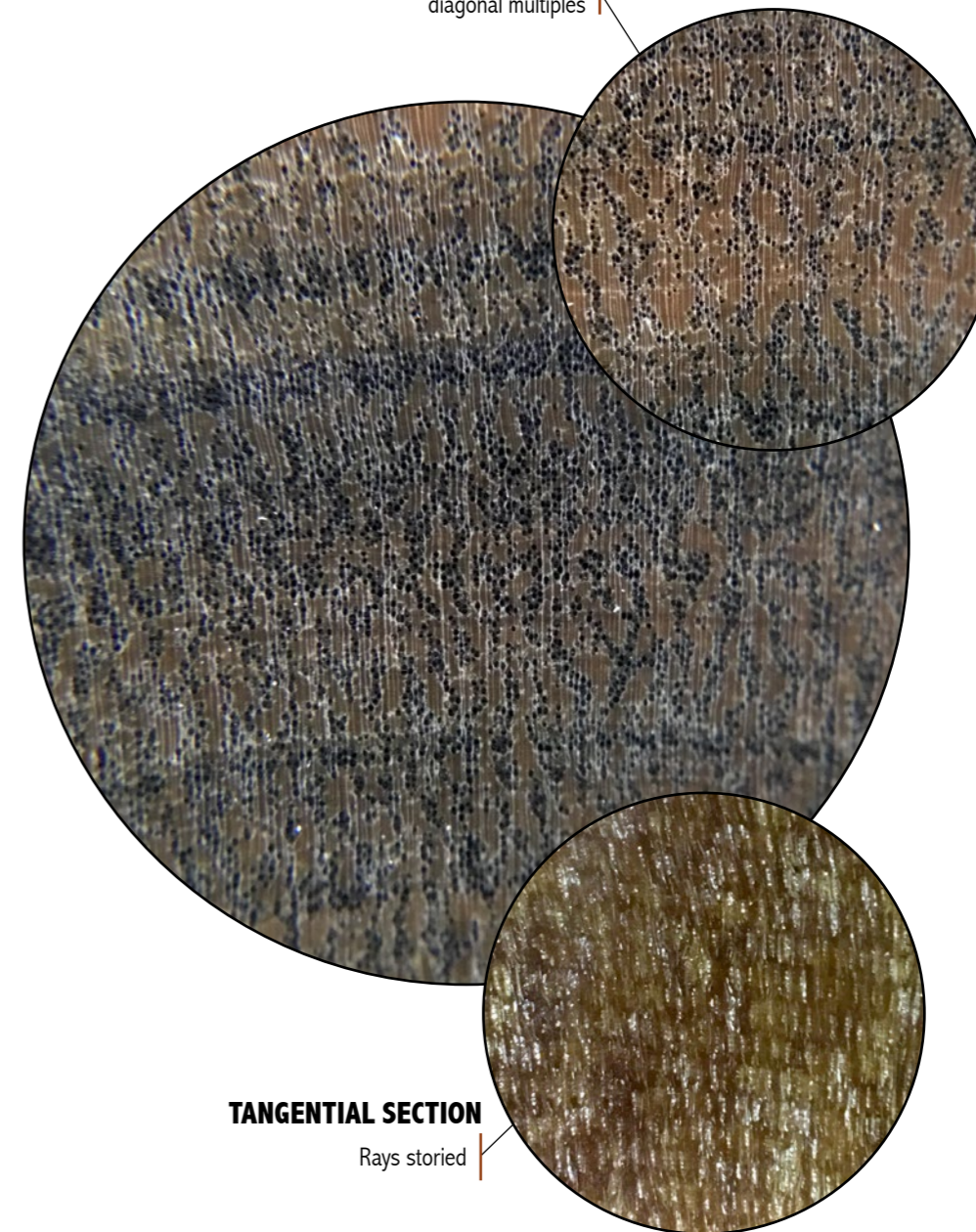
Other. Heartwood not fluorescent. Water extract not fluorescent. Ethanol extract fluorescent.



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TRANSVERSE SECTION

Vessels in radial and diagonal multiples

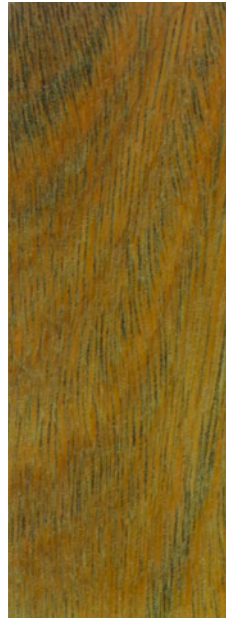


TANGENTIAL SECTION

Rays storied

Bulnesia sarmientoi Lorentz ex Griseb.

Zygophyllaceae



CITES. Appendix II

Lignum vitae

Guaiacum Plum. ex L.
Zygophyllaceae

Arbre de vie, Bahama lignum vitae, bakaut, bastaard pokhout, bastard lignum vitae, bastard pockenholts, bera, boeloebarie, bois de gaiac, bois de gayac, bois de santé, bois de vie, bois néphrétique, bois saint, common lignum-vitae, commoner lignum vitae, Domingo-Jamaika-Panama Pockholz, echt pokhout, Fransosenholts, Franzosenholz, frazostraee, gaïac, gaïac bâtard, gaïac blanc, gaïac du Nicaragua, gaïac femelle, gaïac jaune, gaïac mâle, gaïac noir, gaïac officinal, gaïac tree, galac, gayac jaune vert, gayak fran, gayak, guaiac, guaiacan, Guaiacholz, guaiaco, guaiaco banco, guaiaco di Nicaragua, guaiaco nero, guaiacum, guaiacum wood, guajacan, guajacan blanco, guajacan negro, guajaco, guajak, Guajakholz, guajakved, guayac, guayacán, guayacán amarillo, guayacán azul, guayacán blanco, guayacán blanco, guayacán colombiano, guayacán de América, guayacán de las Antillas, guayacán de Nicaragua, guayacán de playa, guayacán de vera, guayacán genuine, guayacan negro, guayacán negro, guayacán prieto, guayacán real, guayacan wajakaa, guayacancillo, guayacancillo de Cuba, guayaco, gud-strad, guiacu, gum guaiacum, guyacan, guyaiaco, gwajak, hoaxacan, hollywood, hollywood lignum vitae, huesito, Indianwood, ironwood, ken, legno benedetto, legno di guaiaco, legno guajacano, legno santo, leno santo, lignum guaiaci, lignum sanctum, lignum-vitae tree, maatsjoe, madera de gaiac, matlalquahuitl, Mexiko-Pockholz, Nicaragua pokhout, Nicaraguan lignum vitae, Nicaraguan pockenholts, oaxacan, palo de hierro, palo de las Indias, palo de ropa, palo de vida, palo guayacan, palo sano, palo santo, palo santo de América, pano santo de las Indias, pockenholts, Pockholz, pokhout, pokhout, roughbark lignum vitae, soon, thick-sap lignum vitae, tree of life, vera, vera amarillo, vera bera, vera blanco, vera negro, vera prieta, vera prieto, wajakaa, wayaca, wayaka shimaron, westindisch pokhout, wood-of-life, zon, zoon.



Distribution

Guaiacum Plum. ex L. comprises six species (*G. coulteri*, *G. nelli*, *G. officinale*, *G. palmeri*, *G. sanctum*, *G. unijugum*), all listed in CITES. Distributed in Central America, the Caribbean and northern South America.

Features

Sapwood yellowish brown and heartwood greenish black with oily surface. Growth ring boundaries indistinct. Wood very hard and very heavy weight. Characteristic odour, like rubber. Similar in appearance to holy wood.

Uses

The timber and resin have been traded in Europe since the early 16th century via Spain. The wood was used for centuries for its alleged remedial powers before its health claims were questioned nearly 200 years after the first publications about its properties. Its durable wood has been used for shipbuilding, bridge boards and machinery parts because of its self-lubrication (propeller shaft bearings and pulley wheels). Also used in turnery, for carvings and manufacture of handles and bowling balls, wooden clocks, e.g. John Harrison clock bearings, gears of pendulum clocks and marine chronometers.

Macroscopic description

Vessels. Present, exclusively solitary and diffuse-porous. Tyloses absent. Deposits abundant. Vessel diameter 50-100 µm.

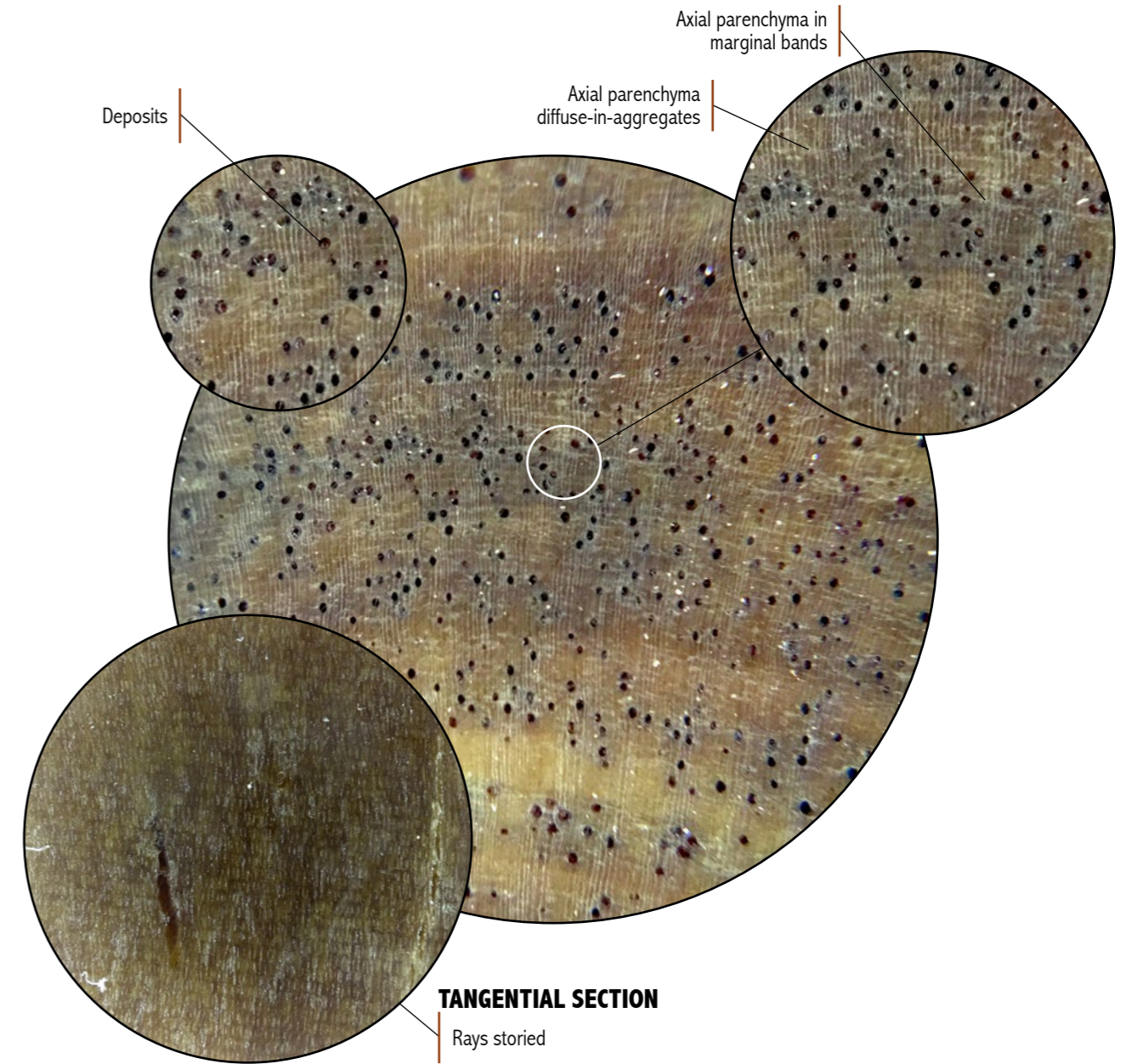
Axial canals. Absent, but there may be traumatic axial canals arranged in tangential bands.

Axial parenchyma. In marginal bands, apotracheal diffuse or diffuse-in-aggregates. Scanty paratracheal, unilateral or incomplete vasicentric.

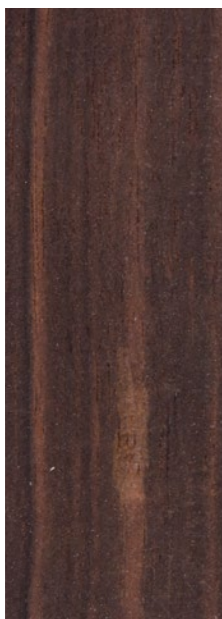
Rays. Exclusively uniseriate. Homocellular with procumbent cells. Ray height < 1 mm. Rays storied.

Other. Heartwood not fluorescent. Water extract not fluorescent. Ethanol extract fluorescent.

TRANSVERSE SECTION



Guaiacum Plum. ex L.
Zygophyllaceae



CITES. Appendix II

Madagascar ebony

Diospyros L.

Ebenaceae

Ébano de Madagascar, Madagaskar Ebenholz, hazozoby, lepinga, mapingo.



Distribution

Diospyros L. is a cosmopolitan genus comprising 732 species, of which only those in Madagascar are protected.

Características

Easily confused with other species of the genus that are not protected. Difficult to distinguish from the wood of other species, such as *Dalbergia melanoxylon*. Sapwood yellowish and heartwood dark brown to black. Growth ring boundaries indistinct. Wood very hard and very heavy weight. Indistinct odour.

Uses

Frequently used in the manufacture of musical instruments, in particular fingerboards for violins, violas and guitars, piano keys and wind instruments, and also for turnery, carvings, sculptures, cabinetmaking, marquetry and inlaying.

Macroscopic description

Vessels. Present, diffuse-porous. In radial multiples of 2 or 3 or even 4 or more. Tyloses absent. Deposits present. Scalariform perforation plates with < 10 bars sometimes present. Vessel diameter 50-200 µm.

Axial canals. Absent.

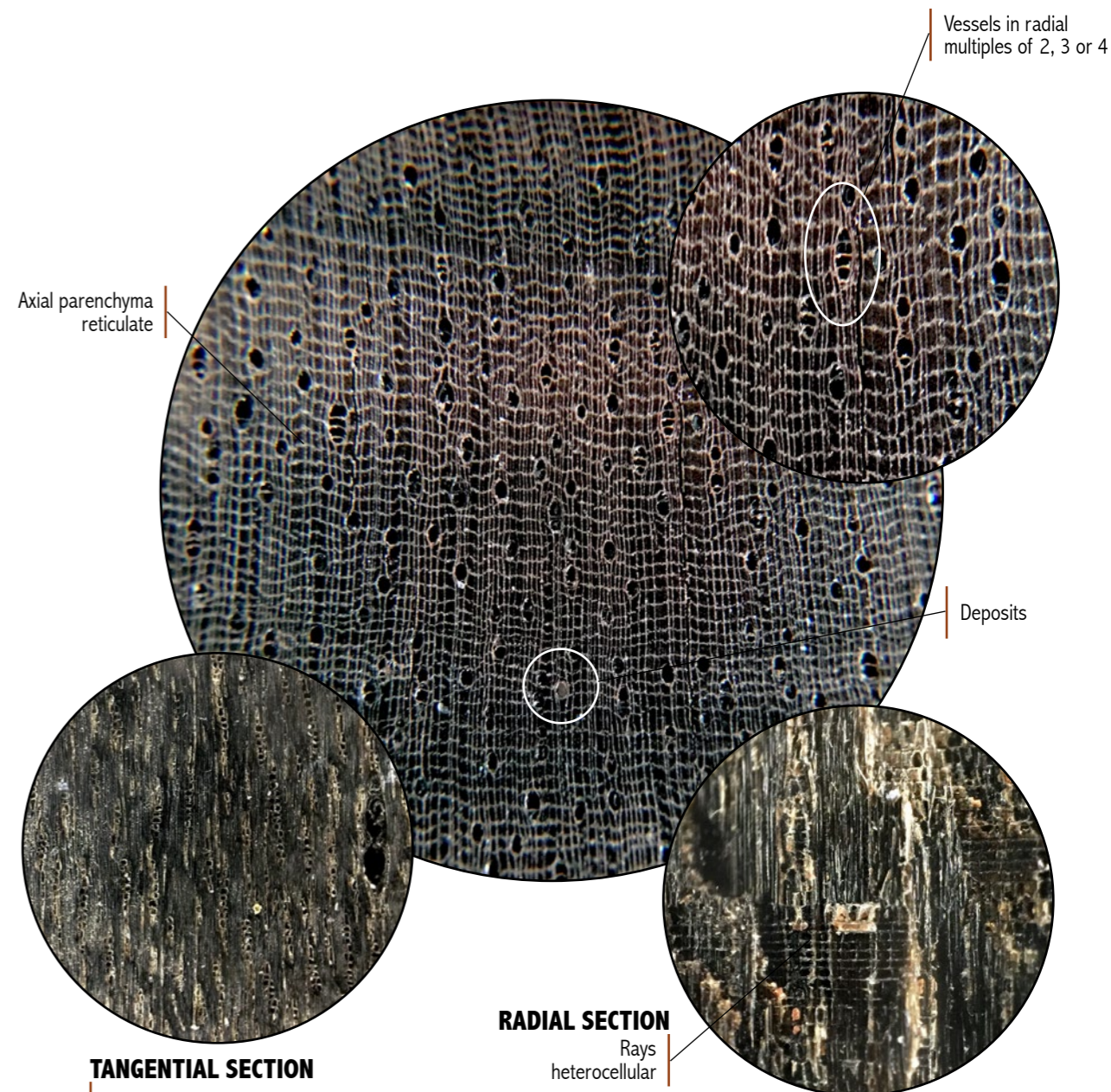
Axial parenchyma. In narrow bands, marginal and not marginal, forming a reticulate pattern with rays. Also diffuse-in-aggregates. Scanty vasicentric very scarce.

Rays. Narrow. Uniseriate. Sometimes 1 to 3 cells wide. Heterocellular with square and upright marginal cells. Ray height < 1 mm. Not storied. *D. sakalavarum* storied.

Other. Heartwood not fluorescent. Water and ethanol extract not fluorescent. Froth test negative.



TRANSVERSE SECTION



TANGENTIAL SECTION

Rays not storied

RADIAL SECTION

Rays heterocellular

Diospyros L.

Ebenaceae



CITES. Appendix II

Mahogany

Swietenia humilis Zucc.,
S. macrophylla King, *S. mahagoni* (L.) Jacq.
Meliaceae



Acajou, acajou Amerique, acajou de Cuba, acajou des Antilles, acajou du Honduras, acajou du Mexique, acajou du Venezuela, adoa, aguano, aguano de Tabasco, aguano venezolano, almendro, American mahogany, antillen, antillen-mahagoni, aquano de Tabasco, ara putange, bastard lime, baywood mahogany, Belice mahogany, bigleaf mahogany, Brasiliaans mahonie, Brazilian mahogany, British Honduras mahogany, broadleaf mahogany, cabano, caoba, caoba americana, caoba brasileña, caoba de Centro América, caoba de Cuba, caoba de hoja ancha, caoba de Honduras, caoba de Venezuela, caoba del Atlántico, caoba del Pacífico, caoba del sur, caoba dominicana, caoba española, caoba mexicana, caoba roja, caobilla, caobo, caobo venadillo, cèdre des Antilles, cedro carmesi, cedro cebollo, cedro espinoso, cedrus mahogany, chacalte, chiculture, civit, coabilla, cóbano, Costa Rica mahogany, crura, Cuban mahogany, curlet mahogany, dai ngua, Dominican mahogany, flor de venadillo, Florida mahogany, gateado, giai ngua, granadillo, grootblad-mahonie, guano, Guatemalan mahogany, guayacach, Honduras mahogany, Jamaican mahogany, kanak-ché, mabu, macchochuc-quiui, madeira, mahog, mahogany du Honduras, mahogany grandes feuilles, mahok, mahoni besar daun, mahonie, mahonijboom, ma-hu, majaine, mara amarilla, mara blanca, mara boliviana, mara colorado, maraacedrada, marabarsina, mararoria, Mexican mahogany, moakumi, mogano di Cuba, mogno, mogu, mova, Nicaraguan mahogany, oruba, orura, palo zopilote, Panama mahogany, Peruvian mahogany, punab, rosadillo, sabica, sapatón, small-leaf mahogany, sopilocuahuilt, Spanish mahogany, tabasco mahogany, tsulsul, tzopilco-cuahuilt, tzopilote, venadillo caoba, Venezuelan mahogany, yulu, zapatón, zopilote.

Distribution

Swietenia Jacq. comprises three species, all of which are listed in CITES: *S. humilis* (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama); *S. macrophylla* (Belize, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Peru, Venezuela); and *S. mahagoni* (Bahamas, Caicos Islands, Cayman Islands, Cuba, Dominican Republic, Florida, Haiti, Jamaica and Turks).

Features

Sapwood and heartwood different in colour. Sapwood yellowish brown and heartwood reddish brown. Growth ring boundaries distinct, demarcated by axial parenchyma in marginal bands. Moderately soft to moderately hard, and light to medium weight. Indistinct odour.

Uses

Since the first half of the 16th century, probably the most highly valued wood for cabinetmaking. Used in high-end furniture and cabinetmaking, decorative veneer, interior and exterior carpentry, shipbuilding, turnery, carvings and sculptures, sports equipment, tool handles, musical instruments and firearm butts.

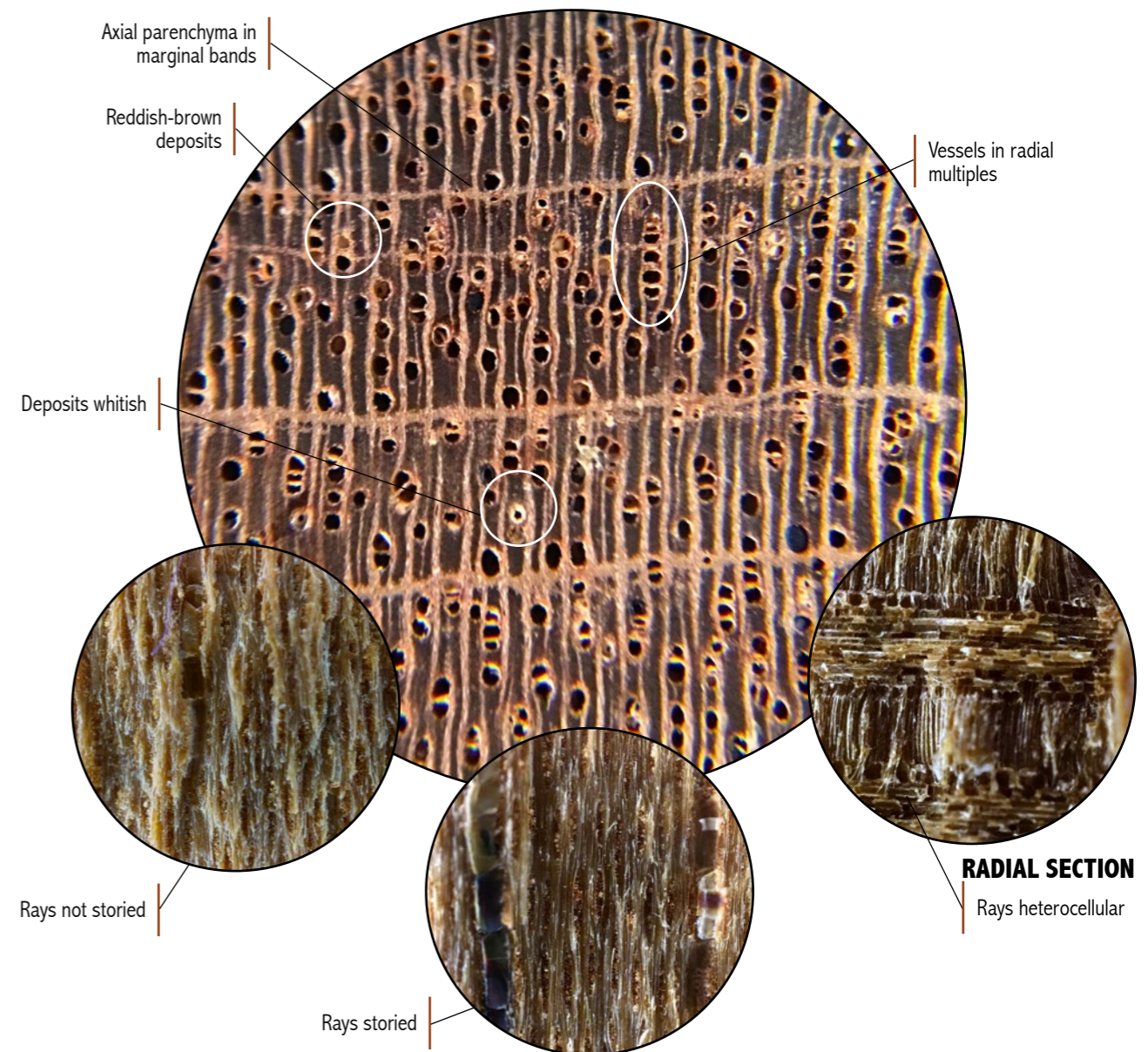
Macroscopic description

Vessels. Present, diffuse-porous. Visible without lens. Normally in radial multiples of 2 or 3. Tyloses absent. Deposits reddish-brown, sometimes whitish. Vessel diameter 100-200 µm.
Axial canals. Absent, but there may be traumatic axial canals in tangential bands.
Axial parenchyma. Marginal, visible without lens, and scanty vasicentric paratracheal, visible with lens.
Rays. Narrow, 3 to 5 cells wide, visible without lens. Heterocellular. Ray height < 1 mm. Storied or not storied.
Other. Heartwood not fluorescent. Water extract not fluorescent. Ethanol extract fluorescent. Froth test positive.



Swietenia mahagoni

TRANSVERSE SECTION



TANGENTIAL SECTION

Swietenia humilis Zucc., *S. macrophylla* King, *S. mahagoni* (L.) Jacq.
Meliaceae

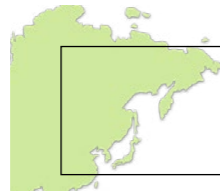


CITES. Appendix III

Mongolian oak

Quercus mongolica Fisch. ex Ledeb.
Fagaceae

Meng gu li, Mongolische Eiche, mongori nar, roble mongol.



Distribution

Quercus L. is a genus widely distributed in temperate forests of the northern hemisphere, reaching as far as Colombia and Malaysia. It has 456 accepted species, but only one, *Q. mongolica* is listed in CITES, creating a problem for anatomical identification.

Species distributed in northern temperate forests of Asia: eastern Russia, China, Korean Peninsula, Japan and Mongolia.

Features

Sapwood yellowish and heartwood dark brown. Growth ring boundaries distinct, demarcated by diameter of earlywood vessels. Wood moderately hard and medium weight. Indistinct odour.

Uses

Posts, sports equipment, boats, vehicles, farming tools, bridges and barrel making (Groves and Rutherford, 2015), furniture and flooring.

Macroscopic description

Vessels. Present, ring-porous. In radial multiples of 2 or 3 or even 4 or more. Tyloses often present. Deposits absent. Vessel diameter > 200 µm.

Vasicentric tracheids. Present.

Axial canals. Absent.

Axial parenchyma. In narrow bands, marginal and not marginal, forming an irregular scalariform or reticulate pattern with rays. Also diffuse-in-aggregates.

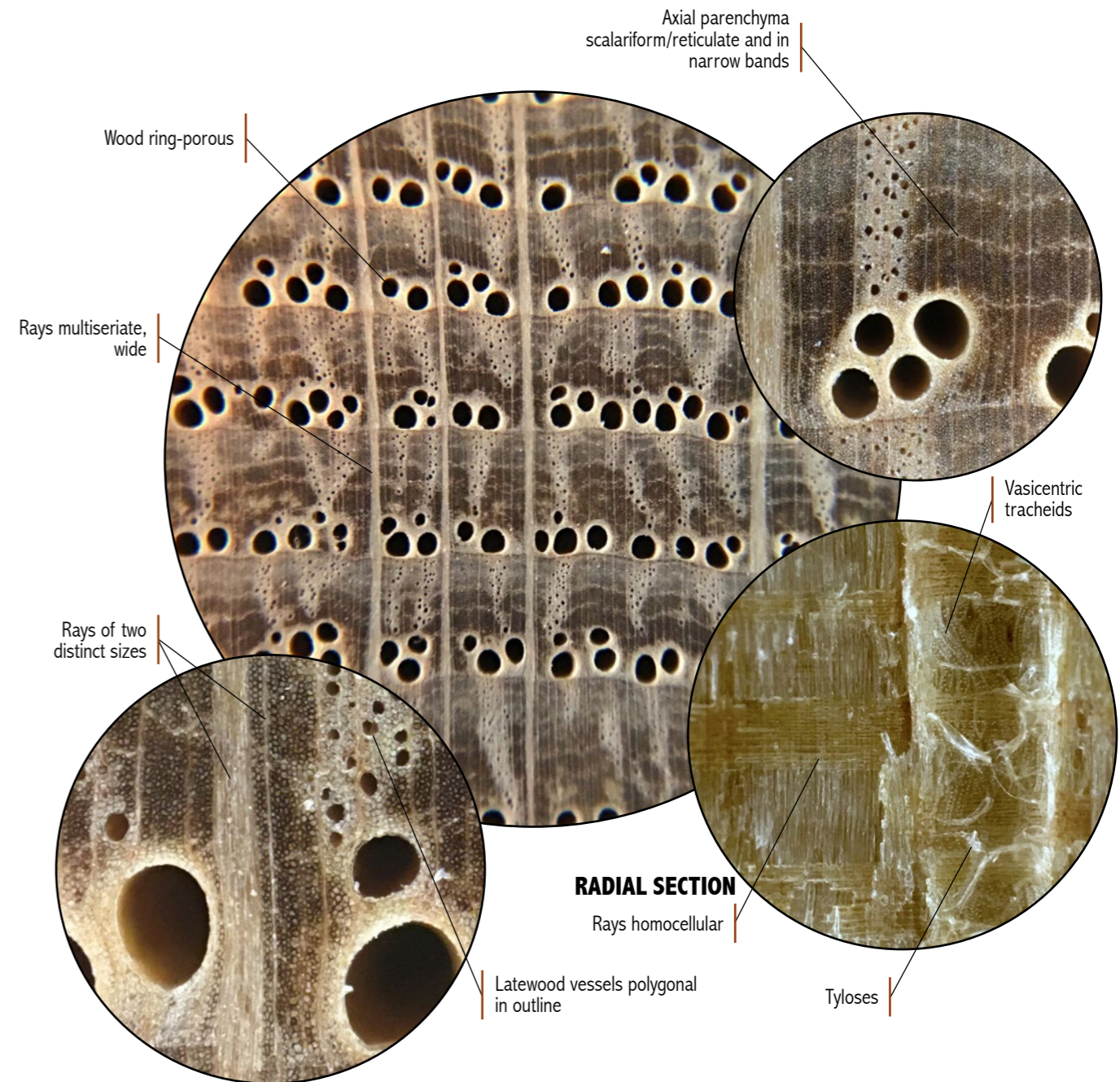
Rays. Wide. Of two distinct sizes. Multiseriate rays of 8 to 20 cells, forming silver grain in radial section. Homocellular with procumbent cells. Ray height > 5 mm or even centimetres high. Not storied.

Other. Heartwood not fluorescent. Water and ethanol extract not fluorescent. Froth test positive.



Quercus mongolica Fisch. ex Ledeb. on Shkot Island – Russia

TRANSVERSE SECTION



Quercus mongolica Fisch. ex Ledeb.
Fagaceae



CITES. Appendix II

Pau rosa

Aniba rosodora Ducke
Lauraceae

Bois de rose femelle, bois de rose, Brazilian rosewood, cara-cara, palo de rosa, palo rosa, pau rosa imbaúba, pau rosa itaúba, pau rosa mulatinho, pau rosa verdadeiro, rosewood.



Distribution

The genus *Aniba* Aubl. comprises 49 species, naturally distributed in the region of the Caribbean and tropical South America. Only *A. rosodora* is listed in CITES (Brazil, Colombia, French Guyana, Guyana, Peru, Suriname, Venezuela). Tree up to 25 m in height and 0.5 m in diameter.

Features

Sapwood and heartwood different in colour. Sapwood yellowish and heartwood orange brown, coffee brown, yellowish, even greenish. Growth ring boundaries distinct or indistinct. Wood soft and light weight. Characteristic odour. Aromatic.

Uses

Wood distilled for its aromatic oil, which is highly valued in the manufacture of high-end perfumes, for aromatherapy and for added scent in toiletries such as soap (Groves and Rutherford, 2015). It has also been used for boat building, furniture, flooring, turnery and tool handles.

Macroscopic description

Vessels. Present, diffuse-porous. In radial multiples of 2 or 3. Tyloses common. Deposits absent. Scalariform perforation plates with < 10 bars sometimes present, or with 10 to 20 bars. Vessel diameter 100-200 µm.
Axial canals. Absent.
Axial parenchyma. Scanty and vasicentric paratracheal.
Rays. Narrow. 1 to 3 cells wide. Heterocellular. Ray height < 1 mm. Not storied.
Other. Oil cells associated with axial parenchyma. Heartwood not fluorescent. Water extract fluorescent. Ethanol extract not fluorescent.



TRANSVERSE SECTION

Tyloses

RADIAL SECTION

Oil cells associated with axial parenchyma

TANGENTIAL SECTION

Rays heterocellular

Aniba rosodora Ducke
Lauraceae



CITES. Appendix II

Pernambuco

Paubrasilia echinata (Lam.) Gagnon, H.C. Lima & G.P. Lewis
(Syn.- *Caesalpinia echinata* Lam.)
Fabaceae (Leguminosae)

Arabutá, Bahia wood, bois de Brésil, bois de fernambouc, brasilete, Brazilwood, bresija, echtes Brasilholz, ibirapitanga, legno del Brasile, legnorosso, palo Brasil, palo de Brasil, Para wood, pau Brasil, pau Brazil, pau de Pernambuco, pau vermelho, pau-Pernambuco, Pernambouc, Pernambuco wood, Rotholz, tupi, violinbow wood, ybyrapytã.



Distribution

Caesalpinia L. originally comprised 161 species, but since its first description in 1753 it has been divided into 30 different genera. Today *Caesalpinia echinata* is called *Paubrasilia echinata* (Lam.) Gagnon, H.C. Lima & G.P. Lewis (Gagnon et al., 2016), forming a monospecific genus. Tree or shrub around 12 m in height, although individuals of up to 30 m have been reported (Fern, 2014). Native of the Brazilian Atlantic forest.

Features

Sapwood yellowish and heartwood dark/coffee brown. Fresh wood orange brown. Growth ring boundaries indistinct. Wood very hard and very heavy weight. Indistinct odour.

Uses

Species exploited for more than 500 years for its dye, until it was replaced by synthetic dyes in the mid 19th century (Fern, 2014). It has been used for exterior and interior carpentry, wood veneer for decorative panelling, cabinetmaking, railway sleepers, marine pilings, shipbuilding, turnery and, since the late 18th century, to manufacture violin bows, for which it is currently the most valued wood.

Macroscopic description

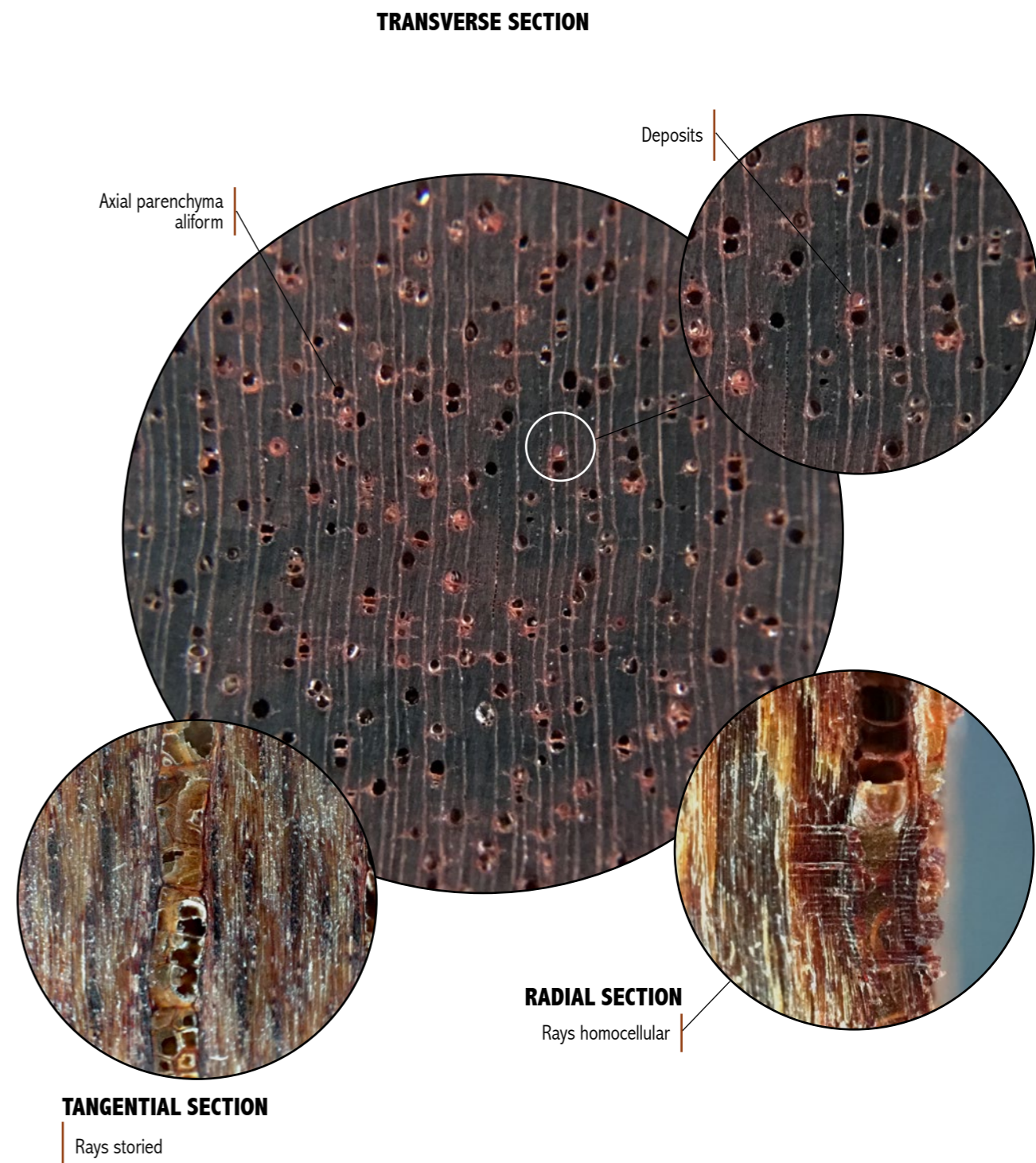
Vessels. Present, diffuse-porous. In radial multiples of 2 or 3. Tyloses absent. Deposits present. Vessel diameter 50-100 µm, sometimes 100-200 µm.

Axial canals. Absent.

Axial parenchyma. In narrow bands seemingly marginal. Also vasicentric, lozenge-aliform and confluent.

Rays. 1 to 3 cells wide. Homocellular with procumbent cells. Ray height < 1 mm. Storied or not storied.

Other. Heartwood fluorescent. Water and ethanol extract fluorescent.



Paubrasilia echinata (Lam.) Gagnon, H.C. Lima & G.P. Lewis
Fabaceae (Leguminosae)



CITES. Appendix II

Ramin

Gonystylus Teijsm. & Binn.

Thymelaeaceae

Ahmin, ainunura, akenia, amin batu, ampudji, bagyo, balet, balun kulit, batu raja, engol, bermiang, dukun, fungunigalo, gaharu buaja, gaharu, gaheu, garu, garu buaja, gatal, geharu, geronggang, kajo churo, kajoe garoe, kaka, kayu garu, kayu liah, kayu minya, lamin ngalang, lantunan-bagio, lantunan-bagyo, lanutan, lanutanbagio, lanutan-bagyo, lapis kulit, latareko, letung, lunak, matakeli, mavota, medang keram, medang keran, medang ramuan, melawis, merang, nasi nasi, nununa, pagatutup, paliu, petata, pinang bai, pulau miyang, ramin, ramin batu, ramin melawis, ramin telur, sambulauan, sang su, sendaren, seriangun, setalam, sirantih kunyi, tebakau putih.



Distribution

Gonystylus Teijsm. & Binn. comprises 32 species, distributed in Southeast Asia to the southwest Pacific (Borneo, Java, Malaysia, New Guinea, Nicobar Islands, Solomon Islands, Sulawesi Islands, Sumatra).

Features

Sapwood and heartwood similar in colour (yellowish). Growth ring boundaries indistinct. Wood moderately soft and medium weight. Fresh or remoistened wood has unpleasant odour. All the woods of the genus are similar.

Uses

Wood used in wide range of items. Curtain rods, brushes, interior carpentry (mouldings, skirting board, flooring), exterior carpentry (shutters and slatted louvre wooden doors), wood veneer for decorative panelling, cots, cabinetmaking, furniture, sports equipment, toys, broom handles, tool handles, umbrella poles, picture frames, technical drawing implements, slatted wooden blinds, paint brushes, plywood and turnery.

Macroscopic description

Vessels. Present, diffuse-porous. Not visible without lens. Normally in radial multiples of 2, 3 or 4. Tyloses absent. Gum deposits absent or rare. Vessel diameter 100-200 µm.

Axial canals. Absent.

Axial parenchyma. Winged-aliform and confluent.

Rays. Narrow, uniseriate. Homocellular with procumbent cells. Sometimes heterocellular with one or two rows of upright or square marginal cells. Ray height < 1 mm. Not storied.

Other. Heartwood not fluorescent. Water and ethanol extract not fluorescent. Froth test positive.



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TRANSVERSE SECTION

Axial parenchyma winged-aliform

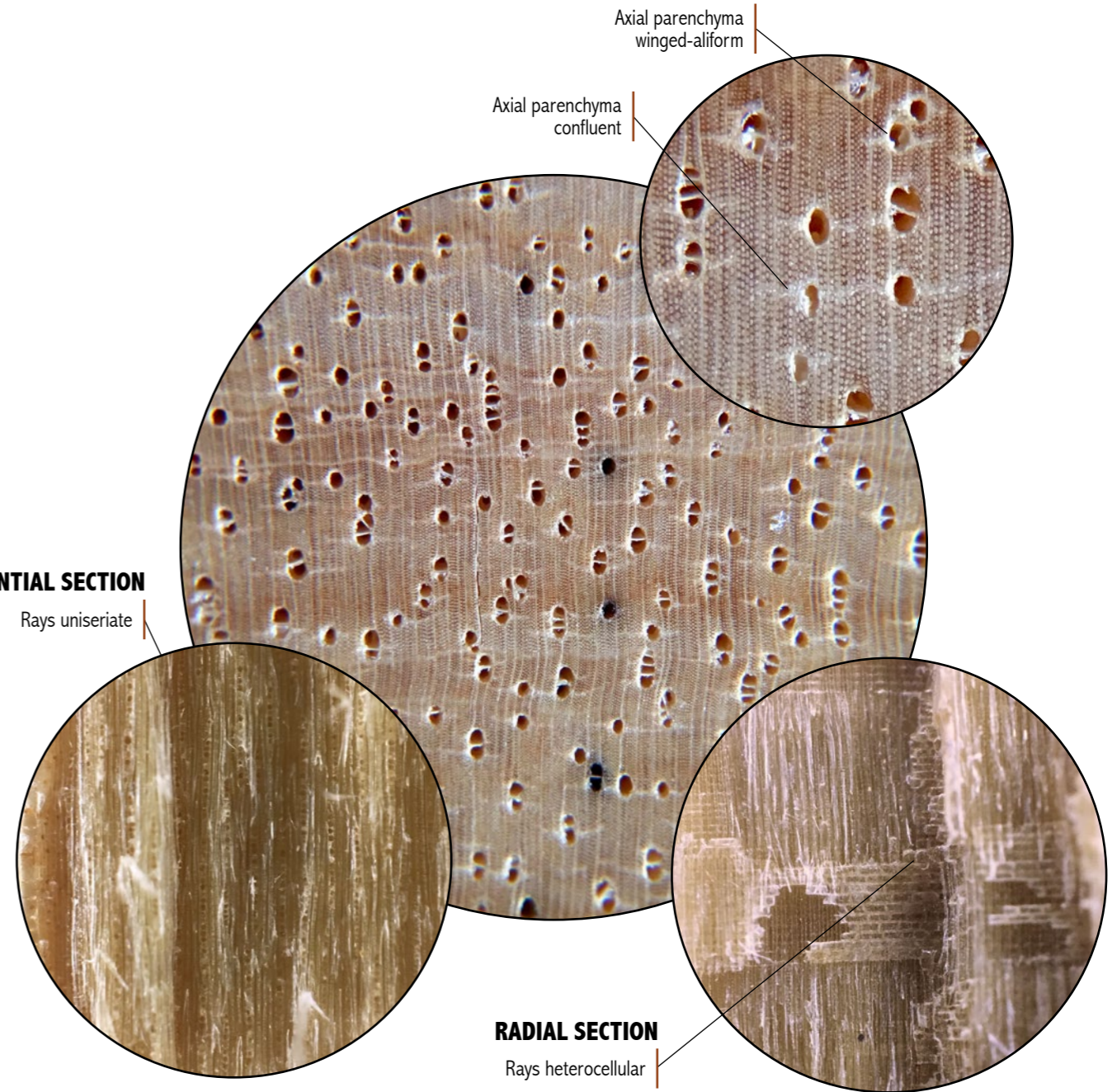
Axial parenchyma confluent

TANGENTIAL SECTION

Rays uniseriate

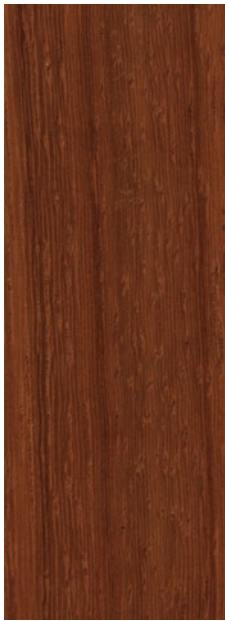
RADIAL SECTION

Rays heterocellular



Gonystylus Teijsm. & Binn.

Thymelaeaceae



CITES. Appendix II

Red sandalwood

Pterocarpus santalinus L.f.

Fabaceae (Leguminosae)

Agaru, agarugandhamu, algum, almug, atti, bois de caliatour, Caliaturholz, chandaman, East Indian sandalwood, faux santal rouge, hone, India sandalwood, Kaliaturholz, lal chan, lal chandan, natha-ni, onecht sandelhout, panaka, patrangam, ragat chandan, rakta chandana, raktachandan, raktagandhamu, ratanjali, red sanders, red sanderswood, red saunders, rotes Sandelholz, rott sandeltra, rubywood, rukhto chandan, sandal rouge, sándalo rojo, sandalo rosso, saunderswood, sivappu, tilaparnni, undum, yerra chandanam.



Distribution

Pterocarpus Jacq. is a widely distributed genus with 41 accepted species, native to tropical and temperate Asia, the Pacific, Africa, Central America and South America. Three species are listed in CITES: *P. santalinus*, native to India; *P. erinaceus*, distributed in Benin, Burkina, Cameroon, Central African Republic, Chad, Ivory Coast, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo; and *P. tinctorius*, native to Angola, Congo, Malawi, Mozambique, Tanzania, Zaire and Zambia.

Features

Sapwood and heartwood different in colour. Sapwood yellowish brown and heartwood dark reddish brown. Growth ring boundaries indistinct. Wood medium weight and moderately hard. Indistinct odour. Wood very similar to *Dalbergia*.

Uses

Used to make traditional instruments and name seals in Japan. The red pigment extracted from this species is used as a dye and colouring agent in cosmetics, pharmaceutical preparations and food items. Highly prized in China for luxury furniture manufacture.

Macroscopic description

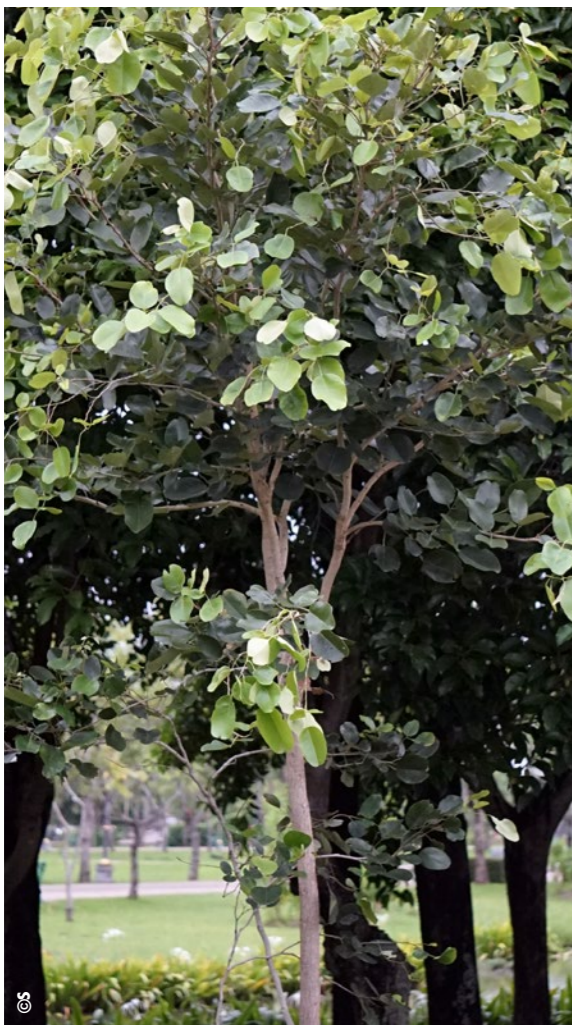
Vessels. Present, diffuse-porous, sometimes semi-ring-porous. In radial multiples of 2 or 3. Tyloses absent. Deposits abundant. Vessel diameter 100-200 µm or even more than 200 µm.

Axial canals. Absent.

Axial parenchyma. In bands not only marginal, more than three cells wide. Paratracheal winged-aliform and confluent.

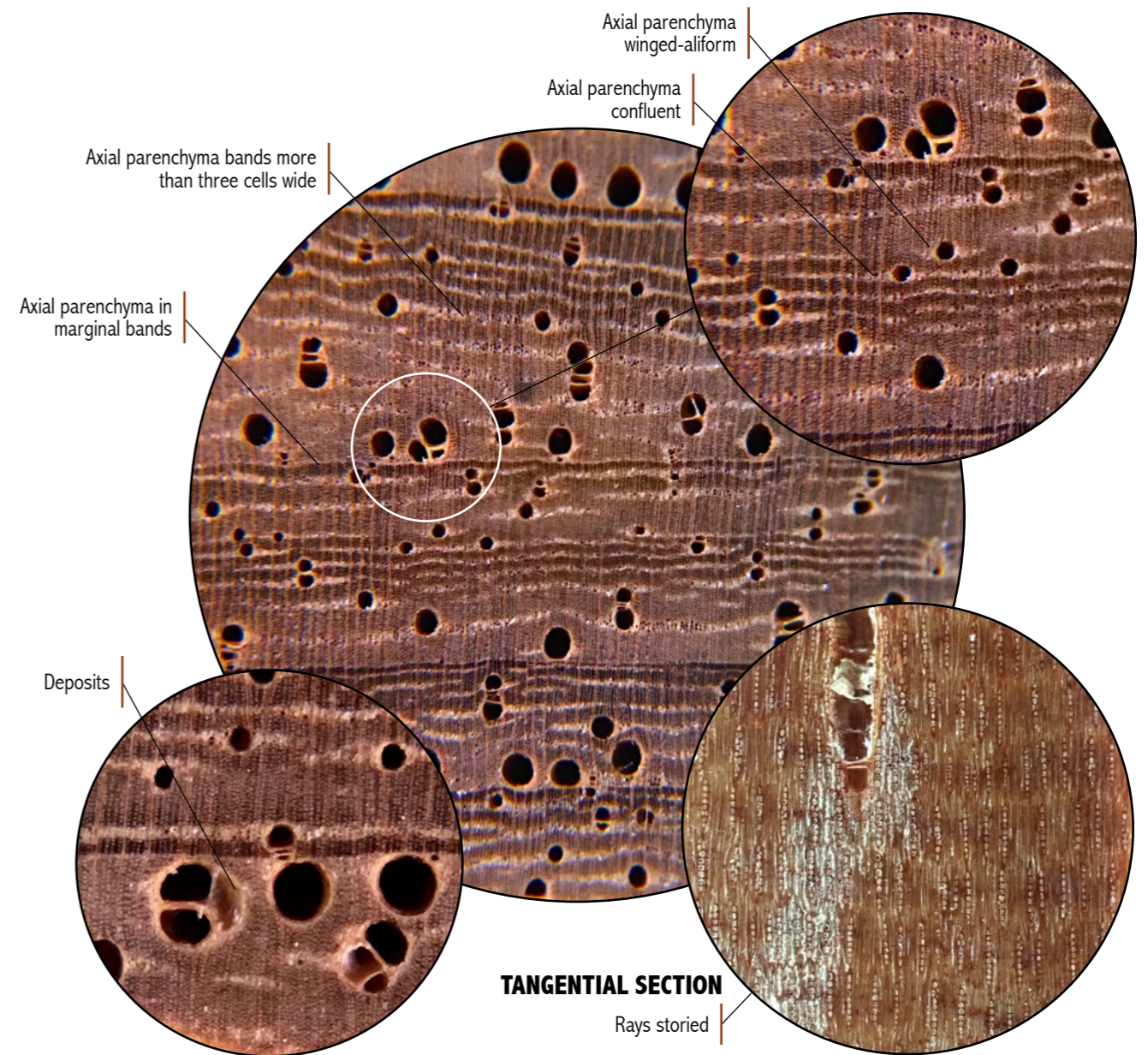
Rays. Very narrow. Exclusively uniseriate, sometimes partially biseriate of the same width. Homocellular with procumbent cells. Ray height < 1 mm. Storied.

Other. Heartwood not fluorescent. Water and ethanol extract fluorescent. Froth test positive.



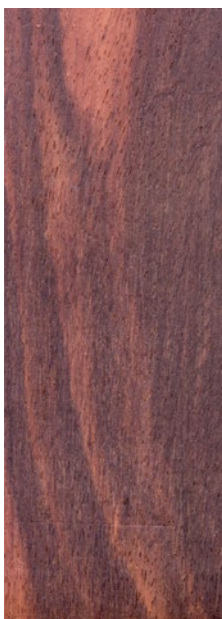
Pterocarpus santalinus

TRANSVERSE SECTION



Pterocarpus santalinus L.f.

Fabaceae (Leguminosae)



Rosewood

Dalbergia L.f.

Fabaceae (Leguminosae)

***D. latifolia*:** Beete, bhotheula, bide, biti, black rosewood, blackwood, Bombay blackwood, chava, east Indian, rosewood, eravadi, eruvadi, Indian blackwood, Indian palisandre, Indian rosewood, Indisches Rosenholz, Indischer Rosenholzbaum, Indonesian rosewood, iridi, itti, Java palisandre, Java palisander, kalaruk, karundoviral, malabar rosewood, malabar, Ostindisch Palisander, Palisander Kalaruk, palisandre de l'Inde, palissandre Asie, palissandre d'Asie, palissandre de l'Inde, palkonda, pallisander, reddish-brown rosewood, roseta rosewood, rosewood, satsal, shima, shisham, shishapa, sisso, sitsal, sonkeling, sonobrits, sonokeling, sonosungu, swetasal. ***D. melanoxylon*:** African blackwood, African ebony, African grenadillo, African grenadilo, Afrikanisches grenadill, atiyi, babanus, babanusi, banbanus, Chinese blackwood, dialâban, East African blackwood, ebene, ebene du Mozambique, ébène du Sénégal, granadilla, granadille d'Afrique, granadillo africano, grenadilla, grenadille d'Afrique, mekelete, moghano, Mozambique ebony, mpingo, mufunjo, mugembe, mukelete, pau preto, poyi, Senegal ebony, sibbe, Sudan ebony, zebra wood. ***D. nigra*:** Acaranda preto, Bahia rosewood, bois de rose, Brazilian rosewood, Brasilianisches Rosenholz, Brasiliansk palisander, cabiuna, cabiuna do mato, cabiuna parda, cabiuna preta, cabiuna rajada, cabiuna roxa, cabiuva, cabeuna, camboré, camboriuna, caviuna legitima, caviuva, cebeuna, gabiuna, graúna, jacaranda, jacaranda branco, jacaranda caviuna, jacaranda cipo, jacarandá da Bahia, jacaranda de Brasil, jacarandá

CITES. Appendix I y II

de Indios, jacaranda Holtz, jacaranda mullato, jacarandá negro, jacaranda pardo, jacaranda preto, jacaranda rosa, jacaranda tan, jacaranda violeta, jacarandá-da-baía, jacarandá-do-brasil, jacarandá-una, jacaranda-wood, jacarandazinho, legno di jacaranda, mader de palisandro, marmut, obuina drago, obuina, palisander, palisander-wood, palisandro, palisandro de Rio, palissander Rio, palissanderhout, palissandre de rio, palissandre du Brésil, palissandre Rio, palissandre, palissandro, pallisandro de Rio, pallisandro, palo de rosa, pao rosa, pau preto, pau rosa, piano wood, pianowood, purpurhout, Rio jacarandá, Rio palisander, Rio palissander, Rio rosewood, Rosenholz, rosewood, rozenhout, saborana, trac den, tulipwood, urauna, uraúna, white rosewood, xim quat. ***D. retusa*:** Black rosewood, caviuna, cocobola, cocobolo nambar, cocobolo negro, cocobolo prieto, Cocoboloholz, ed foxwood, Foseholz, funera, funera, funeram, granadillo, granadillo de chontales, granadillo morado, Jacarandaholz, manarizoby, namba, nambar de agui, nambar legitimo, nambar, Nicaraguan cocobolo, Nicaraguan rosewood, ñambar, ñambar legitimo, palisander, palisandre, palissandre cocobolo, palissandro, palo negro, palosanto de Nicaragua, pau preto, prieto, rosewood, tampizarán, urauna, yellow rosewood. ***D. sissoo*:** Agarú, aguru, biradi, biridi, Bombay blackwood, dalbergia, du-khaek, elondo, gette, Indian rosewood, irugudujava, jag, kara, kattai, nukku, palissandre, pradu-khaek, sheesham, shinshapa, shishu, shisu, sisam, sisau, siso, sissai, sissau, sisso, sissoo, sissu, sisu, sisuitti, sonosisso, sonowaseso, tahli, tali, yette. ***D. stevensonii*:** Belize rosewood, grenadillo rojo, Honduran rosewood, Honduras Palisander, Honduras rosewood, nogaed, hagaedwood, palissandre du Honduras, rosul.

DISTRIBUTION



Dalbergia L.f. is a genus with a very broad distribution, both tropical and subtropical.

It comprises 270 species of trees, shrubs and lianas occurring in tropical rainforests, seasonally dry tropical forests, subtropical humid forests and woodland (Groves and Rutherford, 2015).

Some species, such as *D. nigra* have been traded for more than 300 years, (Record and Hess, 1943).

Since 2017, all the species of the genus have been listed in CITES Appendix II, except *D. nigra*, which has been listed in Appendix I since 1992.

Highly prized quality timber for cabinetmaking, decorative wood veneer, marquetry, carvings, inlaying, furniture, turnery, sculptures, musical instruments (guitars, marimbas, pianos, xylophones) and boat interiors.

Large range of colours and streaks.

Wood anatomy alone cannot distinguish the species of this genus (Gasson et al., 2010). CITES listing of all the species of the genus has aided identification by customs officials and wood identification laboratories.

The wood of the genus *Dalbergia*, is generally recognisable

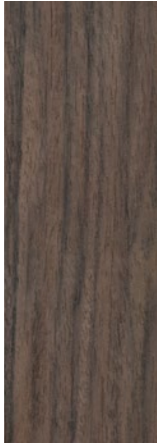

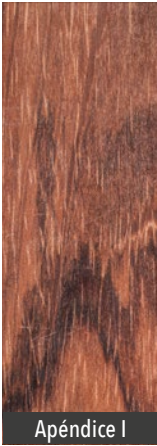
due to the presence of short, regularly storied rays, typically large vessels, abundance of diffuse and diffuse-in-aggregate axial parenchyma, and vestured pits (Gasson et al., 2010). This guide includes six commonly traded species of the genus *Dalbergia*.

Dalbergia cochinchinensis Pierre



Dalbergia cochinchinensis Pierre



Indian rosewood <i>Dalbergia latifolia</i> Roxb.	Grenadill <i>Dalbergia melanoxylon</i> Guill and Perr.	Brazilian rosewood <i>Dalbergia nigra</i> (Vell.) Allemão ex Benth.
FEATURES		
<p>Sapwood yellowish and heartwood dark brown, almost black, coffee brown and purplish, with marked streaks. Wood hard and heavy weight. Growth ring boundaries distinct or indistinct, sometimes demarcated by axial parenchyma in marginal bands and decreasing vessel diameter. Characteristic odour.</p> 	<p>Sapwood yellowish and heartwood almost black, similar to ebony. Wood very hard and very heavy weight. Growth ring boundaries distinct or indistinct, demarcated by axial parenchyma in marginal bands and larger vessel diameter. Indistinct odour.</p> 	<p>Sapwood yellowish brown and heartwood dark brown, almost black, coffee brown and purplish, with marked streaks. Wood hard and heavy weight. Growth ring boundaries distinct or indistinct. Characteristic odour, like vanilla.</p>  <p style="text-align: right;">Apêndice I</p>

MACROSCOPIC DESCRIPTION		
<p>Vessels Present, diffuse-porous, in radial multiples of 2 or 3, occasionally 4. Tyloses absent. Dark deposits present. Vessel diameter 100-200 µm.</p> <p>Axial canals Absent.</p> <p>Axial parenchyma In marginal or seemingly marginal bands, wider than rays. Paratracheal lozenge-aliform, winged-aliform and confluent.</p> <p>Rays Narrow, 1 to 3 cells wide. Visible with lens. Homocellular with procumbent cells. Ray height < 1 mm. Storied.</p> <p>Other Heartwood not fluorescent. Water extract fluorescent. Ethanol extract fluorescent. Froth test positive.</p>	<p>Vessels Present, semi-ring-porous to diffuse-porous, in radial multiples of 2, 3, 4 or more. Tyloses absent. Dark deposits present. Vessel diameter 50-200 µm.</p> <p>Axial canals Absent.</p> <p>Axial parenchyma In narrow bands, marginal and non-marginal, forming a reticulate pattern with rays. Scanty vascentric.</p> <p>Rays Narrow, 1 to 3 cells wide. Visible with lens. Homocellular with procumbent cells. Ray height < 1 mm. Normally storied.</p> <p>Other Heartwood not fluorescent. Water extract not fluorescent. Ethanol extract fluorescent. Froth test positive.</p>	<p>Vessels Present, diffuse-porous, in radial multiples of 2 or 3. Tyloses absent. Dark deposits present. Vessel diameter 100-200 µm.</p> <p>Axial canals Absent.</p> <p>Axial parenchyma In narrow bands, marginal and non-marginal. Diffuse-in-aggregates, vascentric, even slightly aliform.</p> <p>Rays Narrow, 1 to 3 cells wide. Sometimes exclusively uniseriate. Homocellular with procumbent cells, although in some samples rays are heterocellular with one row of upright or square marginal cells. Ray height < 1 mm. Normally storied.</p> <p>Other Heartwood not fluorescent. Water extract not fluorescent. Ethanol extract fluorescent. Froth test positive.</p>



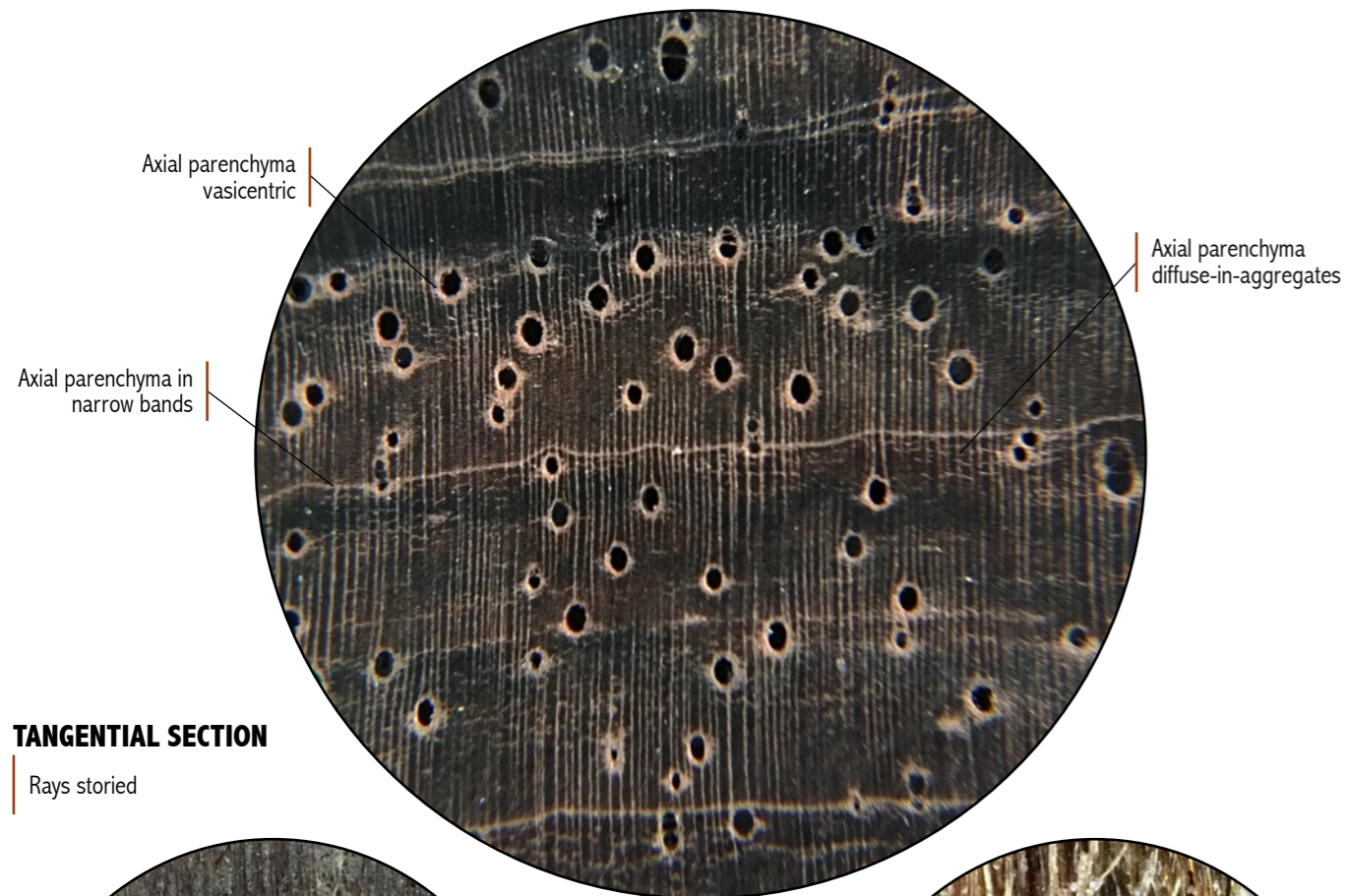
Cocobolo <i>Dalbergia retusa</i> Hemsl.	Shisham <i>Dalbergia sissoo</i> Roxb. ex DC.	Honduras rosewood <i>Dalbergia stevensonii</i> Standl.
FEATURES		
<p>Sapwood yellowish and heartwood reddish brown with marked streaks. Wood very hard and very heavy weight. Growth ring boundaries indistinct. Surface oily. Characteristic odour.</p> 	<p>Sapwood yellowish white and heartwood coffee brown with marked streaks. Wood hard and heavy weight. Growth ring boundaries indistinct. Indistinct odour.</p> 	<p>Sapwood yellowish or orange brown and heartwood dark brown, almost black, coffee brown and purplish, with marked streaks. Wood very hard and very heavy weight. Growth ring boundaries indistinct. Indistinct odour.</p> 

MACROSCOPIC DESCRIPTION		
<p>Vessels Present, diffuse-porous, in radial multiples of 2 or 3. Tyloses absent. Dark deposits present. Vessel diameter 100-200 µm.</p> <p>Axial canals Absent.</p> <p>Axial parenchyma Diffuse and diffuse-in-aggregates. In narrow bands, marginal and non-marginal, forming reticulate pattern with rays. Vascentric, aliform and confluent variable and very scarce.</p> <p>Rays Narrow, 1 to 3 cells wide. Sometimes exclusively uniseriate. Homocellular with procumbent cells, although in some samples rays are heterocellular with one row of upright or square marginal cells. Ray height < 1 mm. Normally storied.</p> <p>Other Heartwood not fluorescent. Water extract fluorescent. Ethanol extract fluorescent. Froth test positive.</p>	<p>Vessels Present, semi-ring-porous to diffuse-porous, in radial multiples of 2 or 3. Tyloses absent. Deposits whitish and dark. Vessel diameter normally >200 µm. Some samples 100-200 µm.</p> <p>Axial canals Absent.</p> <p>Axial parenchyma Diffuse-in-aggregates. In narrow bands, marginal and not marginal, wider than the rays. Paratracheal vascentric, lozenge-aliform, winged-aliform and confluent.</p> <p>Rays Narrow, 1 to 3 cells wide. Visible with lens. Homocellular with procumbent cells. Ray height < 1 mm. Storied.</p> <p>Other Heartwood not fluorescent. Water extract not fluorescent. Ethanol extract not fluorescent.</p>	<p>Vessels Present, diffuse-porous, in radial multiples of 2 or 3, occasionally 4 or more. Tyloses absent. Dark deposits present. Vessel diameter 100-200 µm.</p> <p>Axial canals Absent.</p> <p>Axial parenchyma Diffuse-in-aggregates. In narrow bands, marginal and non-marginal. Paratracheal scanty, vascentric, lozenge-aliform, and confluent.</p> <p>Rays Narrow, 1 to 3 cells wide. Visible with lens. Homocellular with procumbent cells. Ray height < 1 mm. Storied.</p> <p>Other Heartwood not fluorescent. Water extract fluorescent. Ethanol extract fluorescent. Froth test weakly positive.</p>



TRANSVERSE SECTION

Dalbergia nigra (Vell.) Allemão ex Benth.



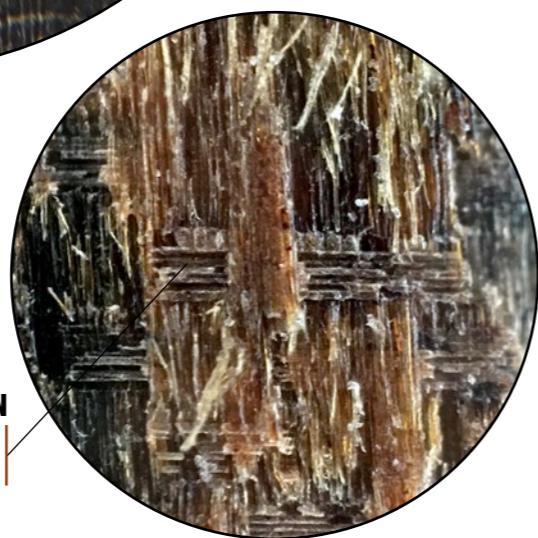
TANGENTIAL SECTION

Rays storied



RADIAL SECTION

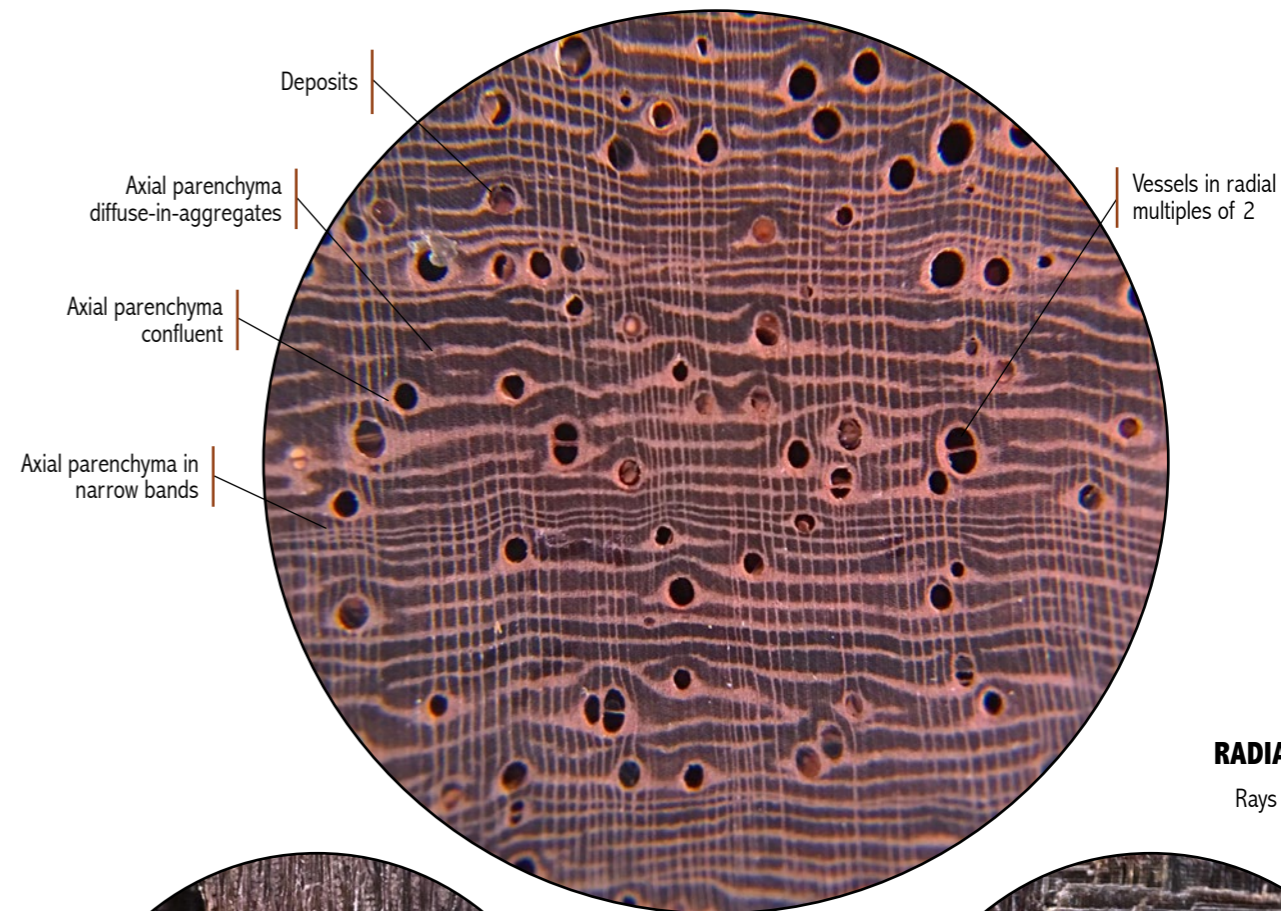
Rays heterocellular (sometimes present)



Dalbergia L.f.
Fabaceae (Leguminosae)

TRANSVERSE SECTION

Dalbergia stevensonii Standl.



RADIAL SECTION

Rays homocellular



TANGENTIAL SECTION

Rays storied



Dalbergia L.f.
Fabaceae (Leguminosae)



CITES. Appendix II

Spanish cedar



Cedrela P.Browne.
Meliaceae

Acajou, acajou rouge, acaju, acayú, akuyari, aluk, atoreb, Barbados cedar, Belize cedar, Brazilian cedar, British Guiana cedar, British Honduras cedar, calicedra de las Antillas, calicedro, cedar, ceder, cèdra acajou, cédrat, cèdre d'Amérique Centrale, cèdre des Barbaies, cèdre rouge, cedrela, cedrela wood, cedro, cedro acajou, cedro amargo, cedro americano, cedro chino, cedro colorado, cedro de las Antillas y Barbadas, cedro de Las Barbares, cedro español, cedro macho, cedro macho de las Antillas, cedro oscuro, cedro real, cedro red, cedro rojo, cedro salteño, Central American cedar, chujte, cigarbox, cigarbox cedar, Colorado cedro, Cuban cedar, epi, Hondouras cedar, icte, Jamaican cedar, kalantas, kapere, koperi, kurama, Mexican cedar, Nicaragua cedar, parank, paranka, red cedar, rojas cedar, rosas cedar, South American cedar, Tabasco cedar, tiocuahuitl, Trinidad cedar, West Indian cedar, Westindische cedar, yalam.

Distribution

Cedrela P.Browne comprises 18 species, all of which are listed in CITES Appendix II. Distribution range: Argentina, Belize, Bolivia, Brazil, Caribbean, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Guianas, Haiti, Honduras, Jamaica, Leeward Islands, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Suriname, Trinidad and Tobago, Uruguay, Venezuela and Windward Islands.

Features

Wood very similar to two other genera of Meliaceae, *Swietenia* Jacq. and *Toona* M.Roem. Sapwood yellowish brown and heartwood reddish brown. Growth ring boundaries distinct, demarcated by axial parenchyma in marginal bands. Wood soft and light weight. Characteristic odour. Aromatic.

Uses

Highly valued for cabinetmaking and quality furniture, musical instruments, panelling, cigar boxes, sculpture, veneer, interior carpentry and boat interiors.

Macroscopic description

Vessels. Present, diffuse-porous. Visible without lens. Numerous. Normally solitary, sometimes in radial multiples of 2 or 3. Tyloses absent. Gum deposits abundant. Vessel diameter 100-200 µm.

Axial canals. Absent, but there may be traumatic canals arranged in tangential bands.

Axial parenchyma. In wide marginal bands visible without lens, also scanty vasicentric paratracheal.

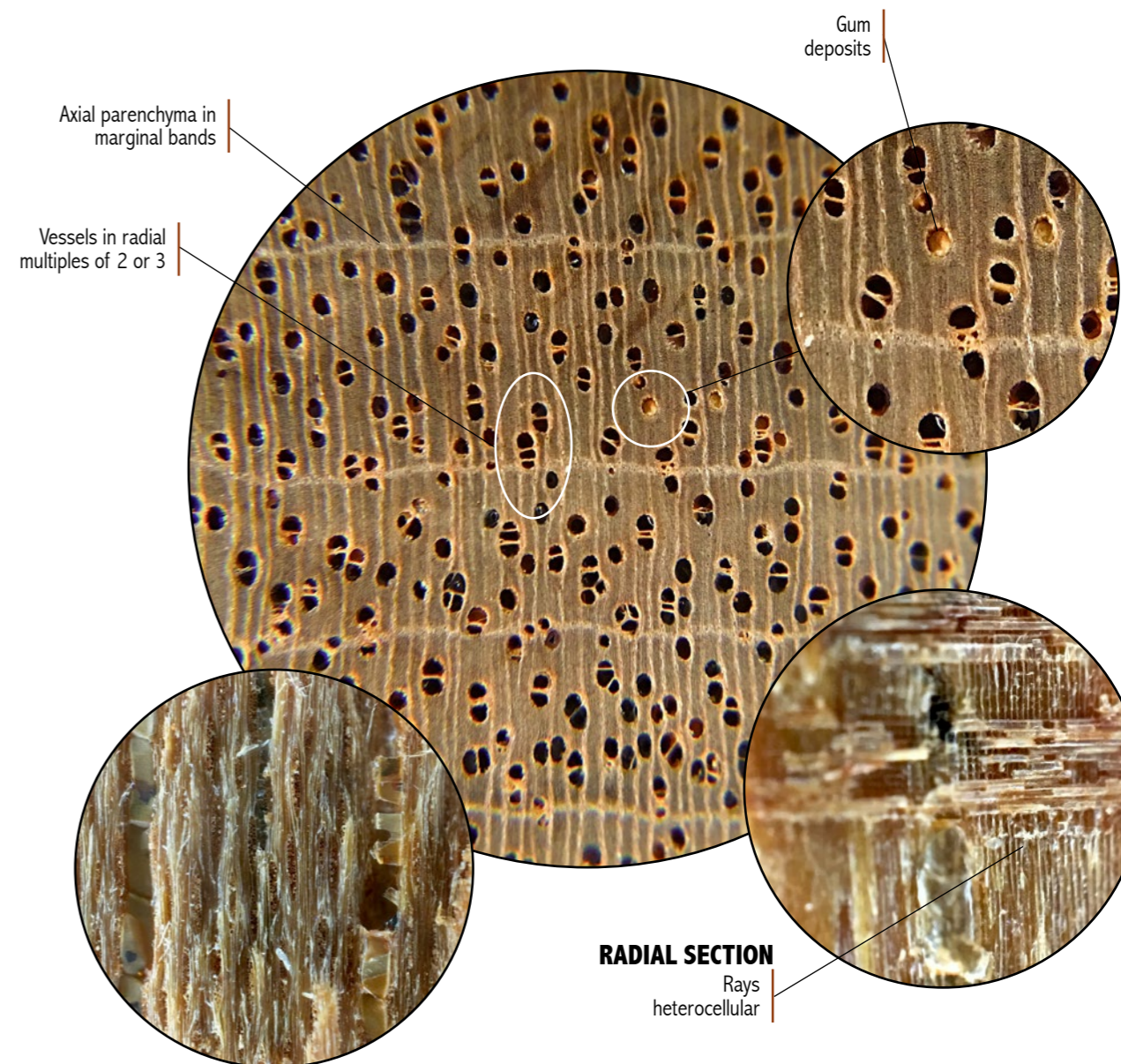
Rays. 2 to 5 cells wide, visible without lens. Heterocellular. Ray height < 1 mm. Not storied.

Other. Heartwood not fluorescent. Water extract not fluorescent. Ethanol extract fluorescent.



Cedrela odorata

TRANSVERSE SECTION



RADIAL SECTION

Rays heterocellular

TANGENTIAL SECTION

Rays not storied

Cedrela odorata L.
Meliaceae

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 Macrograph of oil cells associated with axial parenchyma of
 Aniba rosodora Ducke - Lauraceae - (Luis García Esteban)



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