SERVICE
Wood Biology

OUR REFERENCE
exp_468

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Hästö-Busö cargo

DATE
04-12-2023

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CONCERNS
IDENTIFICATION AND SUPPLEMENTARY INFORMATION OF RARE WOOD IN CARGO HISTORICAL SHIPWRECK

ENFORCE – Centre for Forensic Wood Research

Report Expertise

This report concerns the macro- and microscopic wood identification of the sample recieved with references listed below.

Reference: exp_468
Date recieved: 07-11-2023
Date report: 04-12-2023

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Sample Description

The sample is a small wood block that was part of a cargo. The shipwreck with this cargo was probably submerged for more than 200 years in the Baltic Sea. The color of the wood is reddish and a Finnish wood anatomist suspects the sample might be *Haematoxylum campechianum* or a related species. We will identify this sample and collect supplementary references on the trade history of the identified species.

See picture(s):

Royal Museum for Central Africa
Service of Wood Biology
Leuvensesteenweg 13
3080 Tervuren, Belgium

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Treatment

A small cube of around 1 cm^3 was taken and softened in an oven at 70°C (ref. Lab Protocol). Thin sections were made in transversal, tangential and radial plane using a microtome. These were stained with Safranine 0 and Alcian Blue. The anatomical features (ref. IAWA List) were studied with an optical microscope and an electron microscope. These features were compared with reference material online (ref. InsideWood and Koddenberg *et al.* 2022) and in the xylarium of the Service of Wood Biology.

Anatomical Features and Identification Process

N° (IAWA)	Presence*	Feature Description
58	p	Gums and other deposits in heartwood vessels
69	a	Fibres thin- to thick-walled
70	p	Fibres very thick-walled
83	p	Axial parenchyma confluent
92	p	Four (3-4) cells per parenchyma strand
98	p	Larger rays commonly 4 - to 10 seriate
104	p	All ray cells procumbent
136	p	Prismatic crystals present
142	p	Prismatic crystals in chambered axial parenchyma cells
198	p	Heartwood basically red or shades of red

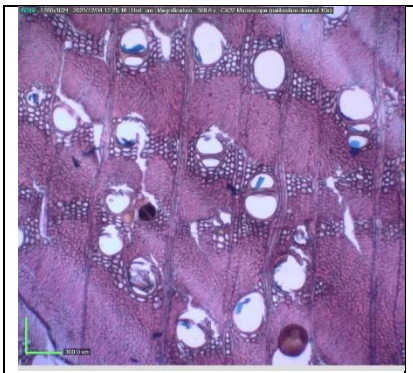
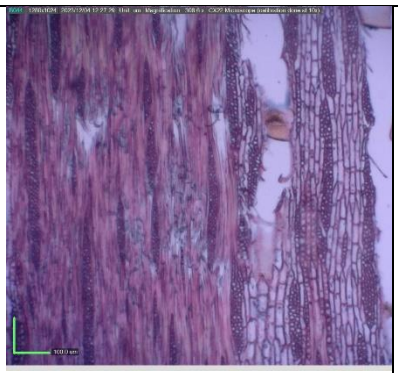
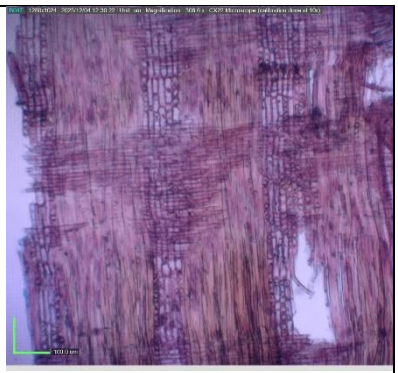
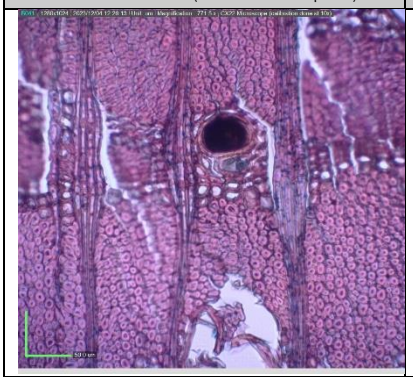
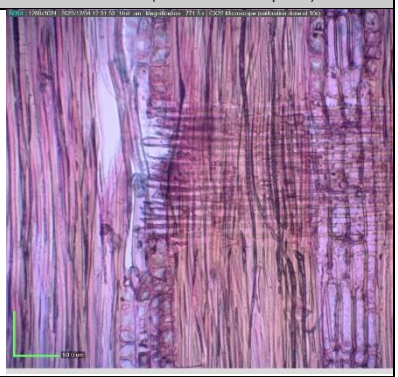
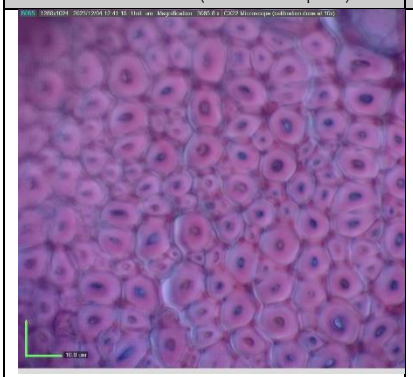
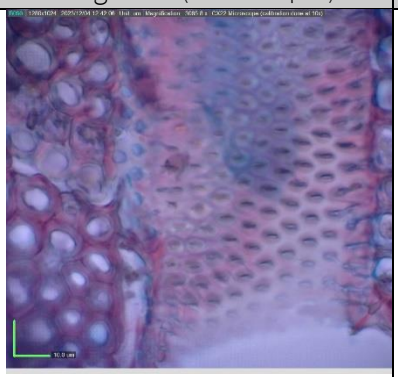
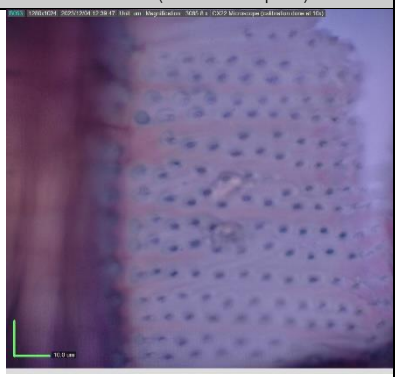
*(p = present, a = absent, v = variable)

Based on this combination of characteristics, InsideWood generated 12 possible species, all part of the *Leguminosae* family. Based on anatomical features of secondary importance, a shortlist of three possible species came up: *Haematoxylum campechianum*, *Peltogyne paniculata* (also known as 'purpleheart') and *Dichrostachys cinerea*. Wood samples and thin sections were available in the Tervuren Xylarium for all three species and were used for comparison with the sample:

- *Haematoxylum campechianum* corresponded very well, also showing the typical wavy parenchyma bands and lots of prismatic crystals in chambered axial parenchyma. Number of rays, size and density of wood vessels also matches with the three samples from the Tervuren Xylarium.
- *Peltogyne paniculata* is a possible candidate but has much more distinct rings, smaller rays and less banded parenchyma.
- *Dichrostachys cinerea* has a lot in common with the sample but has much less parenchyma and a different wood anatomical composition.

Bloodwood is also uses for other species like *Baloghia inophylla, Brosimum rubescens, Corymbia gummifera, Pterocarpus angolensis, Casuarina equisetifolia, Cyrilla racemiflora, Gordonia haematoxylon* or *Lagerstroemia speciosa* but those species all belong (apart from *P. angolensis*) to other botanical families and have very different wood anatomical features.

Microscopic Imagery

		
Transversal (scale 100 µm)	Tangential (scale 100 µm)	Radial (scale 100 µm)
		
Transversal (scale 50 µm)	Tangential (scale 50 µm)	Radial (scale 50 µm)
		
Transversal (scale 10 µm)	Tangential (scale 10 µm)	Radial (scale 10 µm)

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Conclusion and Supplementary Literature Study

The macroscopic and microscopic anatomical features of the sample fully correspond with the botanical species ***Haematoxylum campechianum*.** This species is the only of its genus that is also described within InsideWood. It is also mentioned as the only species of its genus that is spread over most of the tropics and traded significantly more than other species of its genus (Orwa *et al.* 2009; see also further down for the trade history).
The species is traded under commercial names like bloodwood, logwood or campeggio.
Thus the identification of our Finnish colleague-wood anatomist appears correct.

The genus of *Haemotoxylum* only contains five species, of which two are only recently described and one is African and not really documented in trade history:

- *H. campechianum*
- *H. brasiletto*
- *H. dinteri* (only species found in Africa (Namibia), the other four are found in tropical America)
- *H. calakmulense* (described in 2014)
- *H. sousanum* (described in 2008)

It remains difficult to deduct a delimited region of origin based on the identified species (apart from the African species off course), as e.g., herbarium specimens of *H. campechianum* and the quite recently described *H. calakmulense* are both found on the Mexican peninsula. Both species are also linked to warm and subhumid climate with a predominance of semi-evergreen forests. Plasencia Vázquez *et al.* (2017) indicate that many unexplored areas and information gaps on the species exist and need further research.

So *Haematoxylum campechianum* L. is native to Central America and has been known as dye source (called haematoxylin) since the prehistoric times by the Maya. The natives boiled the heartwood in water to extract haematoxylin and then let the solution to gradually oxidize under air. Haematoxylin and eosin is a staining method that dates back to the late 19th century and remains the most popular stain in histology today (Ortiz-Hidalgo & Pina-Oviedo 2018). Nowadays, bloodwood is increasingly used for plantations but its use for furniture, flooring, or fencing is only of regional importance (Koddenberg *et al.* 2022). The name of the species is derived from the State of Campeche in Mexico, where the species abundantly originates. The Maya called this wood Ek.

Spanish explorers were introduced to bloodwood by the Maya before 1525 and must have been familiar with its uses by the end of the sixteenth century (Ortiz-Hidalgo & Pina-Oviedo 2018). Even during the Chinese Ming and Qing Dynasty (from 14th century onwards), there is a possibility that *H. campechianum* is used as a foreign wood for producing dyes but further research is necessary for confirmation (using trading records and chemical analysis of dyes on historical Chinese textiles) (Han 2015).

Also pirates discovered that one shipload of logwood was equivalent to a year's value from any other cargo, and by 1563, more than 400 pirate vessels wandered the Atlantic Ocean and attacked Spanish galleons transporting gold, silver, and logwood from the Americas to Europe. According to Spanish calculations 300 000 quintals of logwood dye (1 quintal = 100 kg) were annually extracted by pirates to England. After countless struggles, fights, and battles for at least a century between the Spaniards and the English for maintaining the monopoly on the logwood industry in the Americas, the Spanish were ultimately forced to grant British settlers the right to occupy

the area of the Yucatan Peninsula and cut logwood in exchange for an end to piracy (Ortiz-Hidalgo & Pina-Oviedo 2018).

During the 17th century, important logwood plantations spread across Mexico, Central America, and South America, and by the following century, 95% of blue and/or black-dyed silk, cotton, wool and leather had been coloured using bloodwood. By the 18th century, 18 000 tons of logwood were distributed from Belize to Britain per year and were sold for £100 to £500 per ton (Ortiz-Hidalgo & Pina-Oviedo 2018).

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