Treatises and technical Texts on Shipbuilding

NADL

03.01 Saveiros

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Saveiros da Bahia

From two papers, presented by Filipe Castro and Denise Gomes Dias at the XVI International Meeting on the History of Nautical Science and Hydrography, Bremerhaven, October 2012. and at the Annual Meeting of the Society for Historical Archaeology in Seatle, 2015.

Introduction

Saveiros were the working horses that supplied Baía de Todos os Santos and distributed its manufactured goods throughout the cities and villages that surrounded that industrial center.

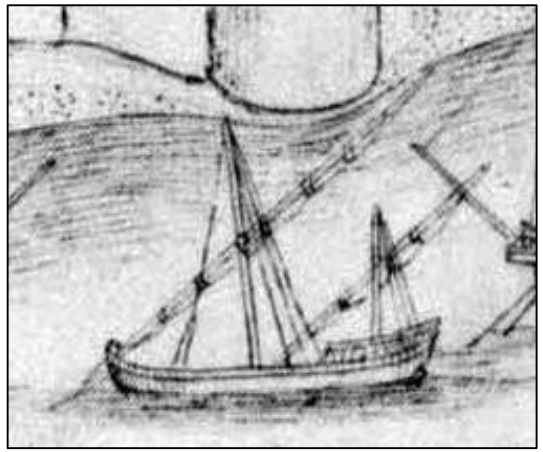
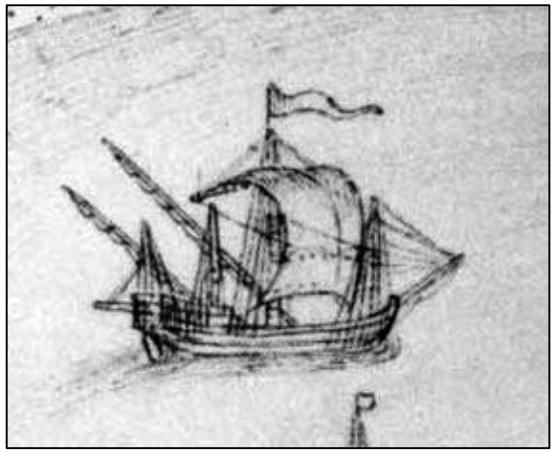
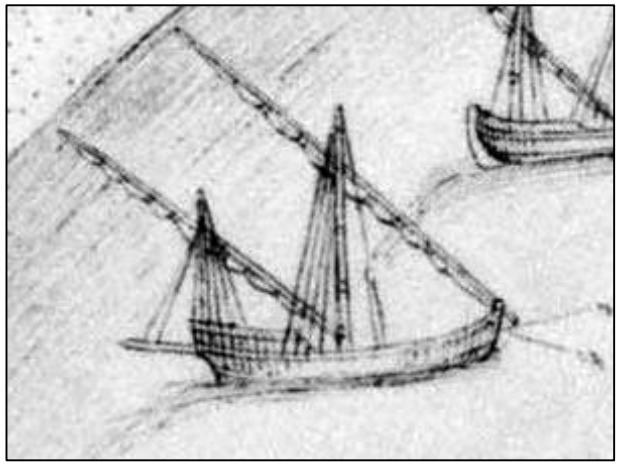
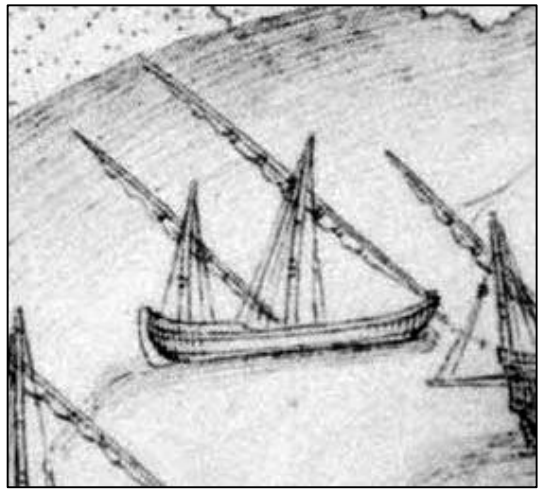
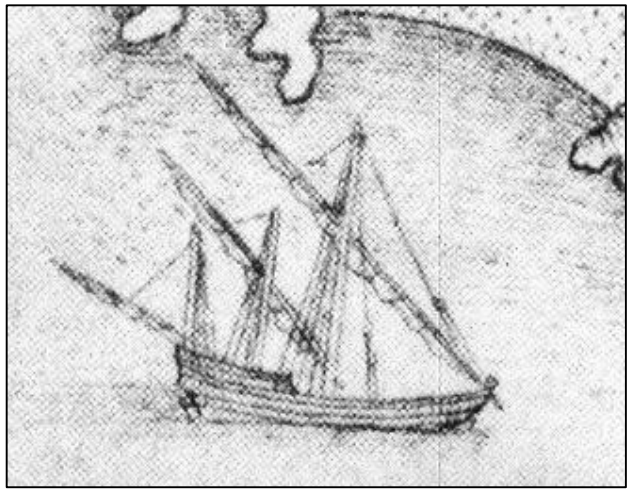
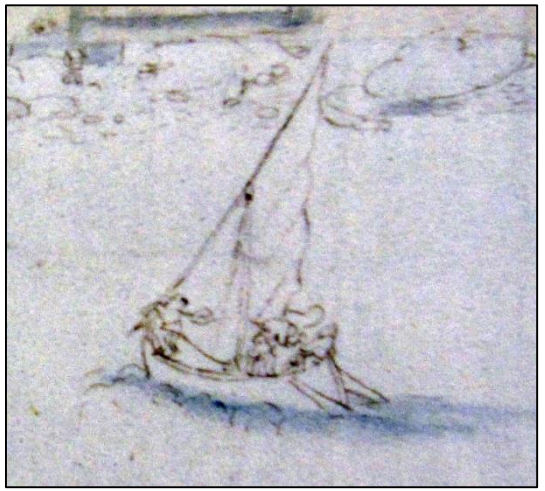
Introduction

Sugar, manioc, pottery, coconuts, palm oil and spices were transported raw and processed, to and from the city of S. Salvador, since times long forgotten.

Introduction

Anthropologist Pedro Agostinho (1973) made the case for its evolution from the colonial caravels through “the slower rhythm of cultural change, [which] may have preserved until today many archaic structures, forms and techniques.”

John Patrick Sarsfield

John Patrick Sarsfield, who in the 1980s traced a hypothetical developmental line, which explained the introduction of the present gaff sails through Dutch influence [17th century] and the change of name from caravela (or caravelão) to saveiro.

John Patrick Sarsfield

Sarsfield documented and published the construction method used by one of these Brazilian shipwright mestre (master shipwright) Walter Assis de Santana and eventually raised funds to build a “caravel” in Valença.

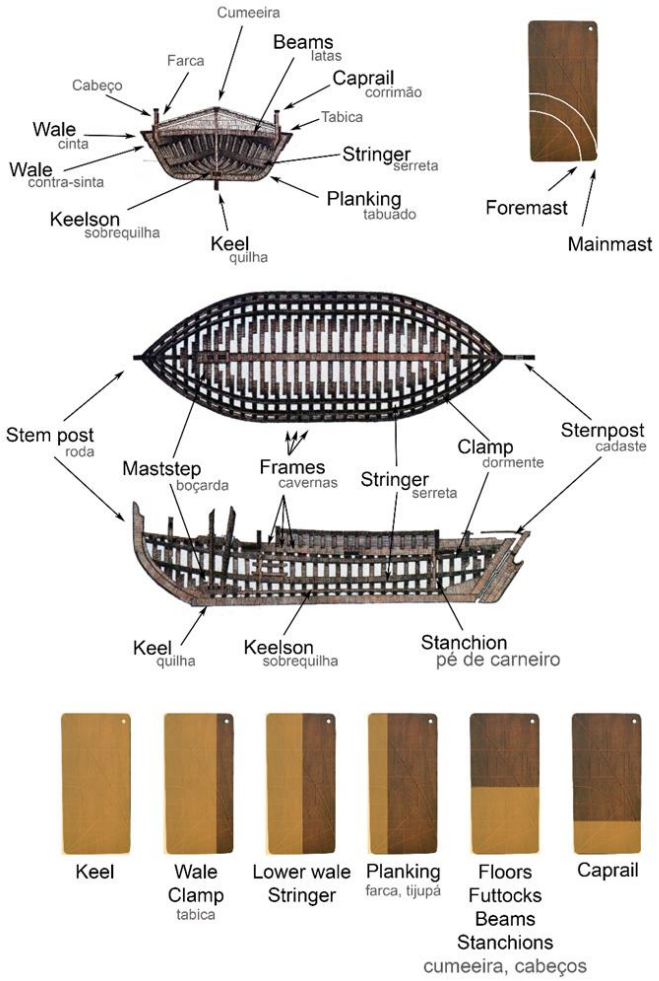
Mestre José Crente

Saveiros were built following an old Mediterranean non-graphic conception method that uses molds, gauges (graminhos), and ribbands, and is known in the Anglo-Saxon world as whole-molding.

Mestre José Crente

A small number of molds, gauges (*graminhos*), and ribbands are used to obtain – or repeat – a particular hull shape with reasonable accuracy.

Lev Smarcevski



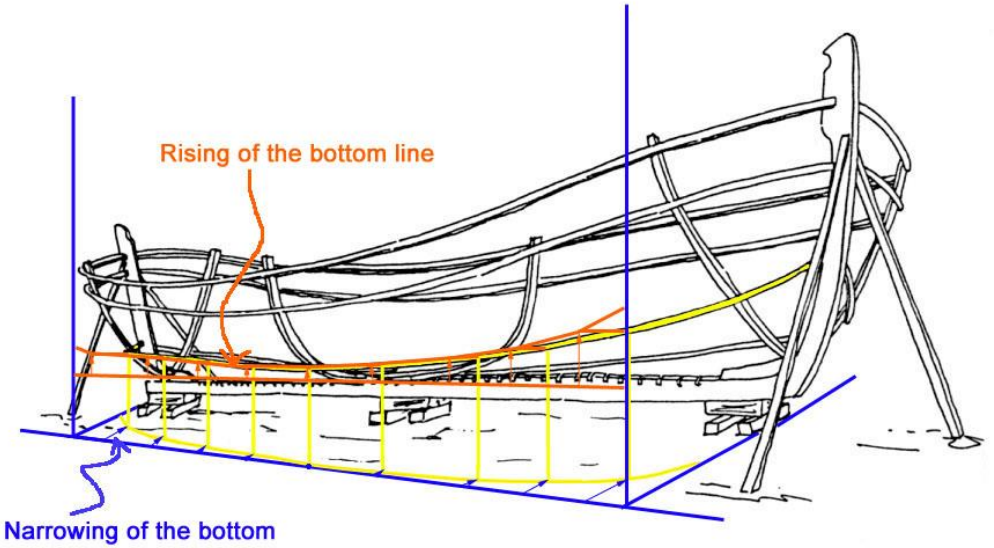
In 1996, a book by Lev Smarcevski presented a recipe for building a 20 m long *saveiro* used by local shipwright, mestre João Bezerra, and based on a *graminho* that also contains the boat's main scantlings.

Molds and Ribbands

Building with master frames, gauges, and ribbands requires a certain period of apprenticeship to understand the use of geometric aids, which can be used without a full understanding of the geometric steps needed to design the molds, calculate the gauges, or determine the number of pre-designed frames.

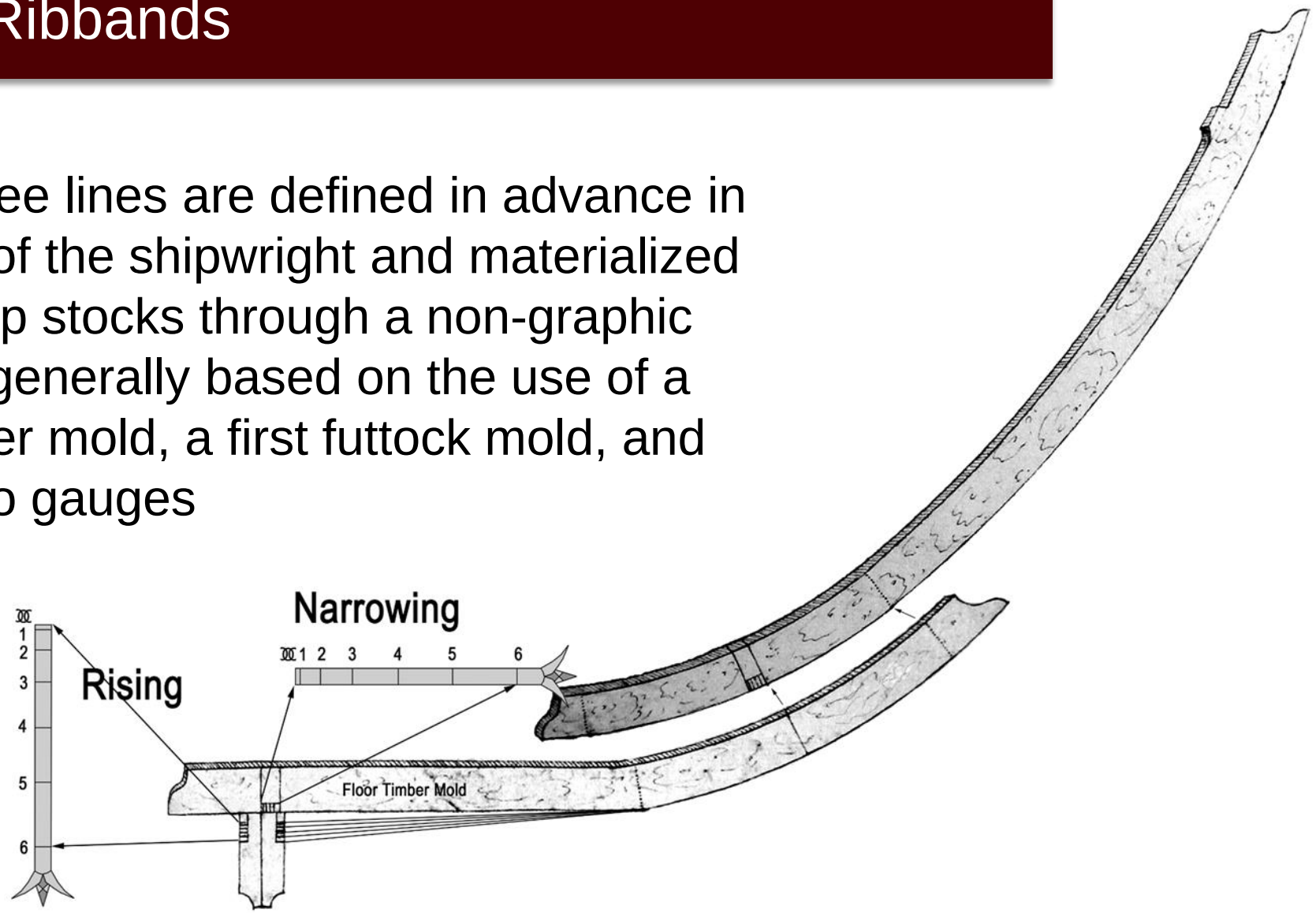
Molds and Ribbands

This method defines the shape of a hull from three basic longitudinal lines: the first outlines the shape of the keel and posts, the second is referred to as the turn-of-the-bilge line and defines the boundary between the vessel's bottom and its sides, and the third is the main wale line or, in smaller vessels, the caprail line.



Molds and Ribbands

These three lines are defined in advance in the mind of the shipwright and materialized on the ship stocks through a non-graphic process, generally based on the use of a floor timber mold, a first futtock mold, and one or two gauges



Molds and Ribbands

In December 2013 we visited Valença and interviewed a number of shipwrights in order to assess the situation and design a strategy to study this shipbuilding tradition.

Graminhos

Tracing a graminho.

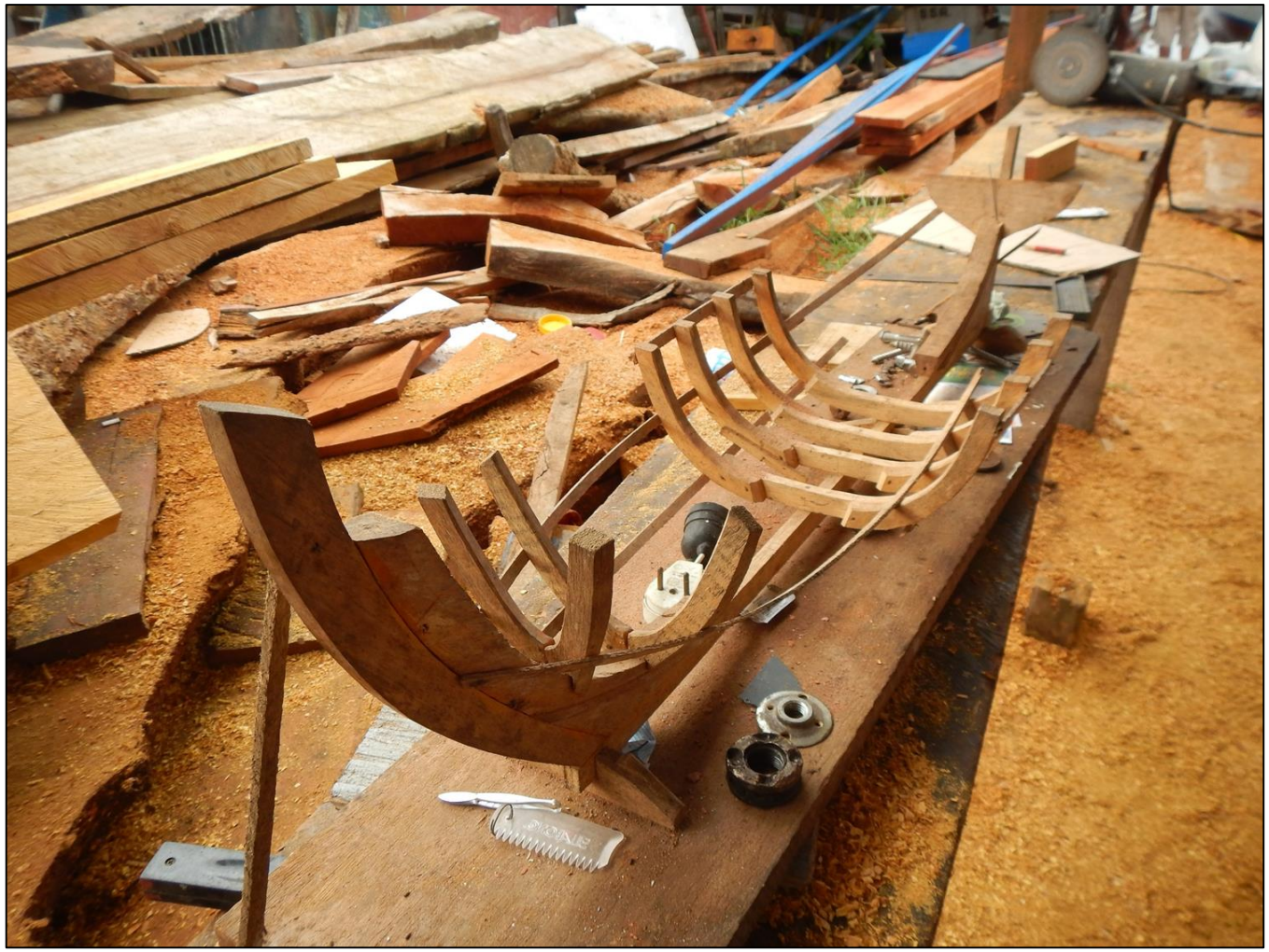
Graminhos

Interestingly, in this visit we observed one case in which the shipwright used the molds and the gauges correctly, together with a number of rules of thumb passed onto him through oral tradition, sometimes without a full understanding of the entire whole-molding process.

Typologies

Boats (*saveiros*, *lanchas*, and *escunas*) are defined by their length overall. The beam and the number of pre-designed frames depend on the boat's length.

Typologies



According to mestre Zé Crente, “a 9 m long saveiro takes eight predesigned frames (casas de armação), one of 10 m requires 10 predesigned frames.”

Stem and Stern Knee

The shapes of the stem post and stern knee (which defines the rake of the sternpost) are set by eye, according to the taste of the shipwright.

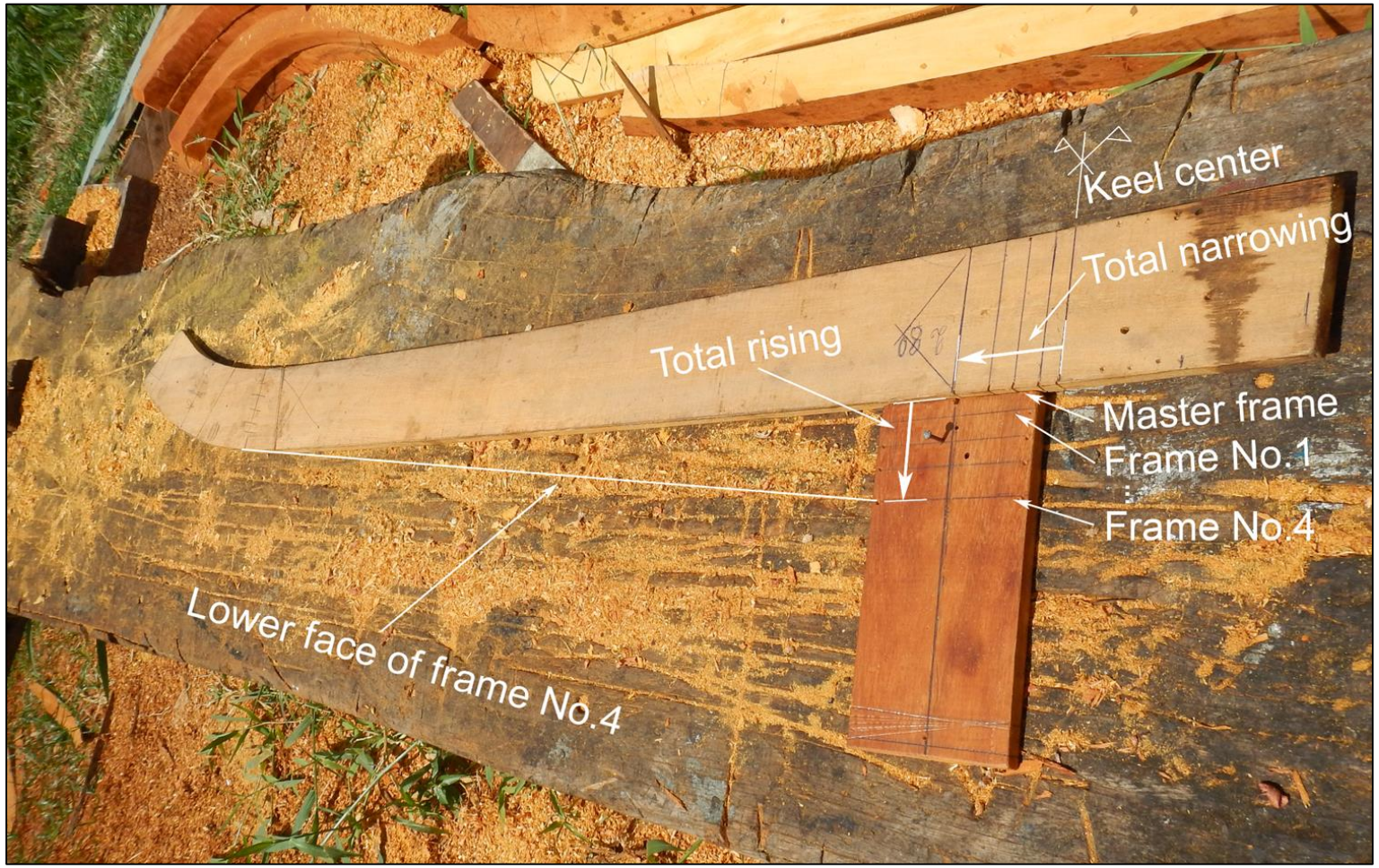
Floor Timbers

The turn of the bilge and futtock arcs are also shaped by eye and are never circular arcs.

Stern Panel

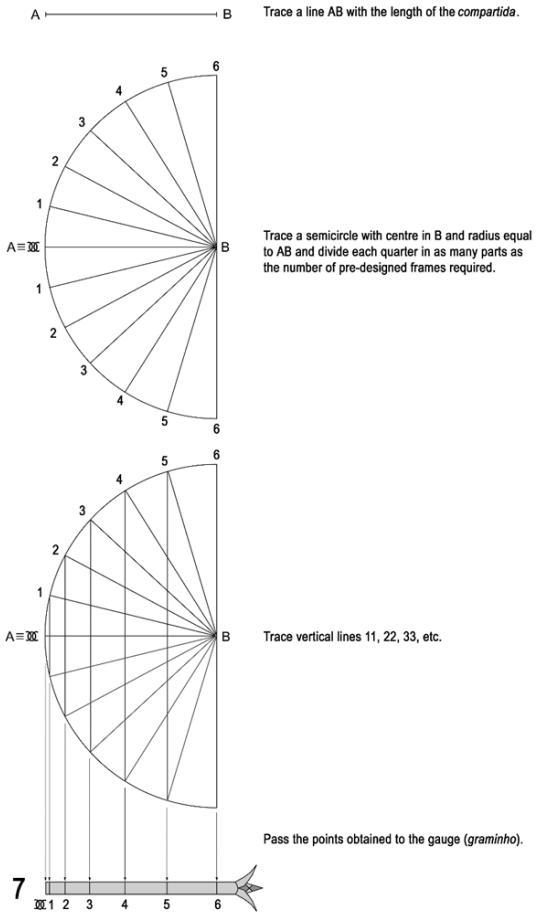
The stern panel, assembled with thick planks, is normally half as wide as the maximum beam and shaped with the futtock arcs inversed (with the turn of the bilge up).

Graminhos



Once the floor timber and futtock molds are ready, the shipwrights define the total rising and narrowing of the turn of the bilge and trace the respective *graminhos*.

Mezzaluna, or besta



The division of the arc of circle used in the construction of the *graminho* is done by trial and error, as described in sixteenth century texts: “and if the divisions are not right, one must make them again, longer or shorter, (…) until they divide the graminho [here meaning the half circle] exactly into the right number [of predesigned frames]” (Oliveira 1991, folio 95).

Bevels

Bevels (*sotamentos*) are cut with the help of a scale marked in the *graminho*.

Bevels

The floor timbers are fashioned a little bit thicker than the mold to allow the beveling, which is taken from the molded dimension (*de cheio*), and the futtocks are cut from the original design thickness (*de solinho*).

Bevels

All bevels are marked with the help of a bevel gage (*suta*) at certain points along the length of the timbers and adzed out. The bevels seem to be measured directly from the *graminho* on the floor timber, but they are increased along the extension of the futtocks, being more pronounced on the top than the bottom sections.

Pre-Designed Frames

After laying the stem post, the bow and stern knees, and the stern panel, the predesigned frames are mounted over the keel.

Pre-Designed Frames

The alignment of the frames is extremely important because once it is done, the keelson is fastened to the keel and the ribbands (*armadouras*) are nailed to the frames in a way that ensures a perfectly symmetrical berth from which the bow and stern frames (*enchimentos*) are shaped.

Mast Step

In the smaller river boats we have observed, the mast step is just a mortise on the upper face of the keelson. In larger boats it is a transversal timber laid over the keelson.

Main Wale

The main wale (*cinta*) is fastened to the complete framing, bent with the help of ropes and clamps, augured and fastened with screws – bolts in the past.

Planking

When timbers need to be bent, shipwrights use fire (*quentura*), oil, and weights, keeping the portion of the timber over the fire permanently wet.

Planking

The planking starts from the main wale and is laid downwards. According to mestre Chico, after laying four planks under the main wale, another four planks are laid from the keel upwards, and a ninth, drop strake, is then laid to close the hull.

Spiling

Spiling (*fasquilhar*) is done with a thin ribband (*fasquilha*), from which offsets are measured at each frame. The measurements are transferred to the inner face of the plank being shaped.

Room and Space

Room and space on a 10 m long saveiro was 25 cm in the predesigned frames and 35 cm in the bow and stern *enchimentos*.

Garboards

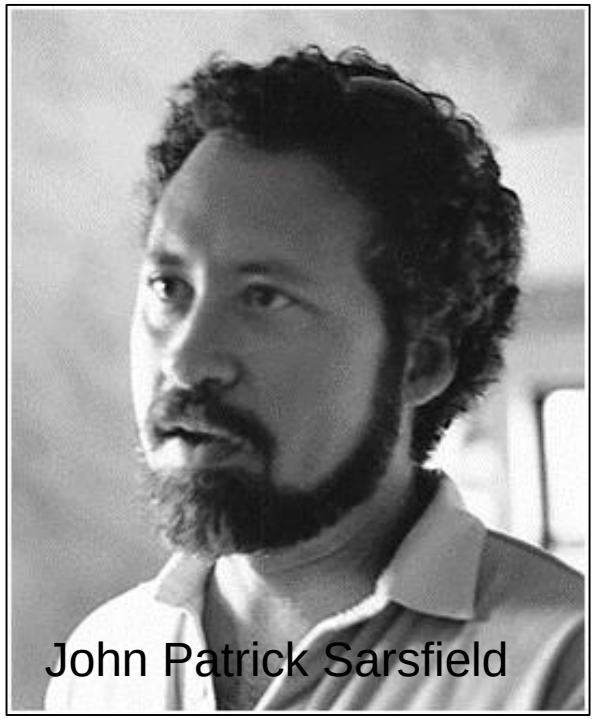
The garboards (tábuas de resbordo) are sometimes laid last, with a characteristic sharp angle on the forward hood.

No rabbet

There is no rabbet (*alefriz*) along the keel. Only the bow and stern knees have rabbets to receive the planking hoods.

Whole Molding

Lev Smarcevski's book, *A alma do saveiro*, presents a very interesting *graminho*, which sheds light on the whole molding methods used in Baía, and mentioned in John Patrick Sarsfield's work, unfinished after his tragic and untimely death.

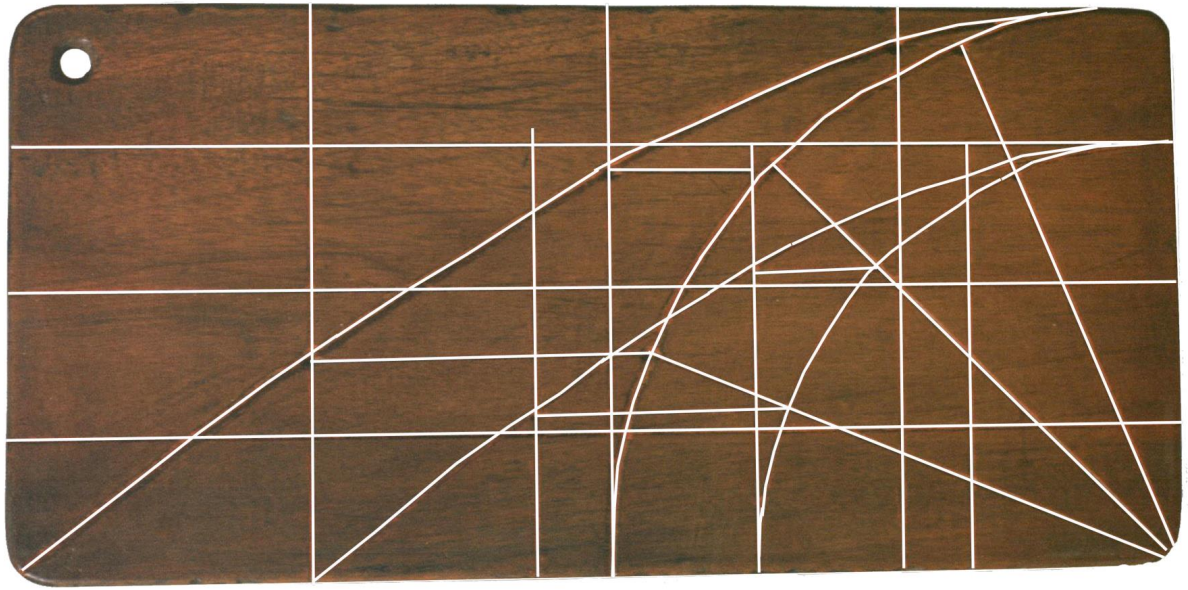


John Patrick Sarsfield

Mestre João Bezerra

Lev Smalevski explained one of these, belonging to shipwright João Bezerra:

> The size of the *graminho* is the section of the keel. It contains the sections of the most important timber of a boat.



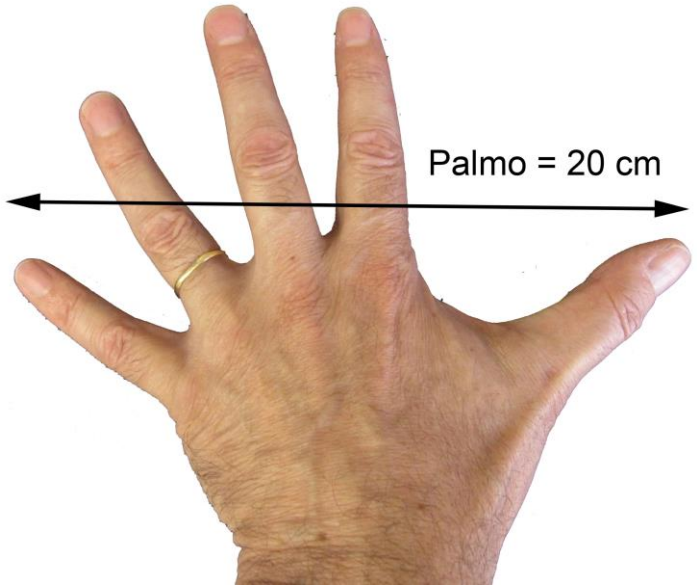
Mestre João Bezerra

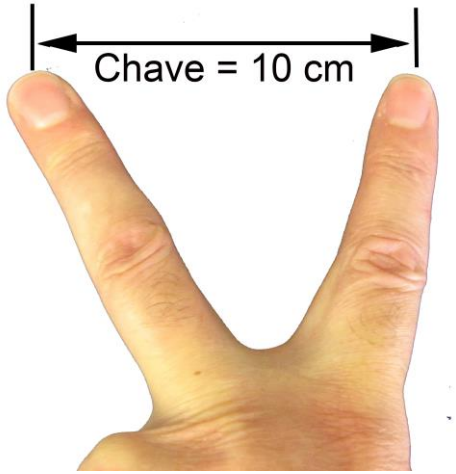
It is a very important tool when the shipwright goes to the forest to cut the timbers.

We are indebted to Mauro Bondioli, who shared these images with us.

Units

Saveiros are measured in *palmos* (20 cm), *chaves* (10 cm) and *polegadas* (2.5 cm)





Dimensions

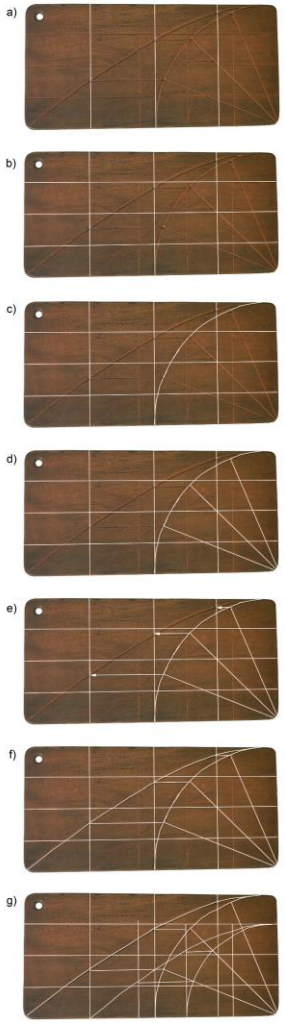
For a boat 100 *palmos* long (LOA = 20 m), the keel molded dimension should be h = LOA/50 = 40 cm, and its sided dimension b = h/2 = 20 cm.

The boat's beam should be LOA/3; The entries and runs LOA/4;

This hull will have a capacity of 100/2 = 50 *toneladas* (each 2 *palmos* of length overall are equivalent to 1 *tonelada* of capacity).

Lev Smarcevski explains the tracing of the *graminho* used by shipwright João Bezerra in detail.

Graminho



a) First one divides the *graminho* vertically into four parts;

b) Then horizontally, also into four parts;

c) Then one traces the quarter of circle AB;

d) Divides the quarter of circle into four parts;

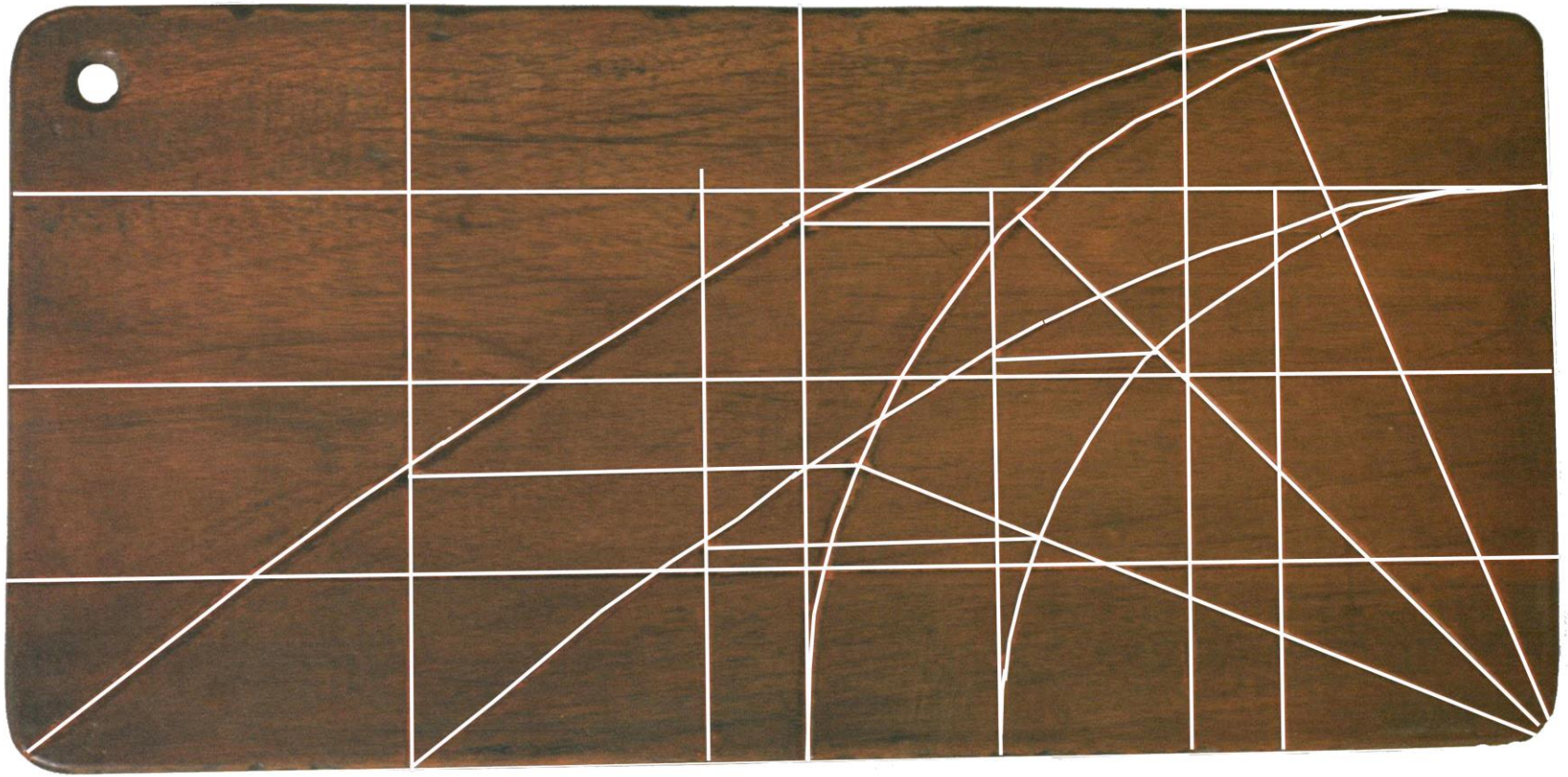
e) Extends the lines horizontally into the vertical lines:

f) Traces the curve AC;

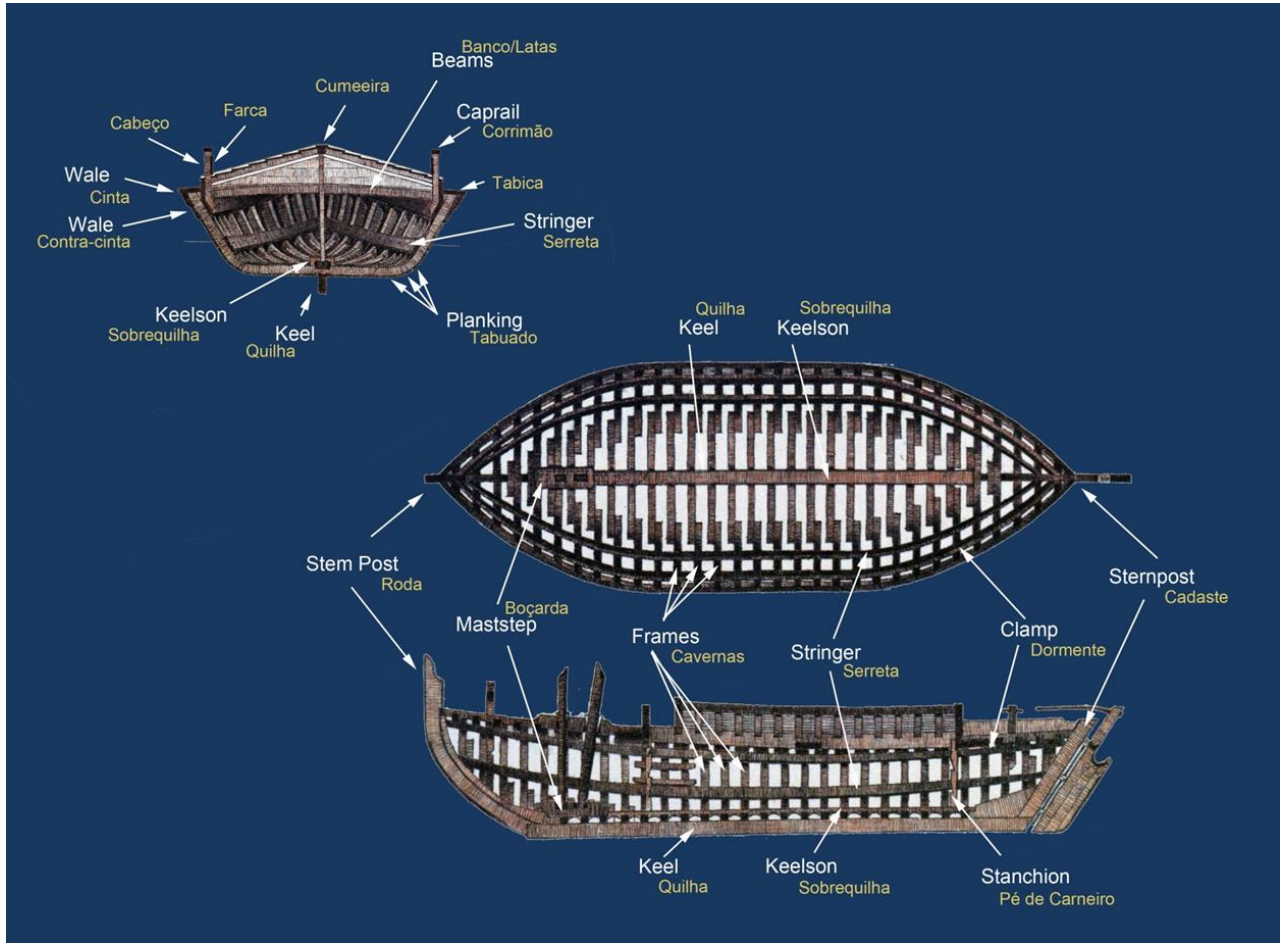
g) Then one repeats the procedure on a smaller rectangle (¾ x ¾ of the original).

Graminho

The complete *graminho* looks like this:



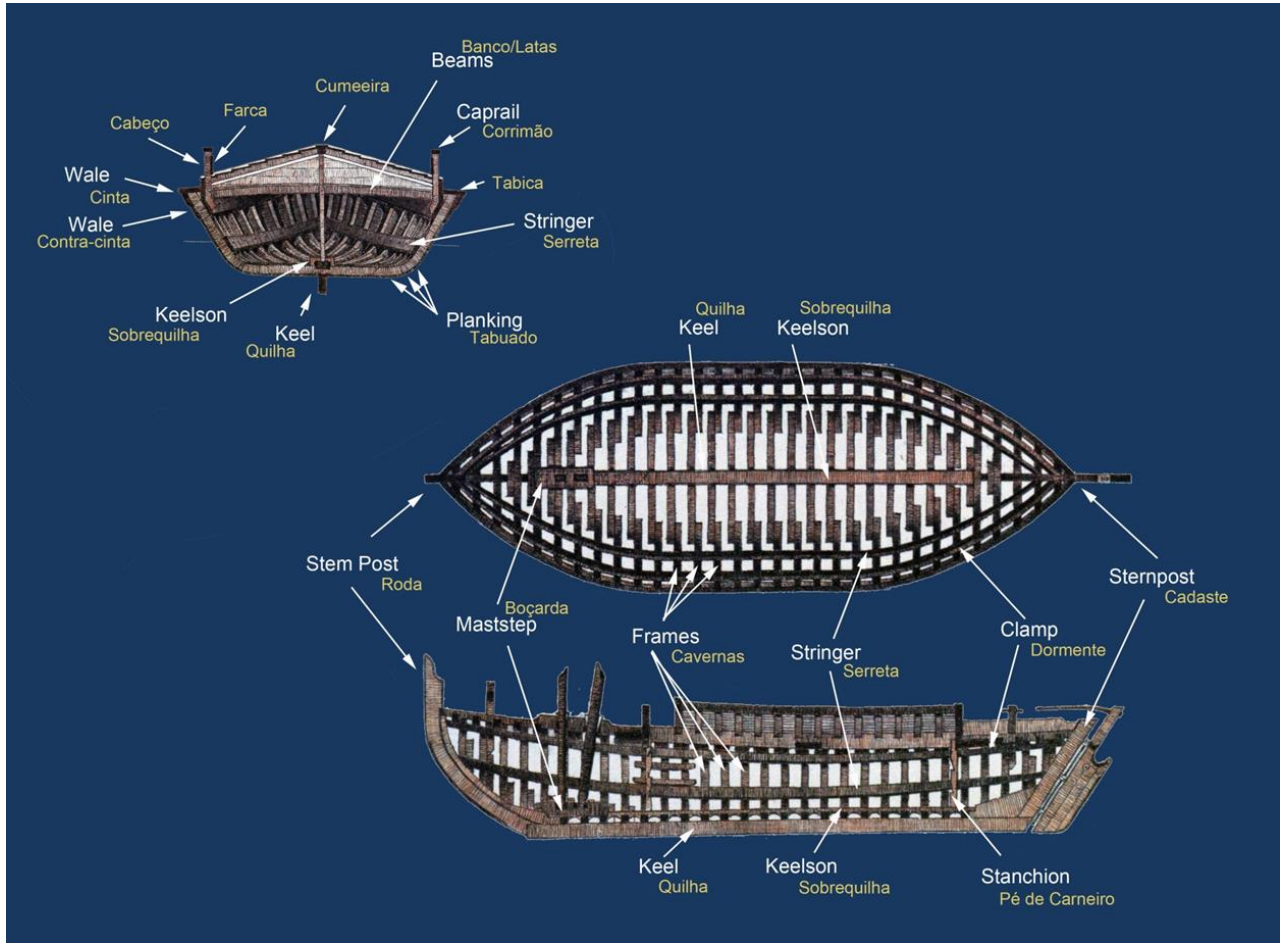
Graminho



All the principal timbers necessary to build a *saveiro* are represented in this *graminho.*

Tabuado do casco, cobertura e farca.

Graminho



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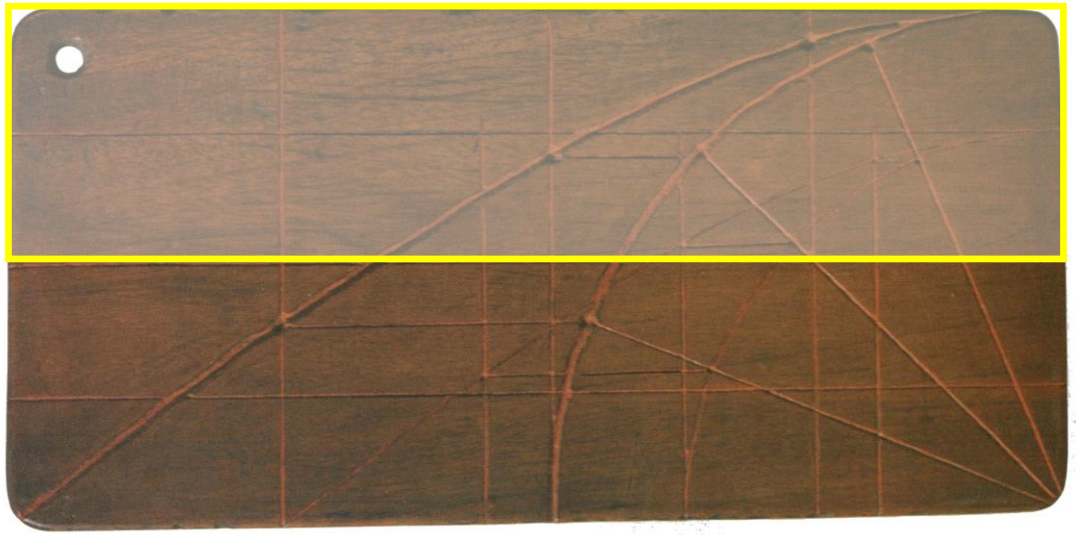
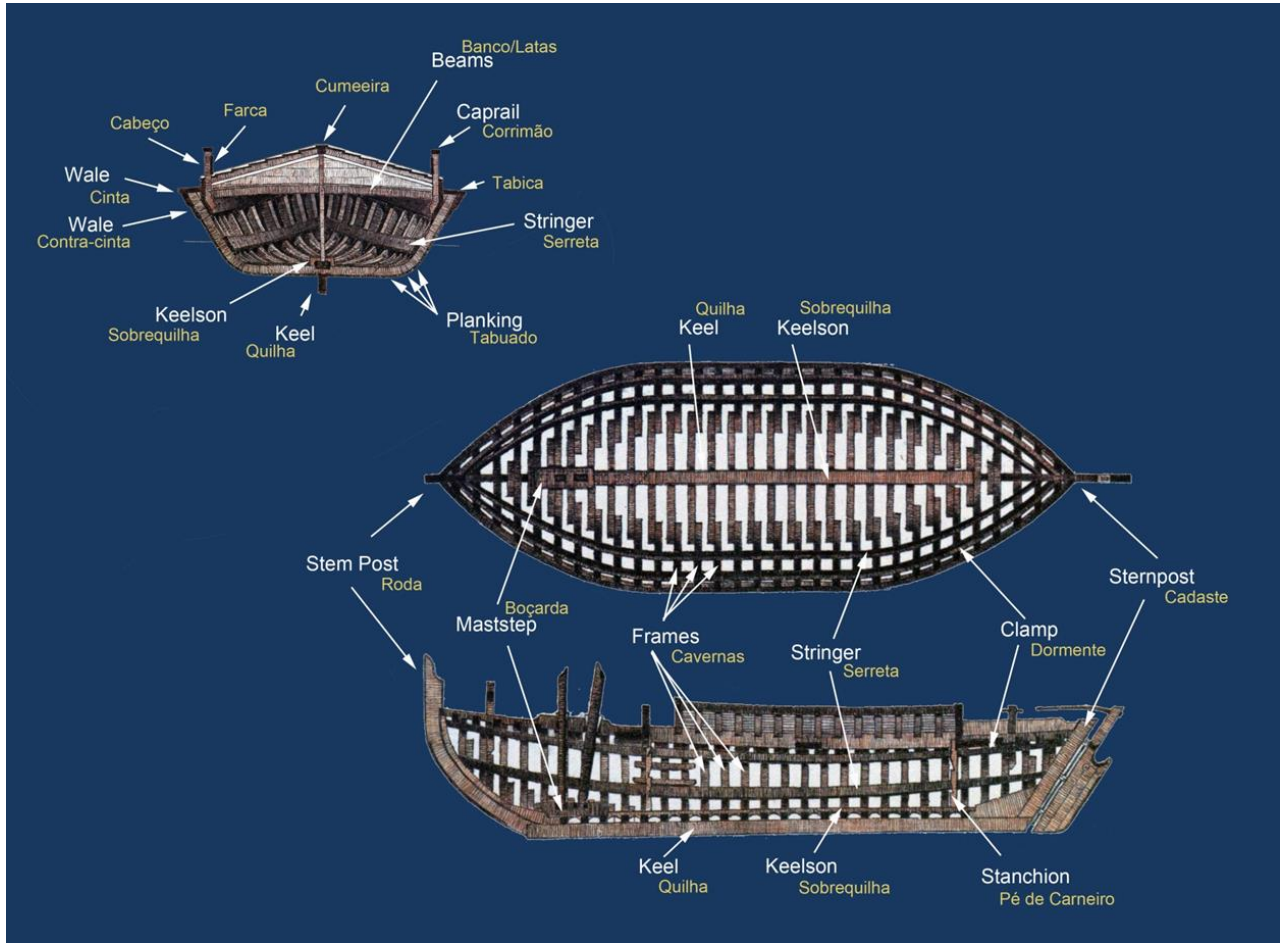


Tabuado do casco, cobertura e farca.

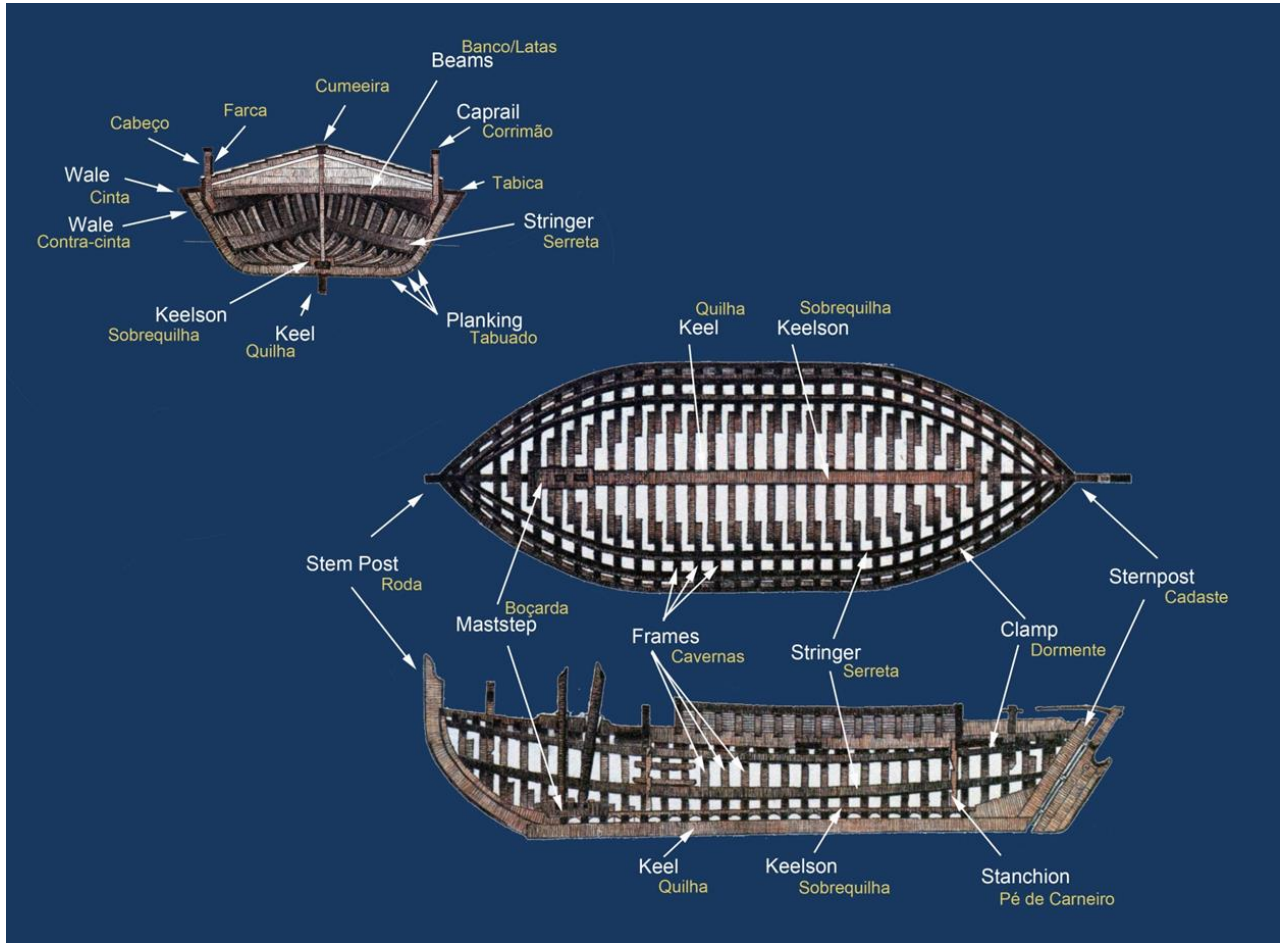
Graminho



All the principal timbers necessary to build a *saveiro* are represented in this *graminho.*

Cinta, tabica, banco e dormente.

Graminho



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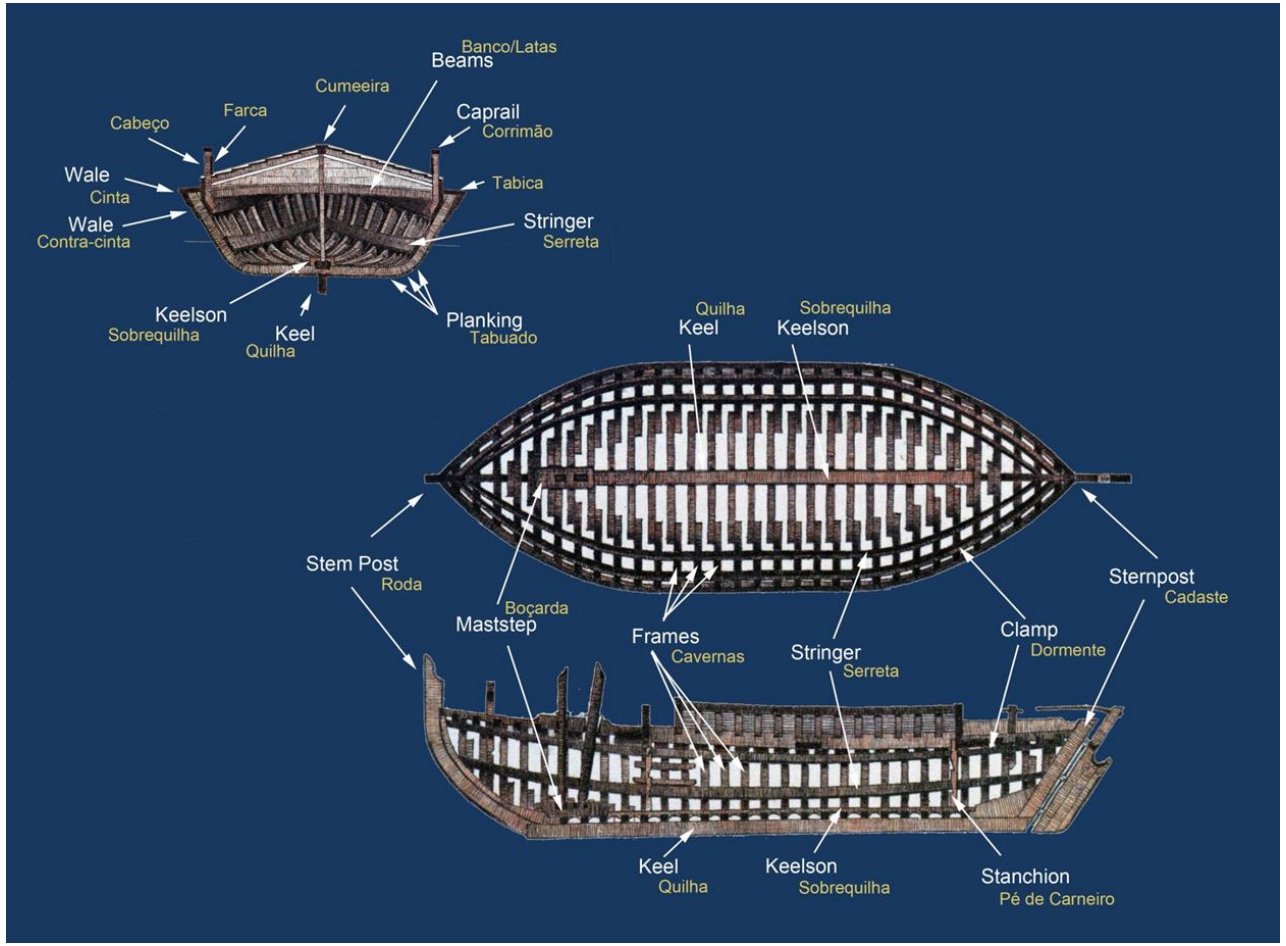
Quilha.

Graminho



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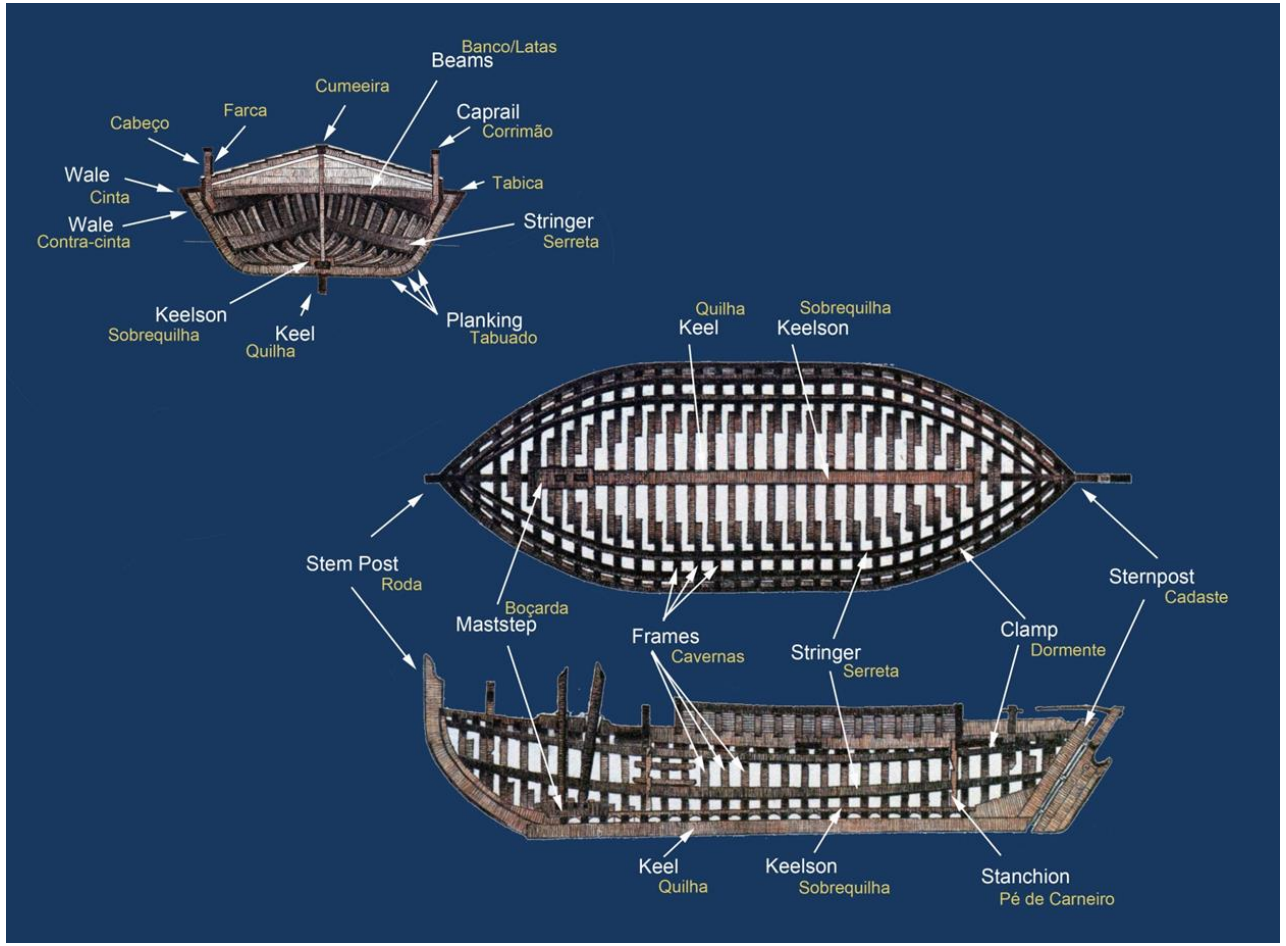
Corrimão.

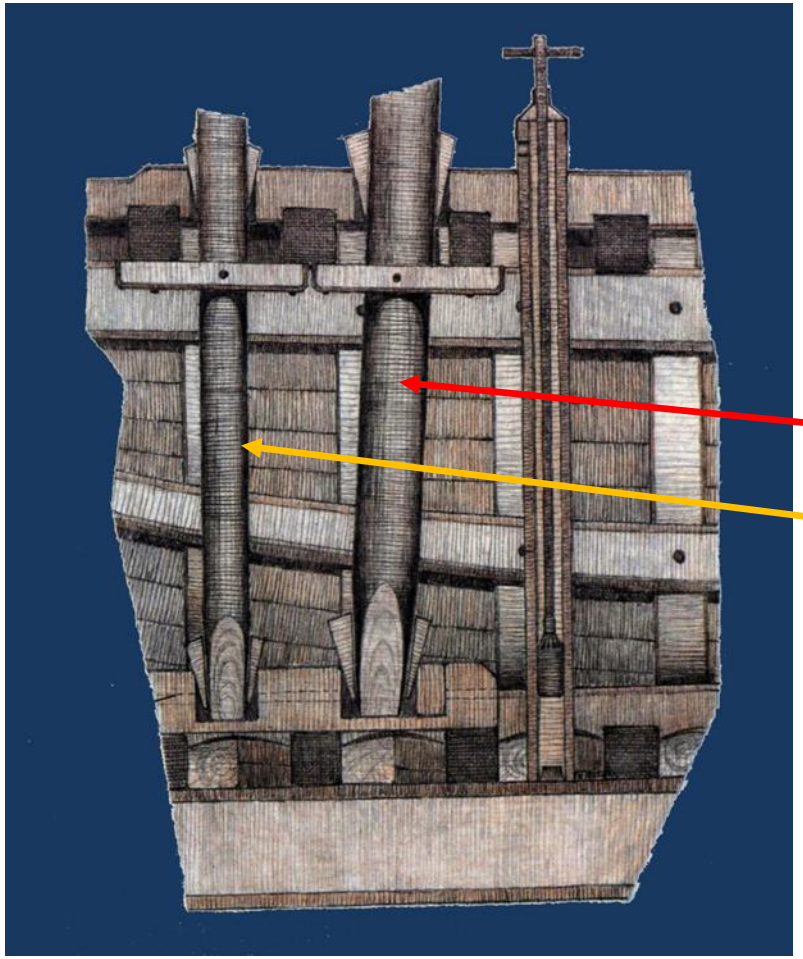
Graminho



All the principal timbers necessary to build a *saveiro* are represented in this *graminho.*

Cavernas, braços, latas, cumeeira, pé de carneiro e cabeços.

Graminho



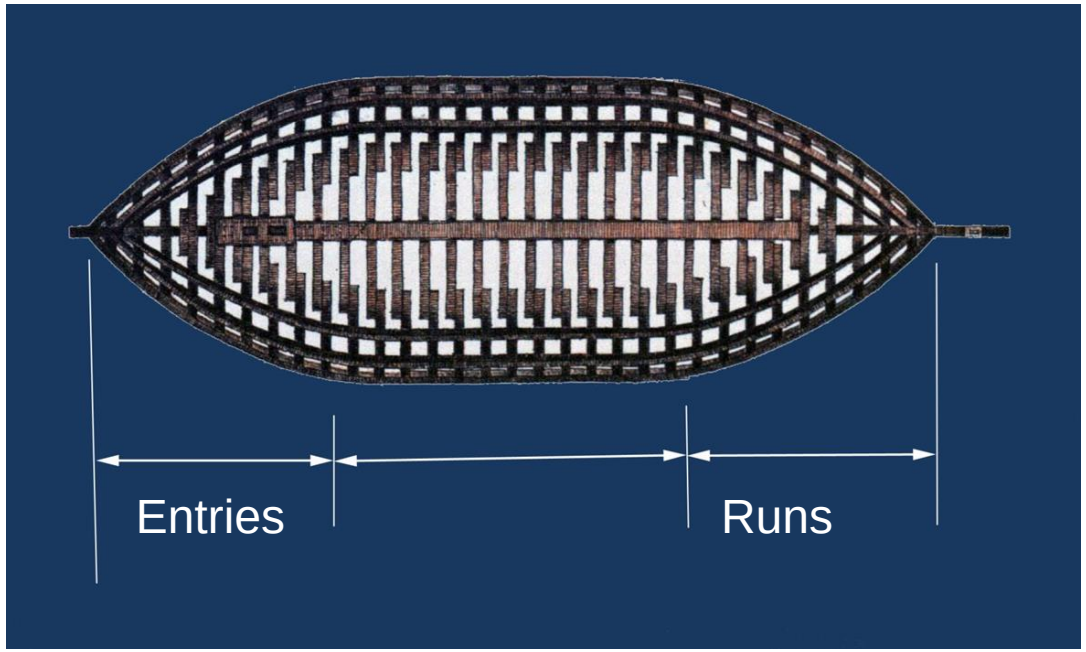
$Ø_1$ = 20 cm

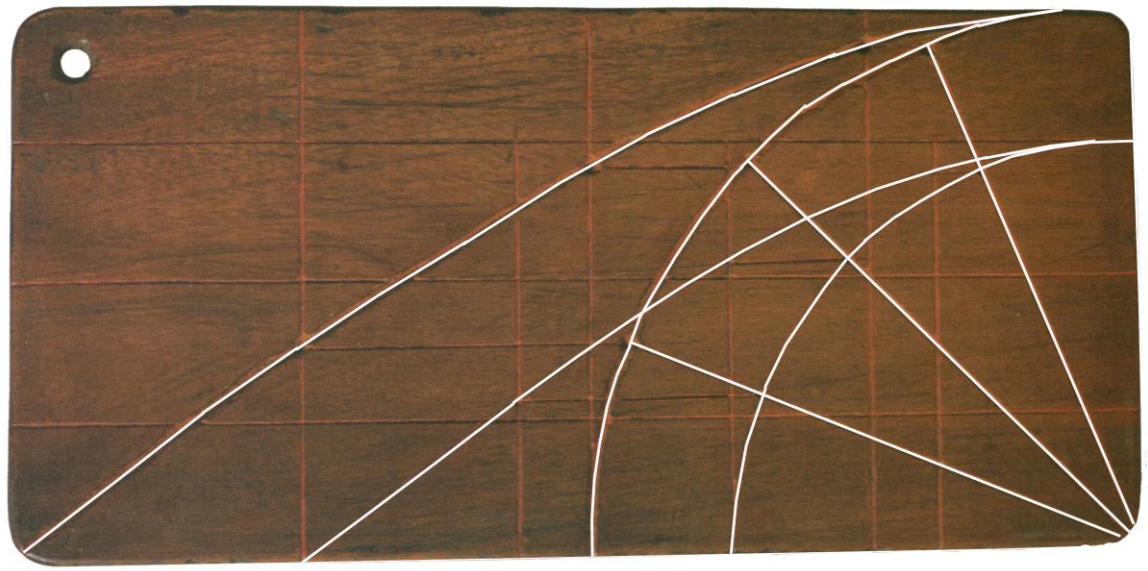
$Ø_2$ = 15 cm

All the principal timbers necessary to build a *saveiro* are represented in this *graminho.*

Diameters of the Masts.

Entries and runs





The entries and runs obtained by shipwright João Bezerra are the curves derived from the mezzaluna, but it is not clear to which four frames they are applied.

Bibliography

Saveiros

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