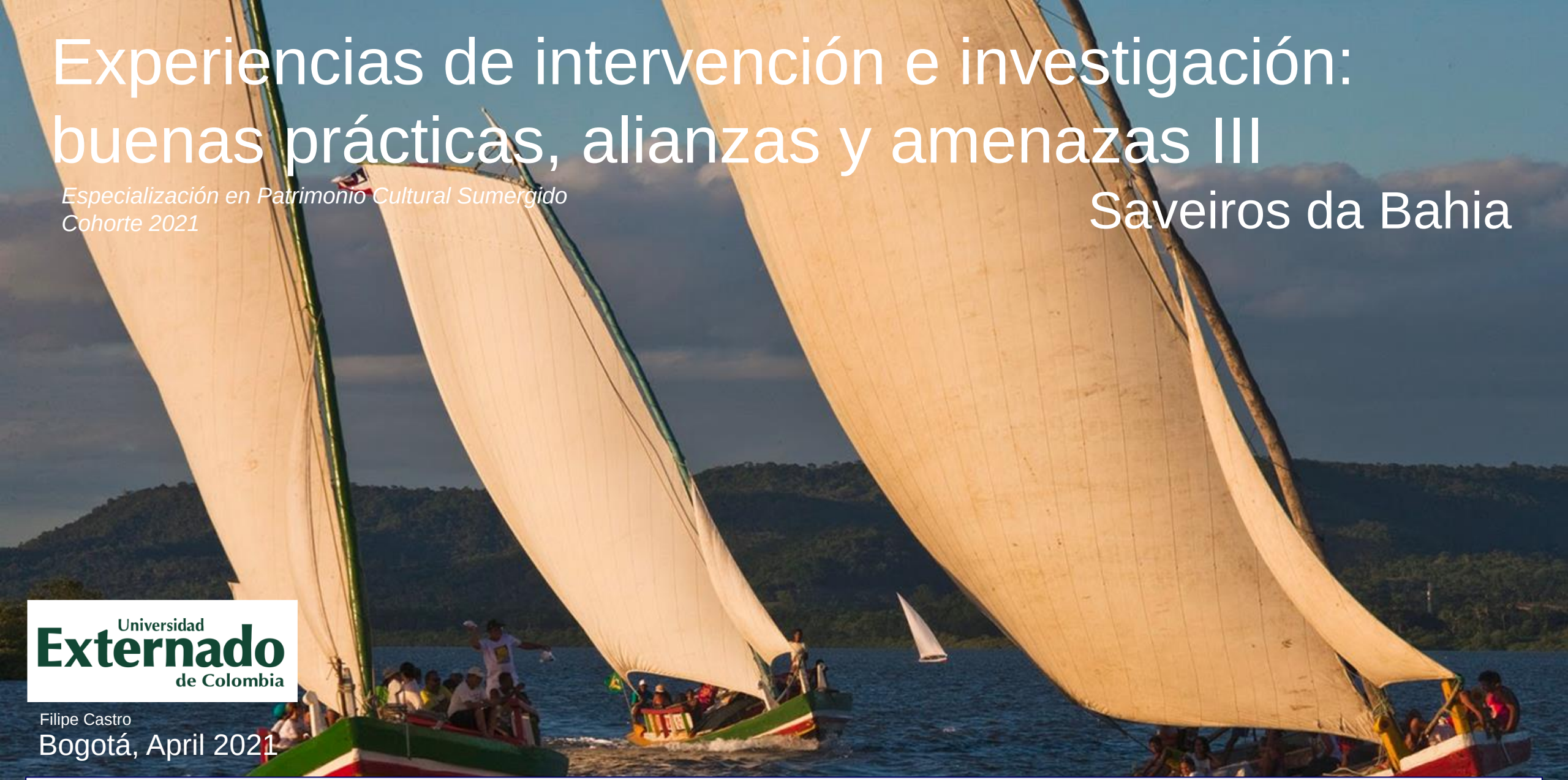
Experiencias de intervención e investigación: buenas prácticas, alianzas y amenazas III

Especialización en Patrimonio Cultural Sumergido
Cohorte 2021

Saveiros da Bahia



Universidad Externado de Colombia

Filipe Castro

Bogotá, April 2021

história territórios comunidades

CENTRE FOR FUNCTIONAL ECOLOGY
SCIENCE FOR PEOPLE & THE PLANET

INSTITUTO DE HISTÓRIA CONTEMPORÂNEA

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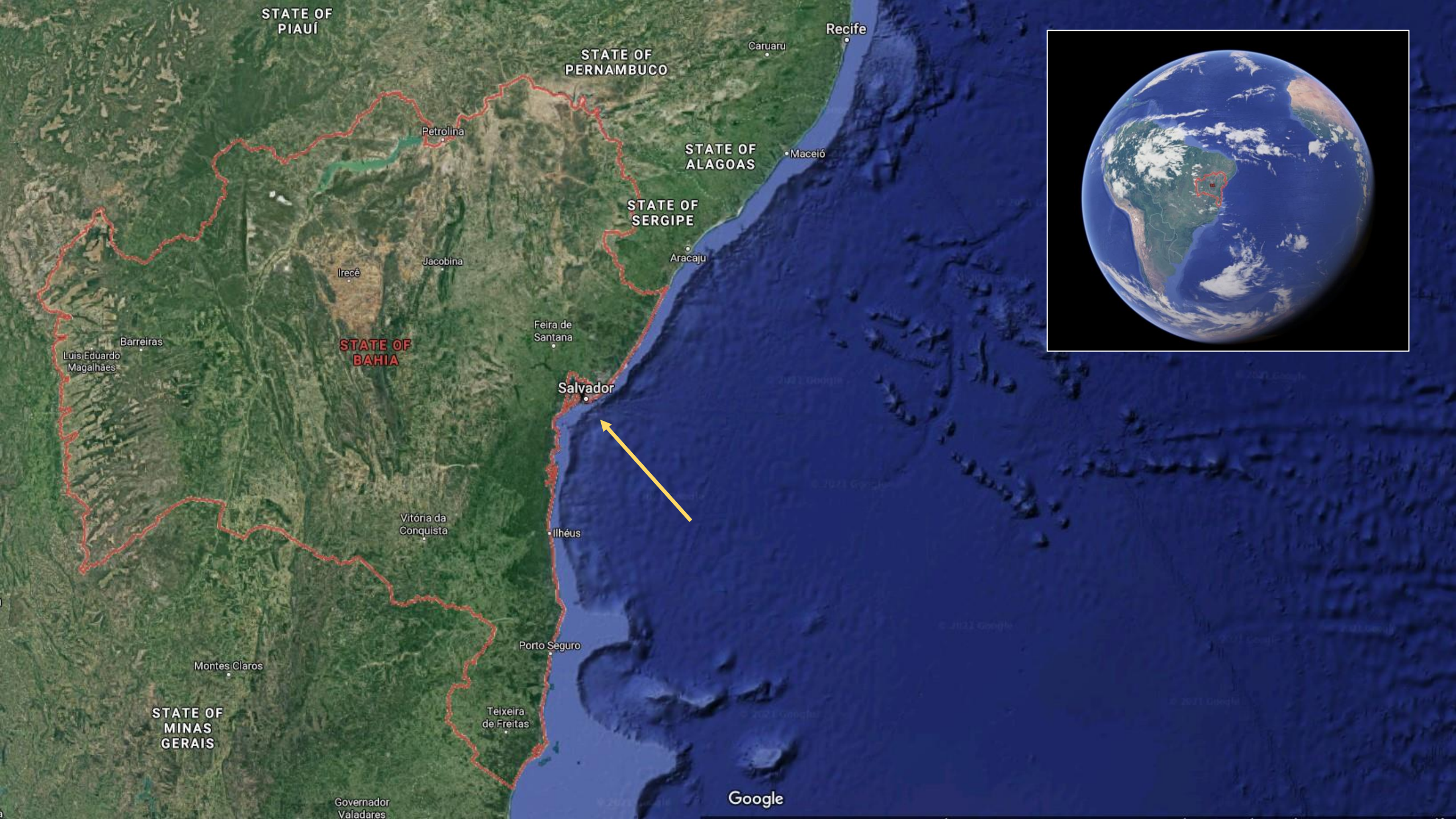
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Barreiras
Luís Eduardo Magalhães
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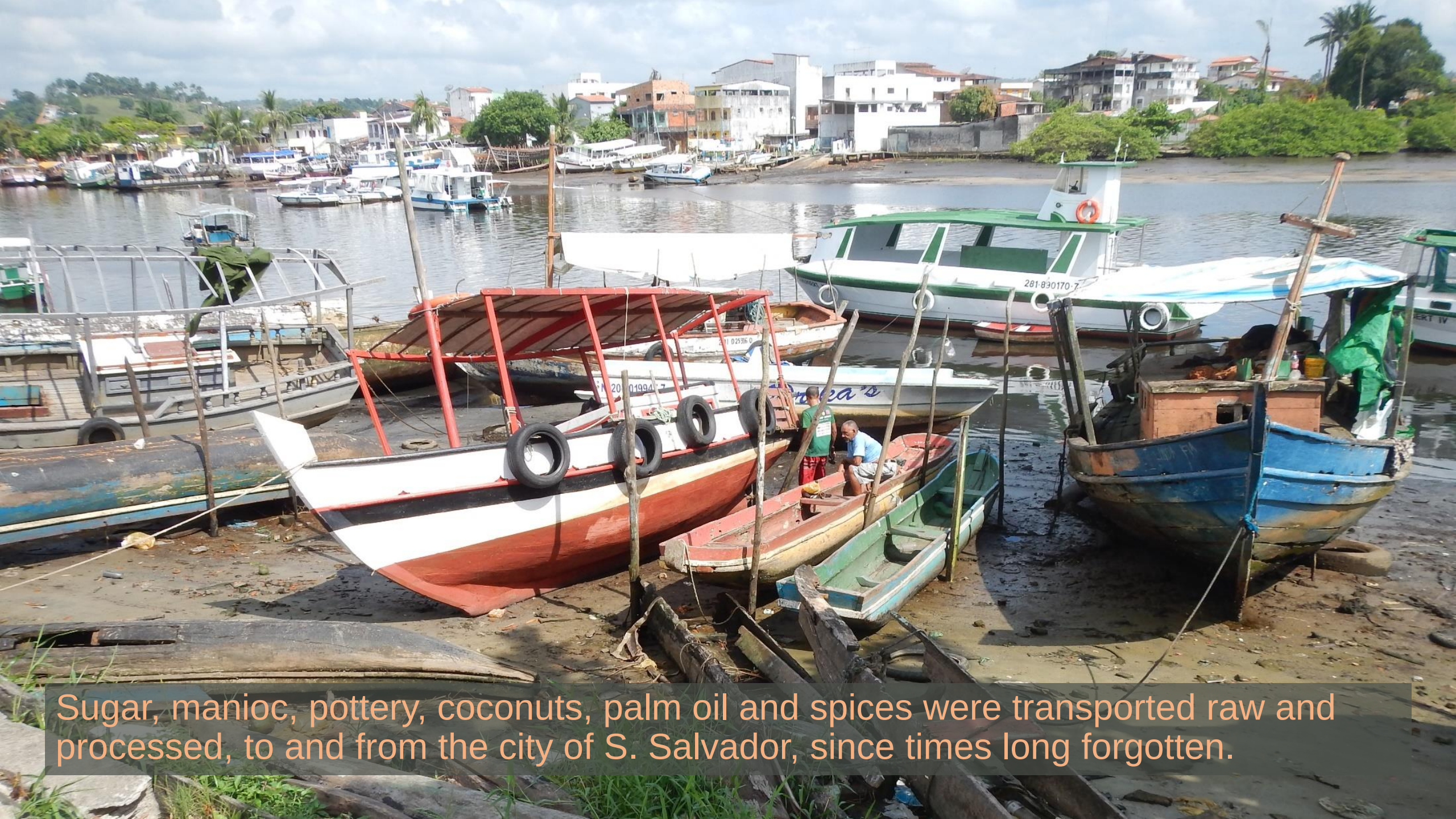
I cultivate rhythms. That's how it is. My head is like a museum. But the difference is that rhythms don't become statues. They pass by you over and over. They come and live inside me, then go and live inside others. In other heads and thoughts. Rhythm requires ongoing movement all the time.

Carlinhos Brown
Video *Carlinhos Brown: World Music Portraits* (2004)

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



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.

Ships can be built in many ways, but Bahia's *saveiros* are built using a non-graphic process that can be traced to the late Middle Ages.

Ship Taxonomies

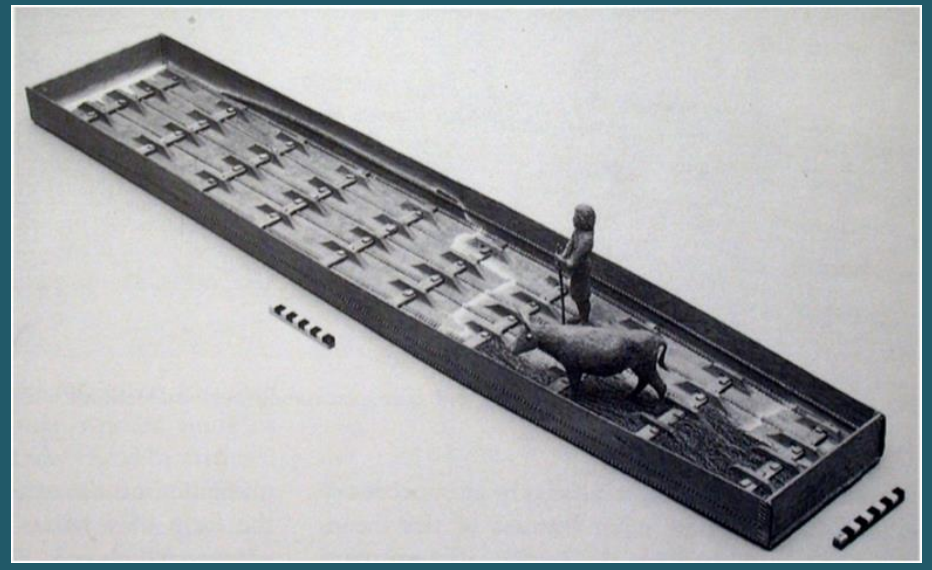
A. Basil Greenhill's taxonomy (roots):

1. Rafts
2. Skin boats
3. Bark boats
4. Dugouts

Figure 5.1 Sixteenth-century log rafts of Ecuador as drawn by G. Benzoni. After Edwards, 1965: pl. 16b (courtesy The University of California Press).

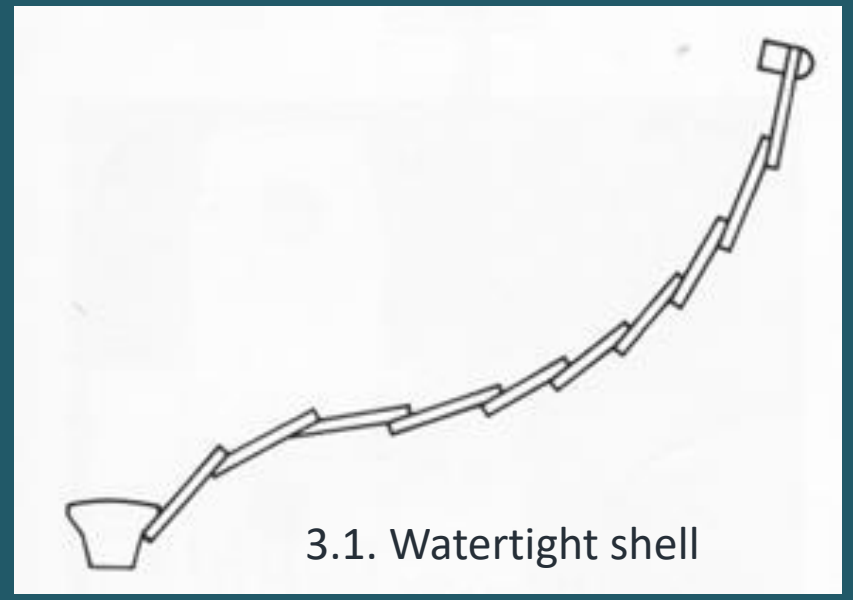
B. Dick Steffy's taxonomy (function):

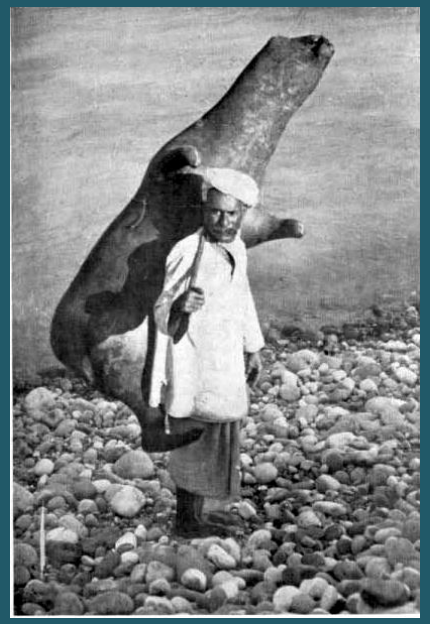
1. Cargo carriers,
2. Warships,
3. Fishing craft,
4. Utility craft.

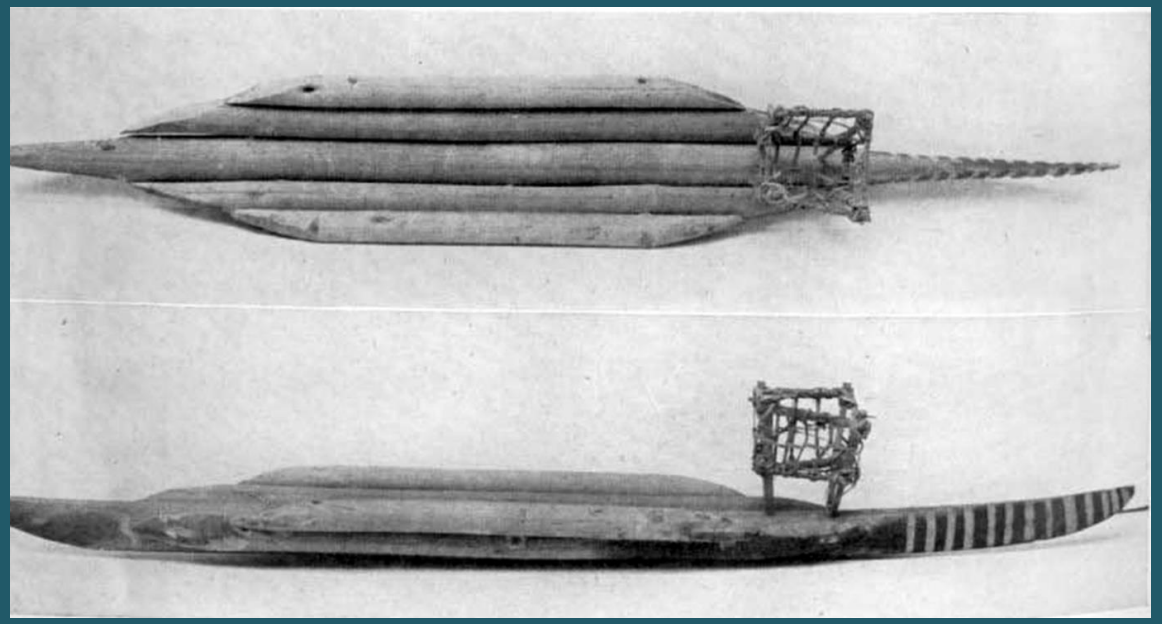


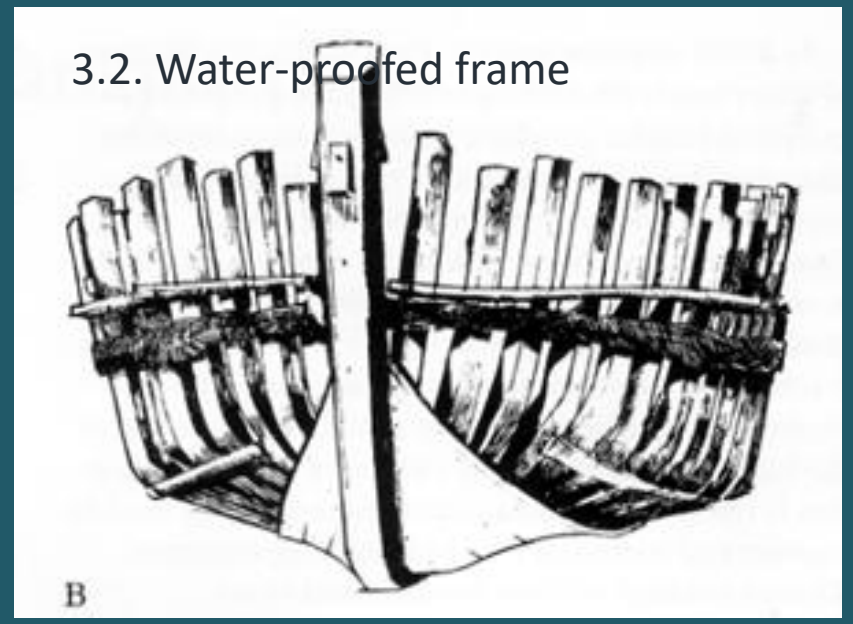
C. Sean McGraill' taxonomy (bouyancy):

1. Bouyancy applied directly on men: floats;
2. Bouyancy applied indirectly: rafts;
3. Hollow shapes: boats.



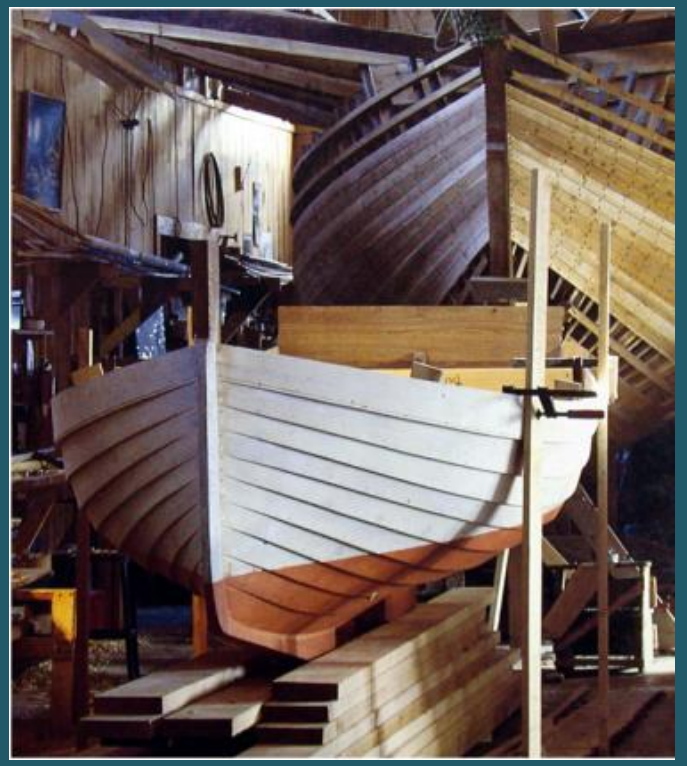






D. Eric Rieth's taxonomy (technology):

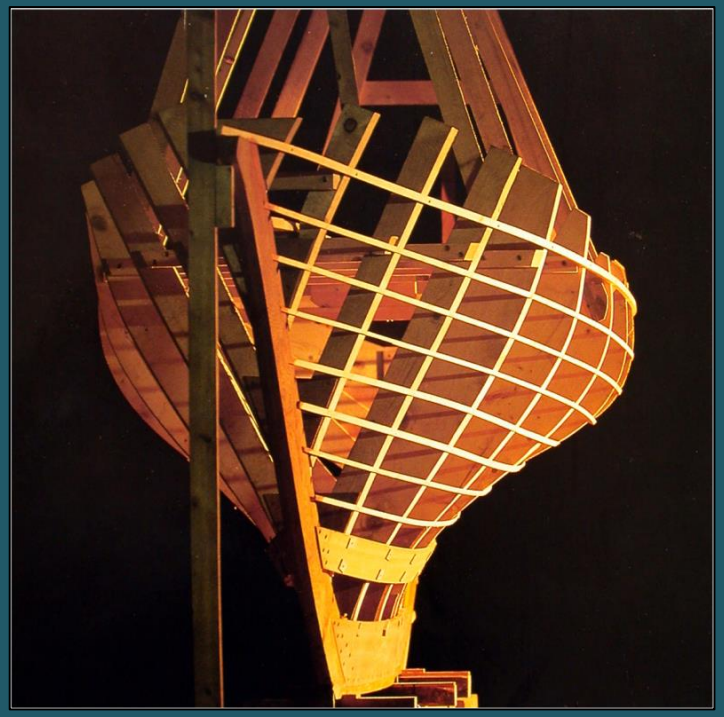
1. Floats,
2. Rafts,
3. Boats:

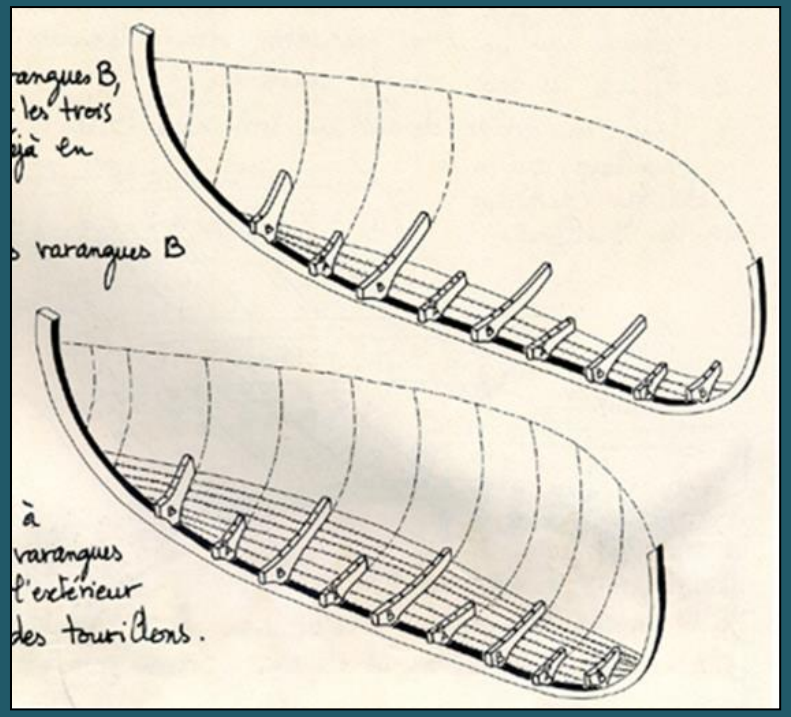


3.1. Dugouts,
3.2. Extended dugouts,
3.3. Assembled craft.

E. Hasslöf / Basch (structure):

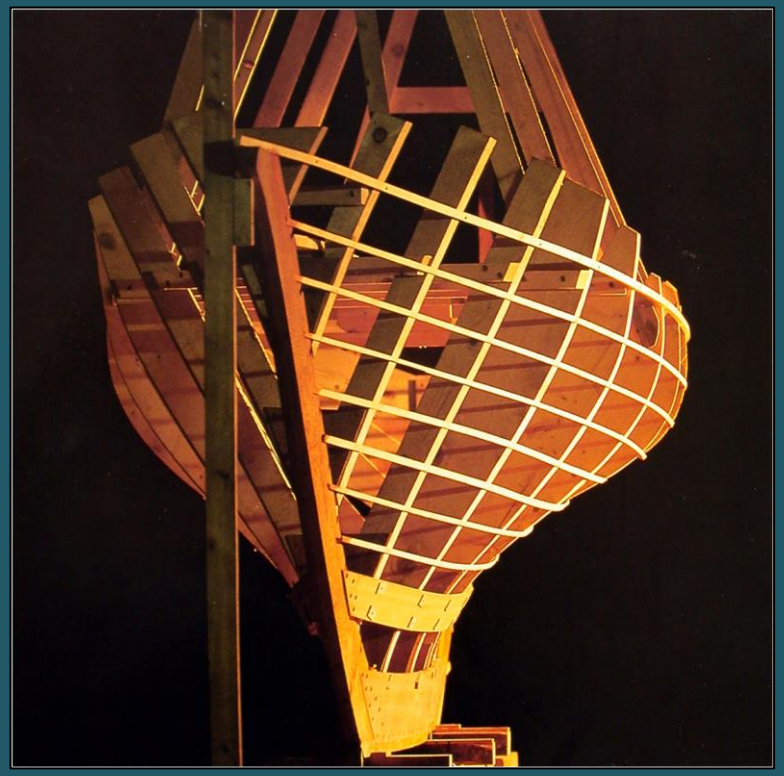
1. Shell-first (based) vessels
2. Frame-first (based) vessels
3. Things in between...





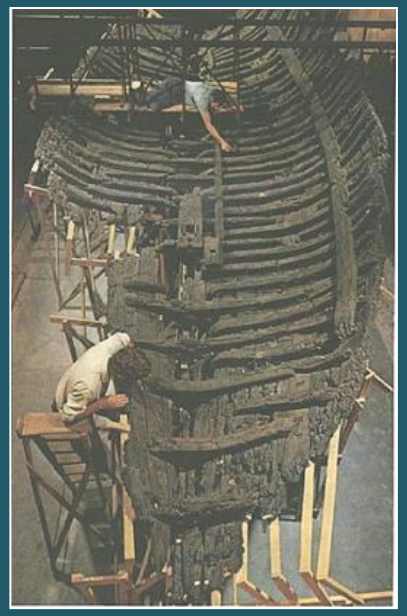
F. Hasslöf / Basch / Hocker (structure):

1. Shell-first (based) vessels
2. Frame-first (based) vessels
3. Bottom-first (based) vessels



G. Patrice Pomey:

1. Conception
2. Construction
   - 2.1. Structural Principle
   - 2.2. Construction Sequence



Kyrenia (4th c. BC)
Structural conception: shell based.
Building technique: shell first.

Yassi Ada I (7th c. AD)
Structural conception: bottom shell-based, upper works frame-based.
Building technique: mixed.

H. Architectural Signatures

Ole Crumlin-Pedersen and Eric Rieth suggested the existence of construction traits common to a particular region or cultural horizon:

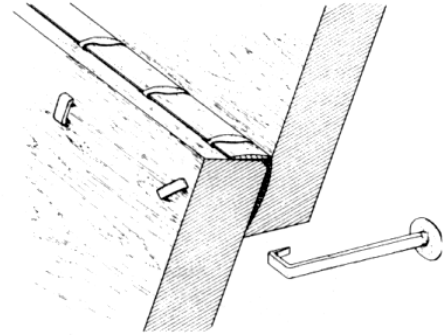


Fig 2. In Medieval cog-wrecks the overlapping planks are normally held together by square-nails bent over twice on the inside and driven back into the wood. The seam is made watertight by driving moss into a wedge-shaped slit on the inside of the boat. The moss is held in position with a thin batten fastened with iron staples, "sintels".

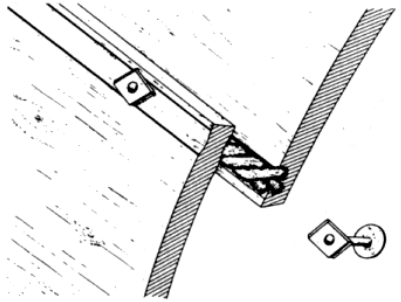


Fig 3. In Viking and Medieval Scandinavian ships the overlapping planks are normally held together by clench-nails with a round head outside, a round shaft and a rectangular rove on the inside of the planking. The seam is made watertight by placing "luting", a loose string of wool, in a groove before inserting the nails.

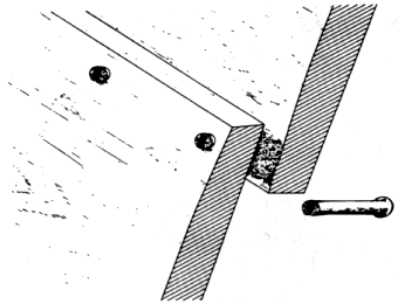
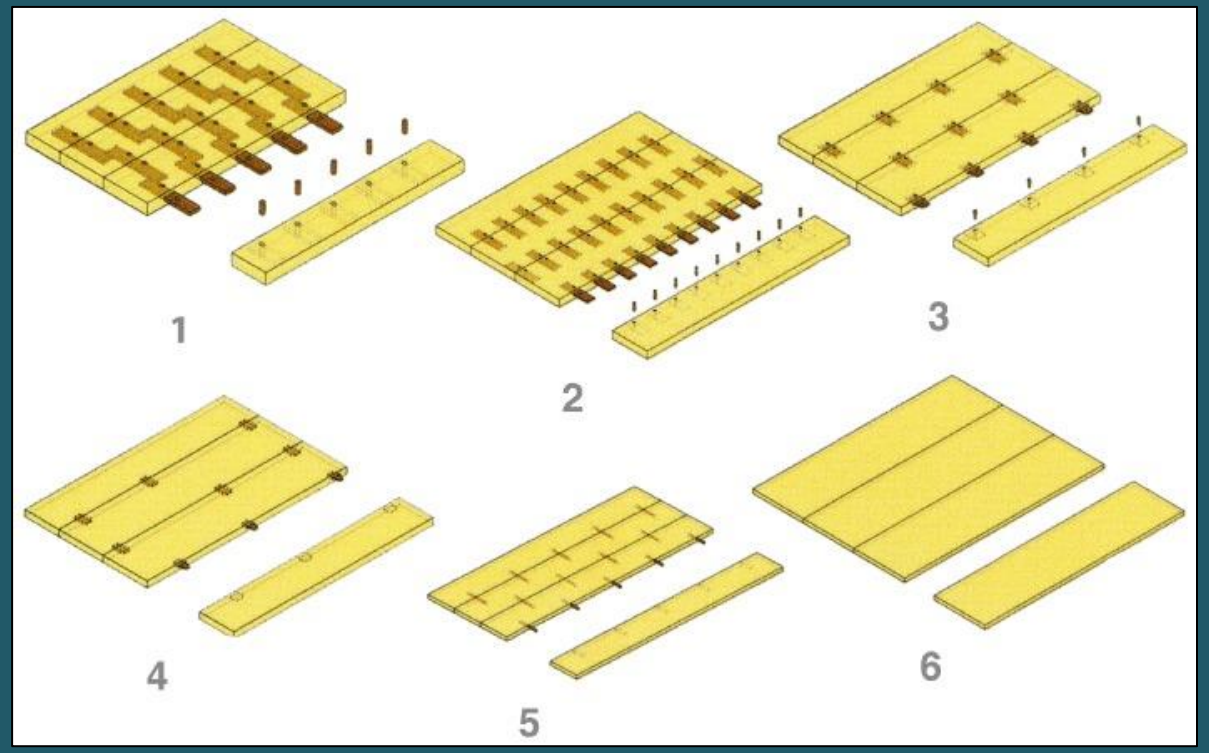


Fig 4. In Medieval West Slavic ships the overlapping planks are normally held together by "treenails", small wooden pegs with a conic head on the outside and a wedge on the inside of the planking. The seam is made watertight by placing moss or a mixture of wool and moss as luting in a groove before inserting the treenails.

Rieth, Eric, "Construction navale à Franc-Bord en Méditerranée et Atlantique (XIVe-XVIIe siècle) et 'Signatures Architecturales' Une Première Approche Archéologique", in Rieth, E., ed., *Méditerranée Antique. Pêche, Navigation, Commerce*, Paris: Comité des Travaux Historiques et Scientifiques, 1998.



Early examples:
Shell first / Watertight shell;

Planking: Edge-joining.

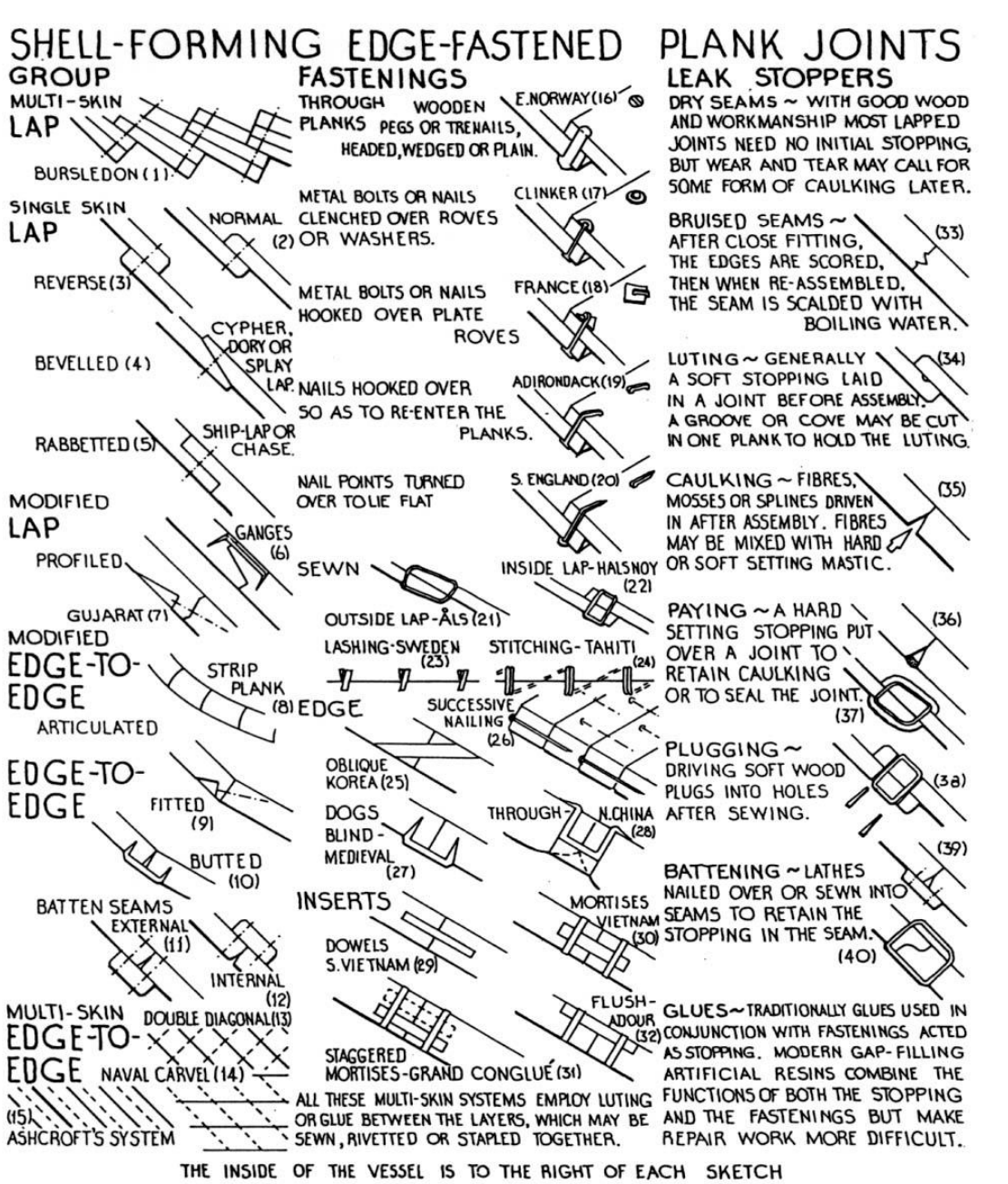
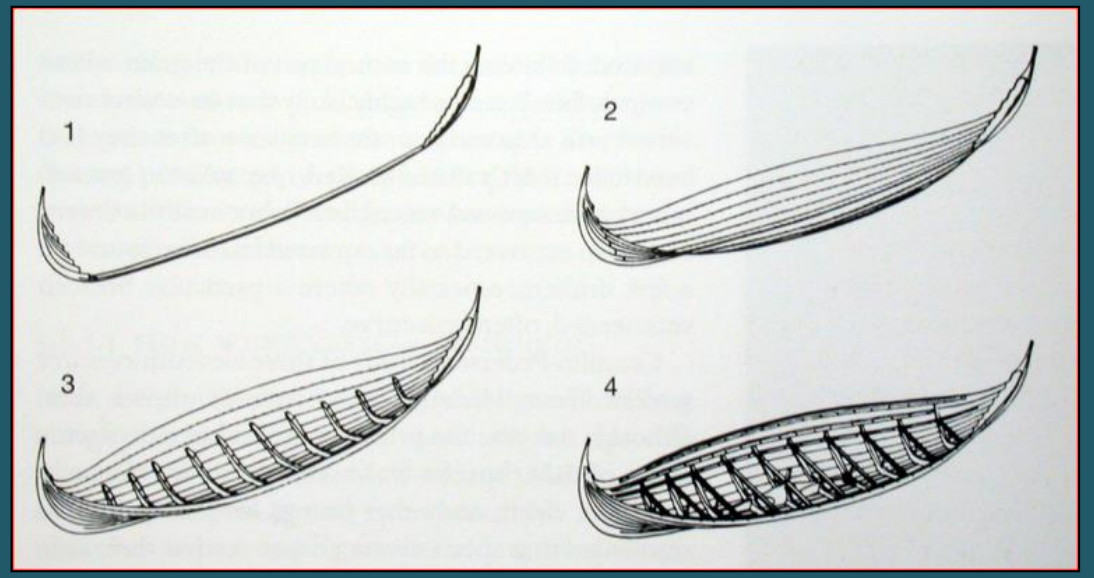


Figure 26 Some different kinds of edge-joining. *Eric McKee*

I. Piero Dell'Amico's Ship taxonomy:

1. Oral tradition
2. Partially geometric methods
3. Geometric methods



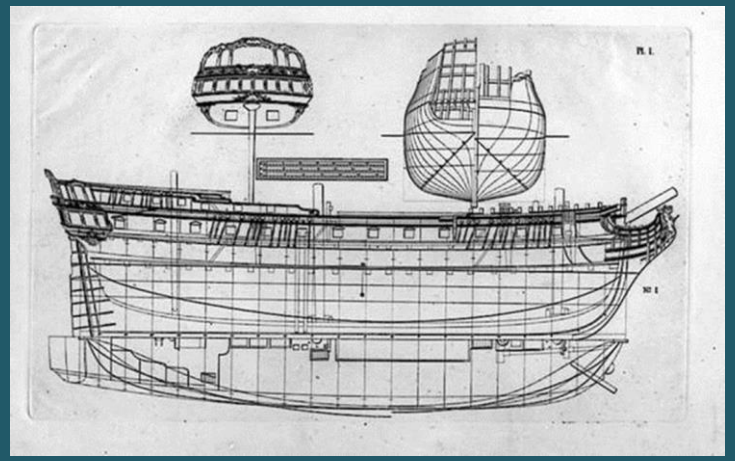
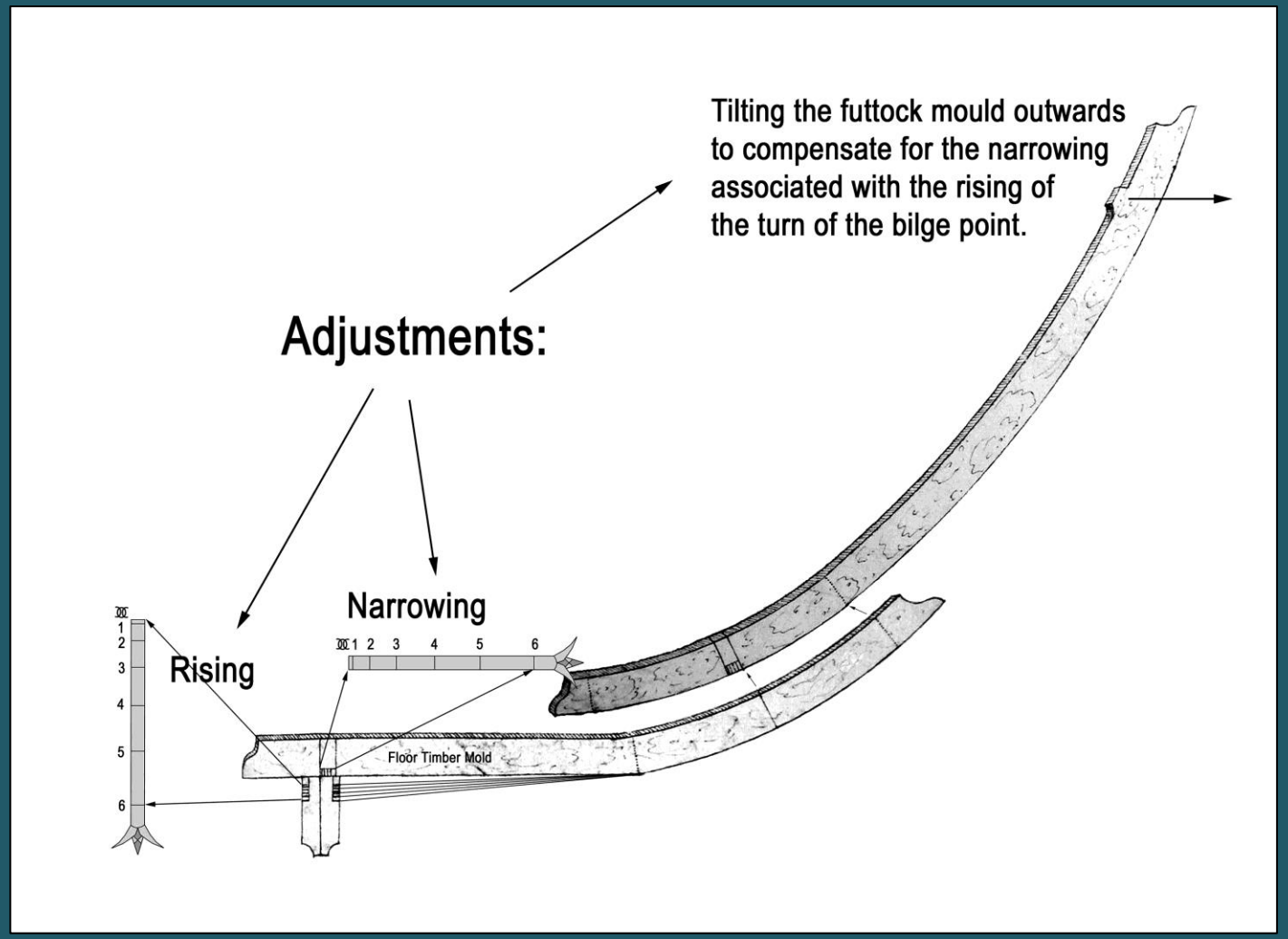


Fig. 2 – Cantiere Crivello, Porticello (Palermo). Seste di imbarcazioni costruite in precedenza (P. Dell'Amico).

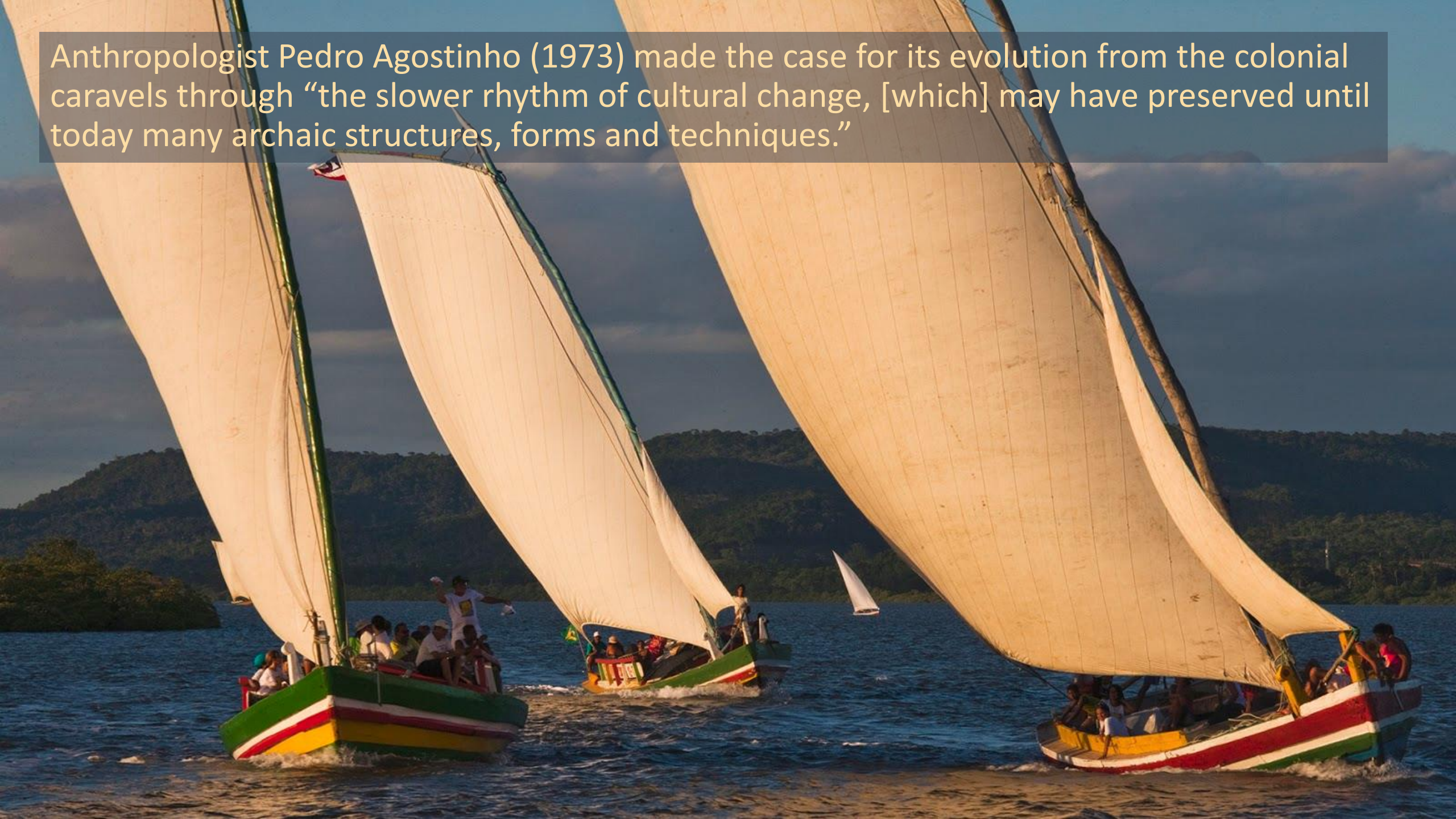
2. Partially geometric methods

A helpful concept to analyse the transfer of knowledge in the shipbuilding world was introduced by Richard Dawkins, which allows us to look at a vessel as a population of *memes*, or "units of culture" (an idea, belief, pattern of behavior, etc.) that can change and be transmitted.



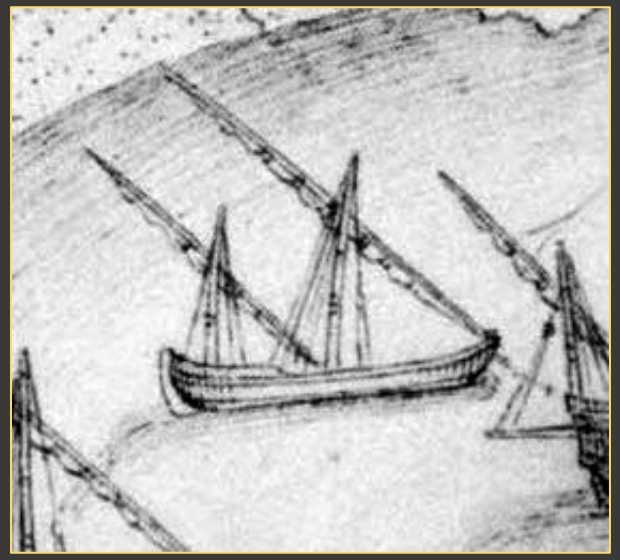
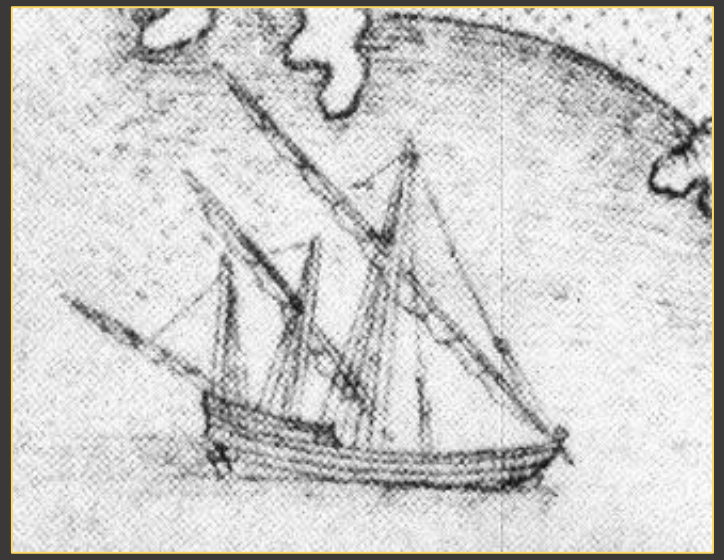
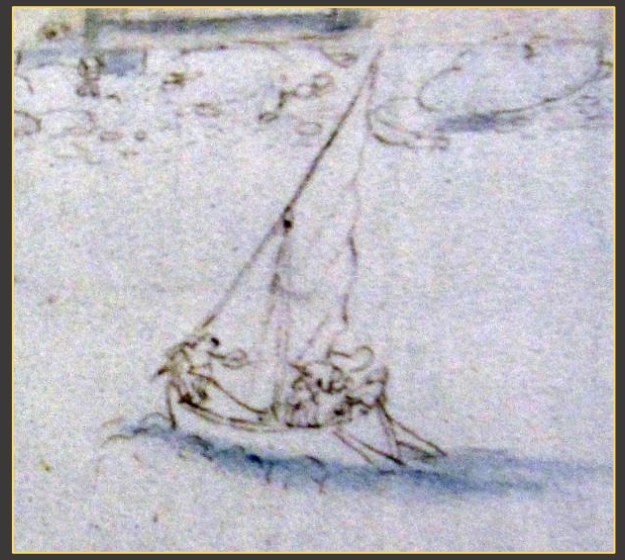
Dawkins, Richard, *The Selfish Gene*. New York: Oxford University Press, 1989.

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.

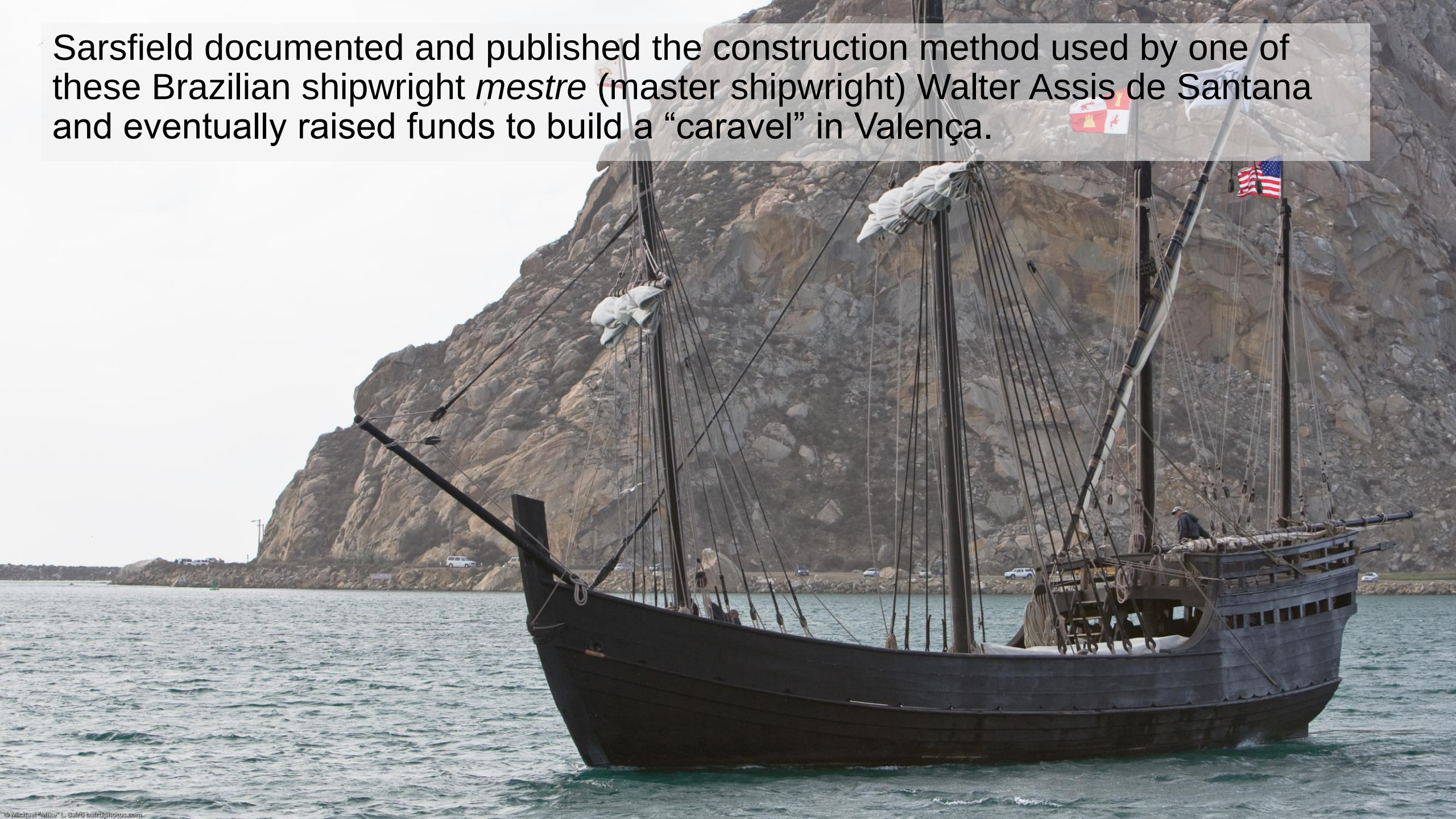


Anthropologist Pedro Agostinho (1973) made the case for its evolution from the colonial caravels through “the slower rhythm of cultural change, [which] may have preserved until today many archaic structures, forms and techniques.”

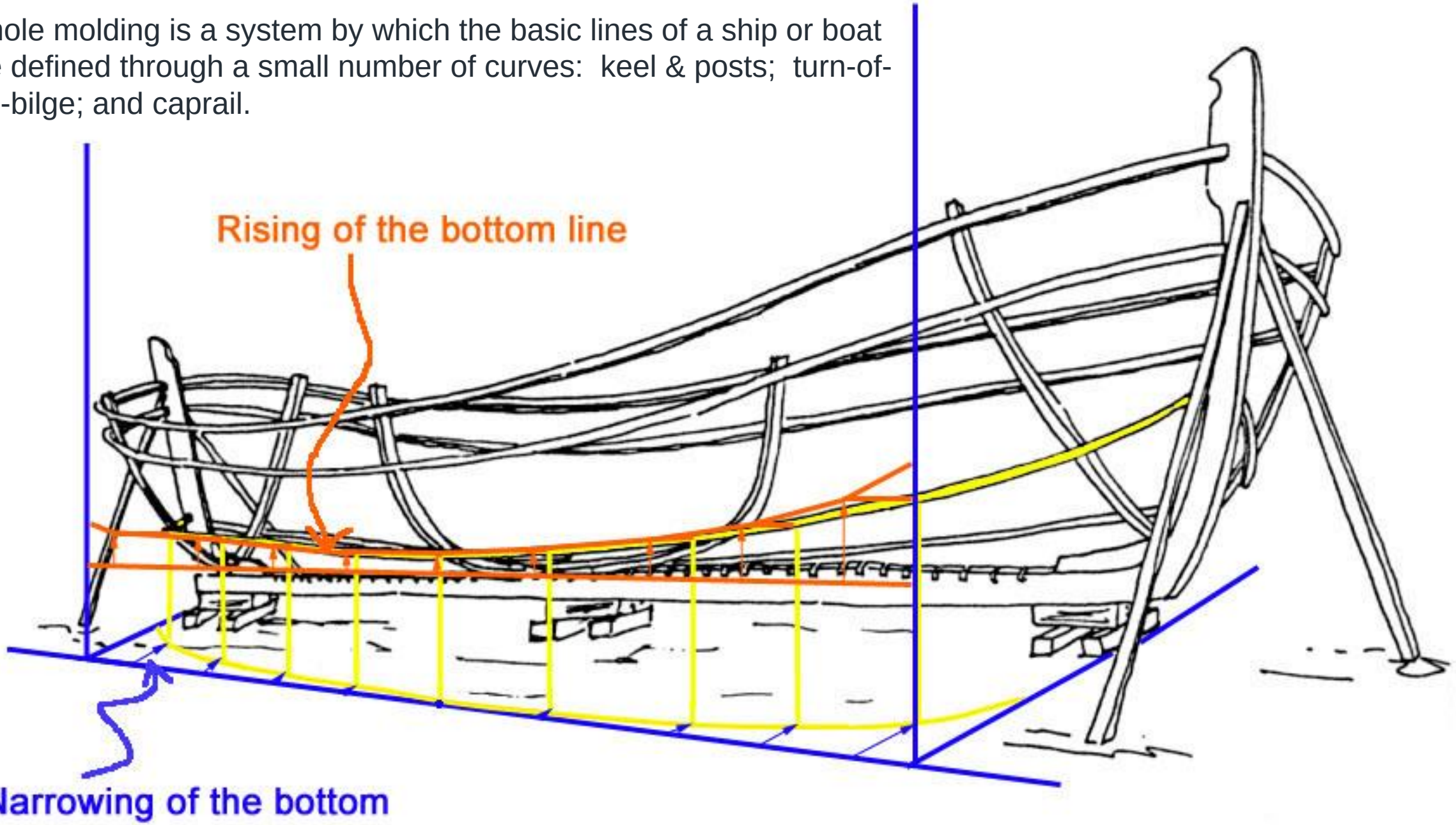


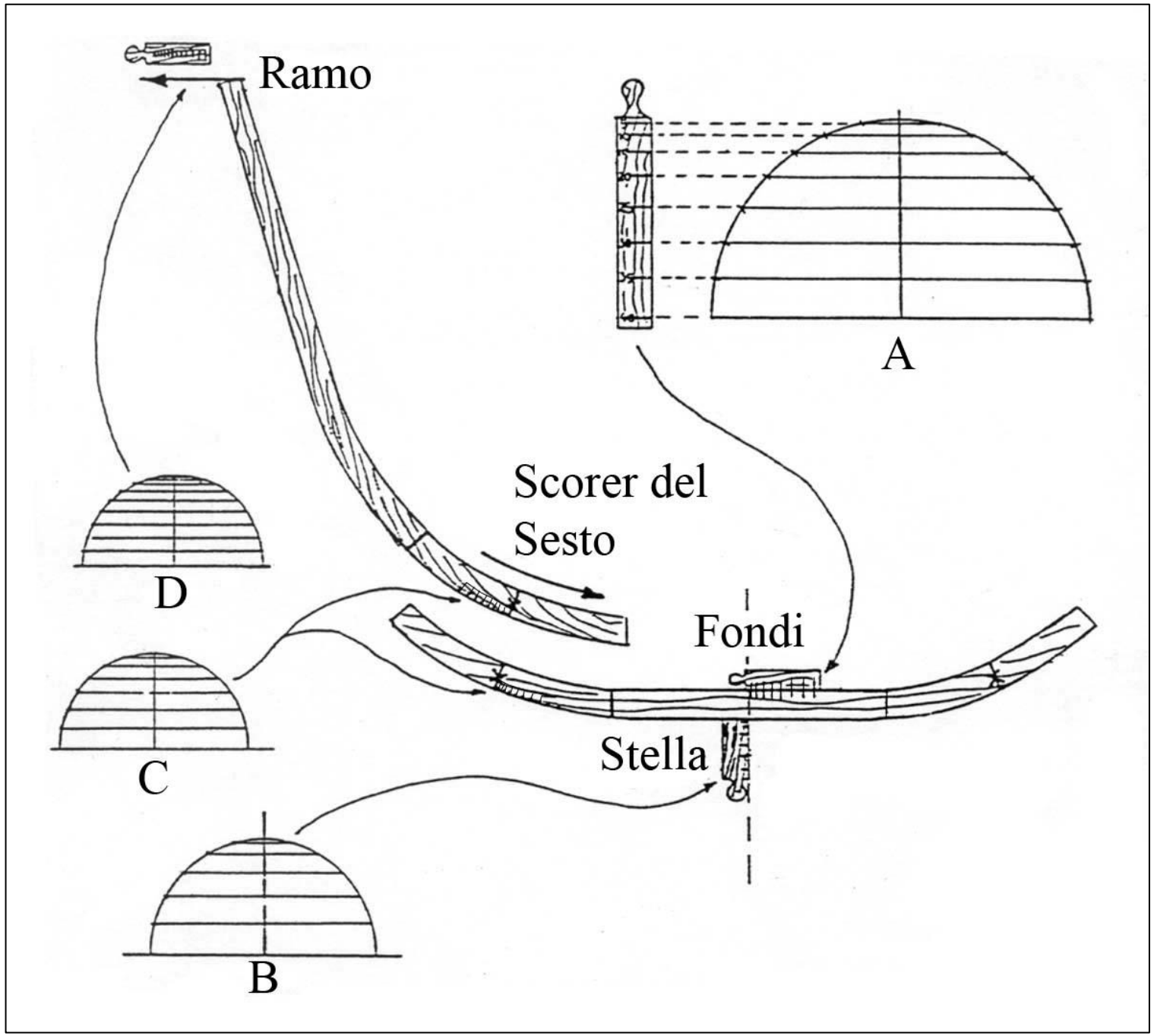





John Patrick Sarsfield, who in the 1980s traced a hypothetical developmental line, which explained the introduction of the present gaff sails through Dutch influence [17th century] and the change of name from caravela (or caravelão) to saveiro.

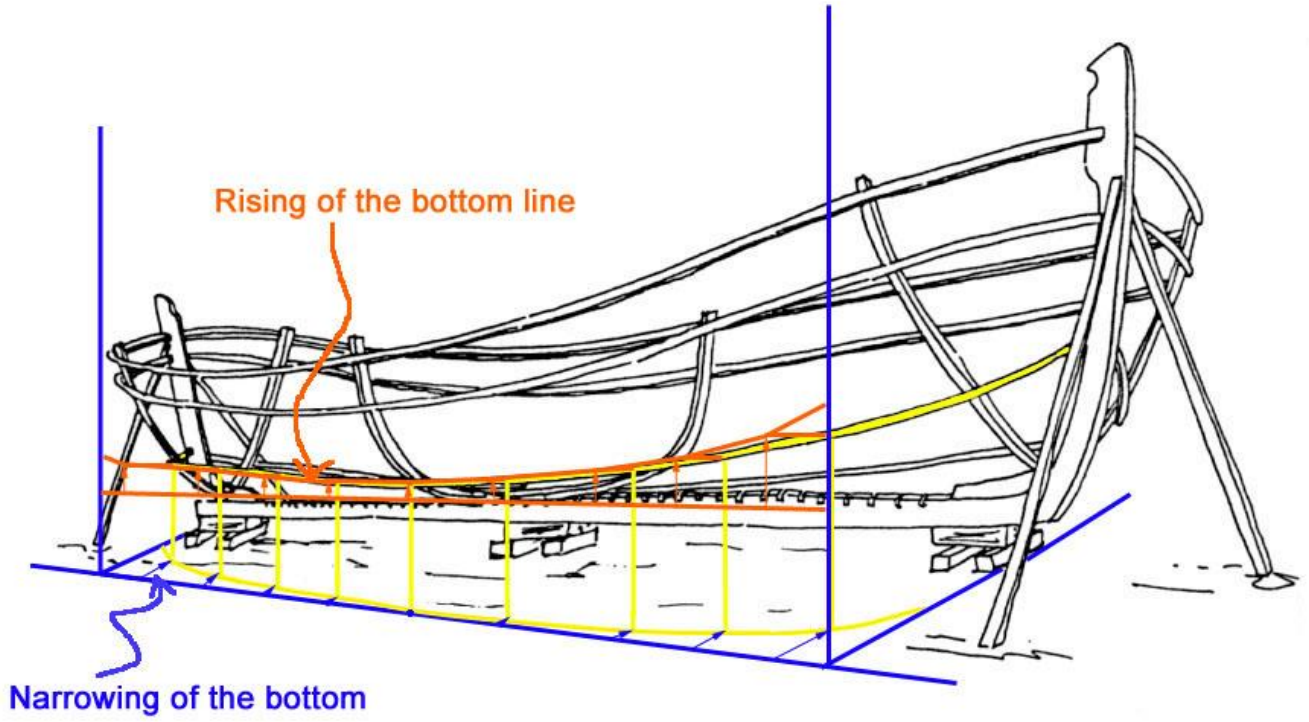

Sarsfield documented and published the construction method used by one of these Brazilian shipwright *mestre* (master shipwright) Walter Assis de Santana and eventually raised funds to build a “caravel” in Valença.

Whole molding is a system by which the basic lines of a ship or boat are defined through a small number of curves: keel & posts; turn-of-the-bilge; and caprail.



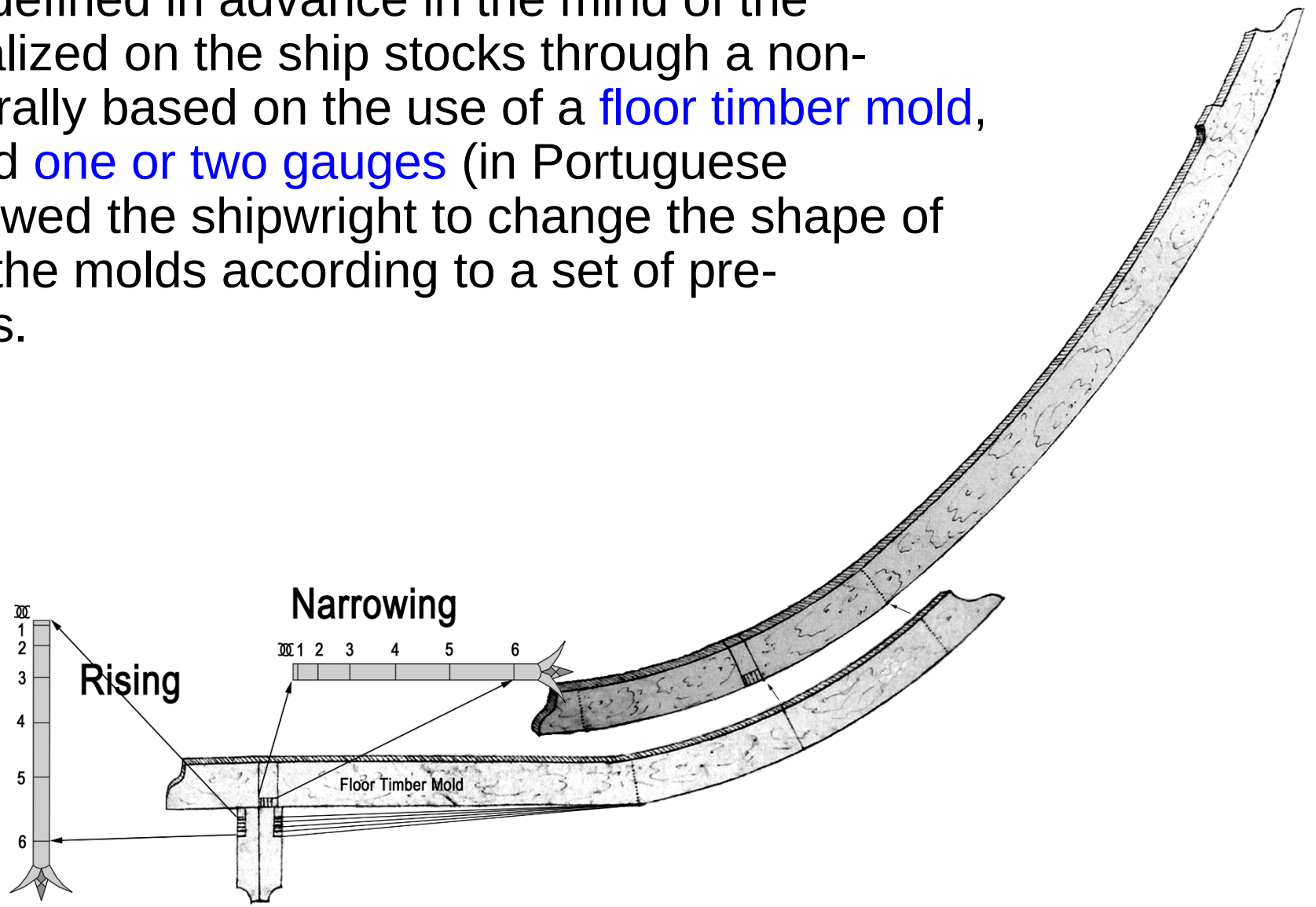


The projections of the curves in two orthogonal planes are simulated by two fair curves, obtained by a simple geometric process Italians called *mezzaluna* and Portuguese *besta* (crossbow).



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.

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 (in Portuguese *graminhos*), which allowed the shipwright to change the shape of each frame by sliding the molds according to a set of pre-established increments.



No construction drawings were used.

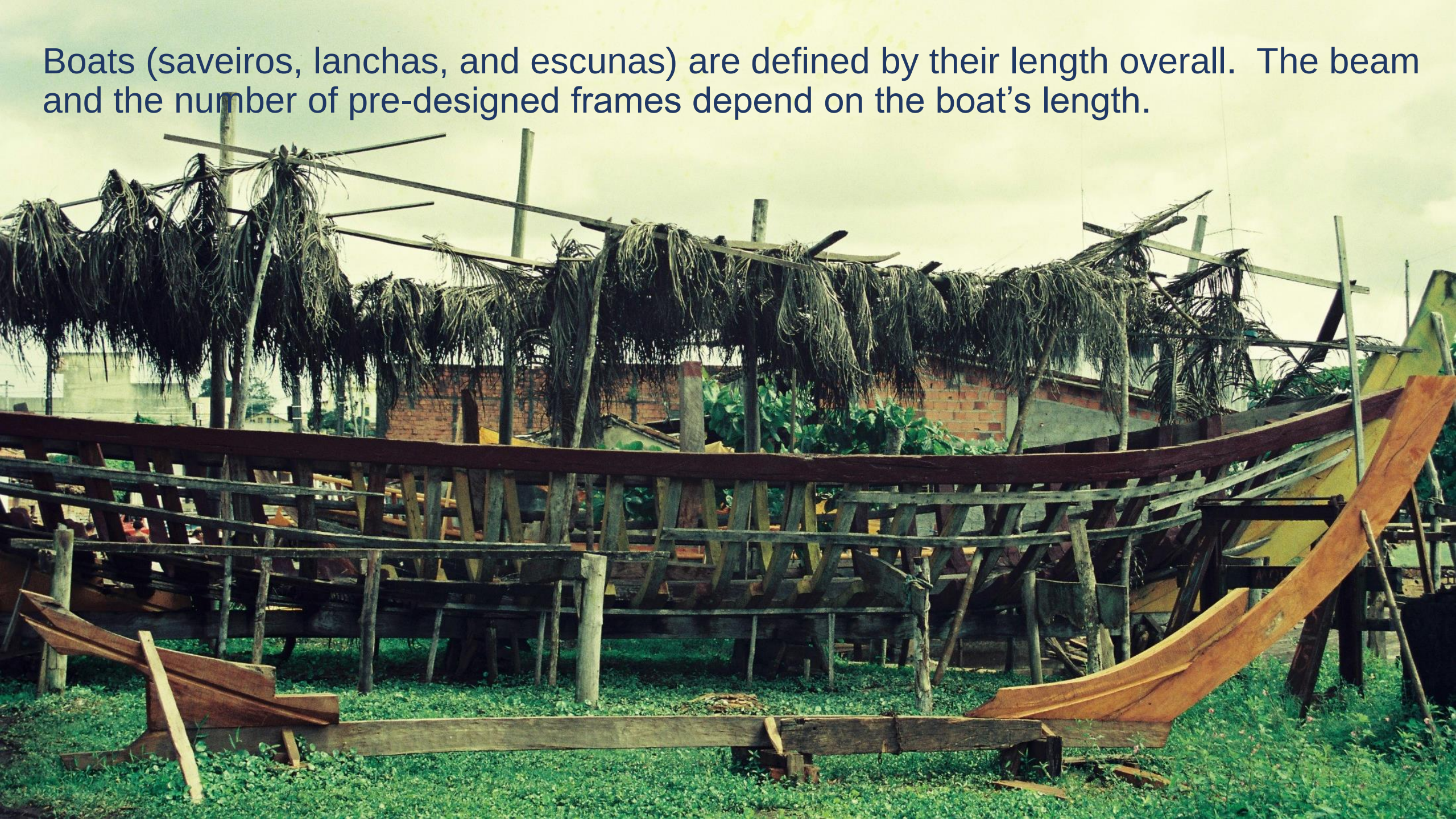
In December 2013 we visited Valença and interviewed a number of shipwrights in order to assess the situation and design a strategy to study this shipbuilding tradition.

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, 2013

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

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.



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

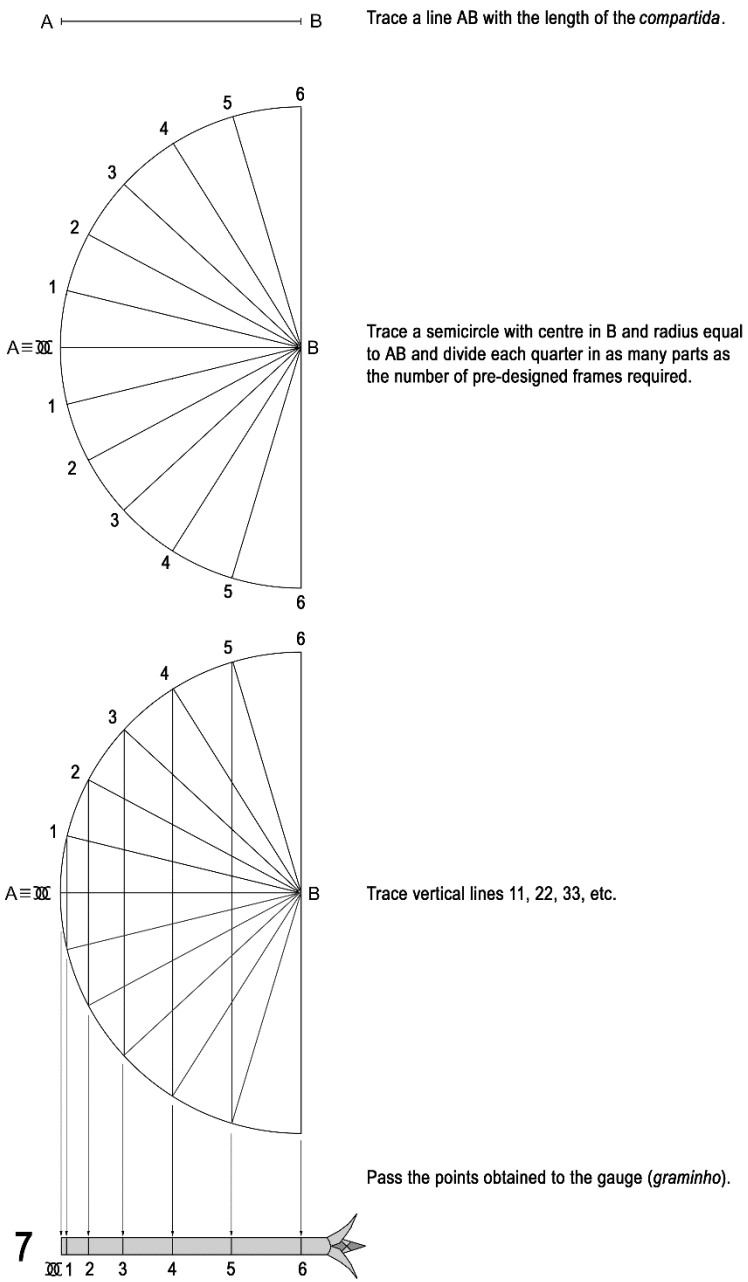
According to *mestre* Zé Crente, “a 9 m long saveiro takes eight predesigned frames (*casas de armação*), one of 10 m requires 10 predesigned frames.”

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.

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

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).

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*.



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).

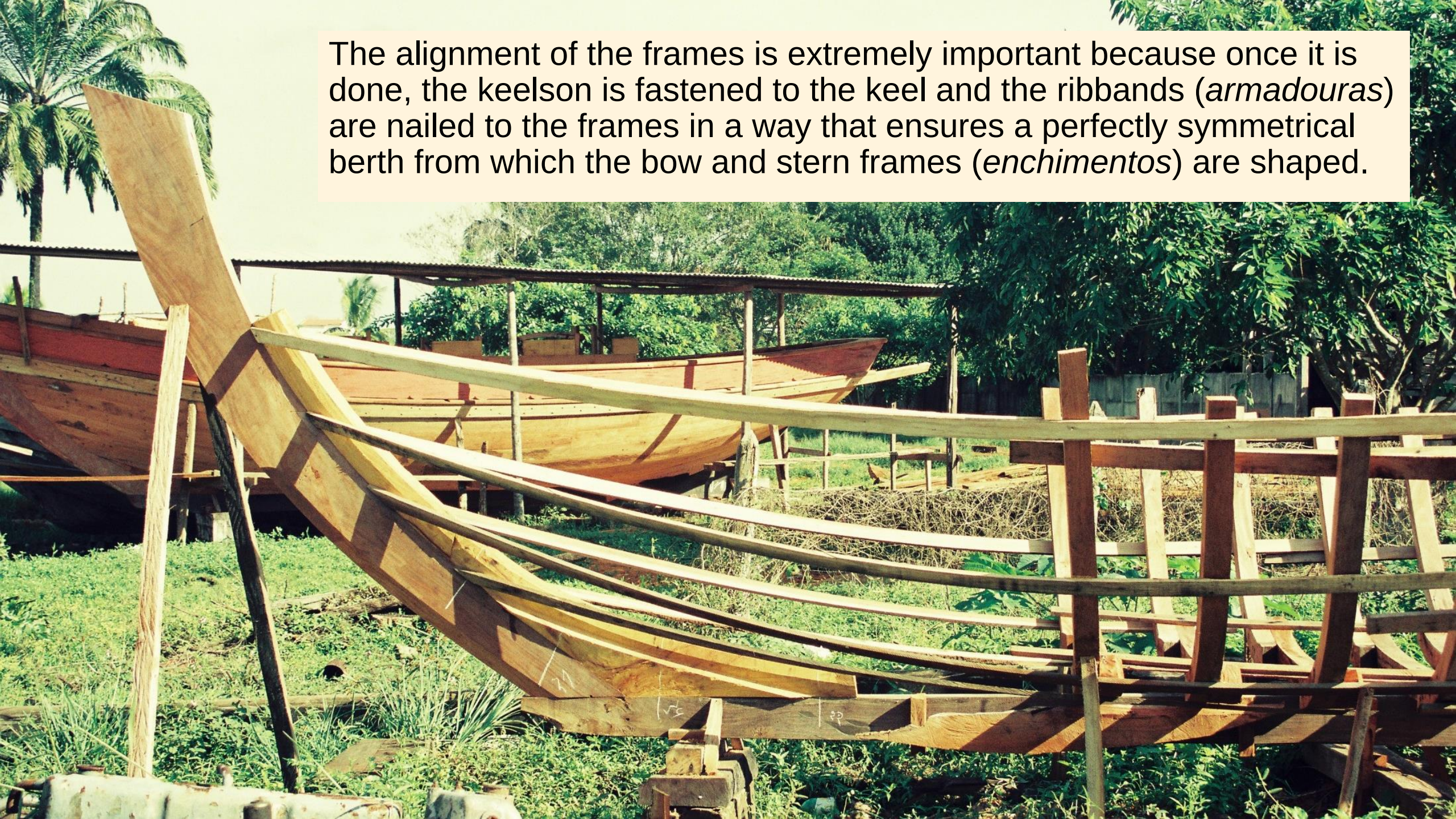
Tracing a *graminho*.

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

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*).

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.

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



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.

In the smaller river boats, we have observed that 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.

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.

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

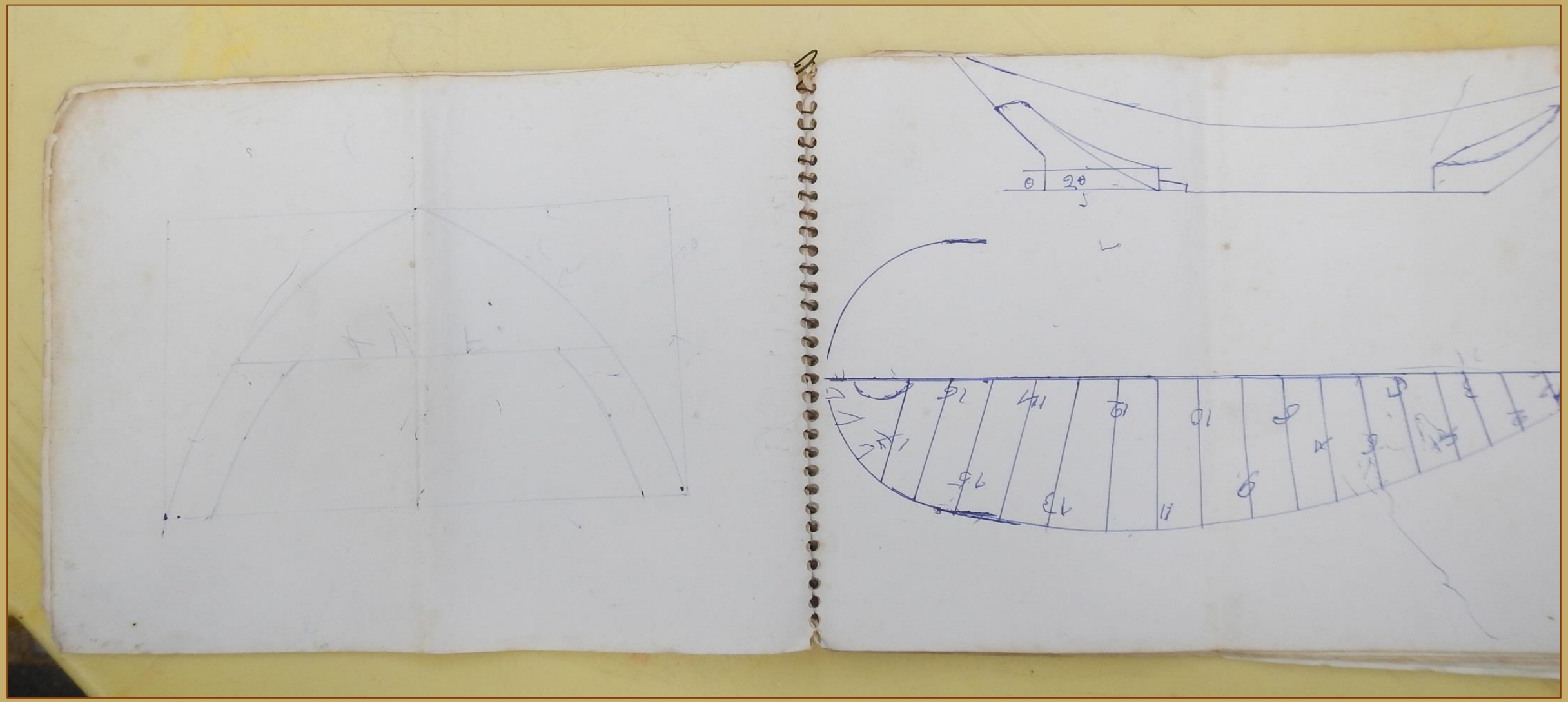
The planking starts from the main wale and is laid downwards. According to *mestre* Chico, after laying four planks under the mainwale, another four planks are laid from the keel upwards, and a ninth, drop strake, is then laid to close the hull.

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

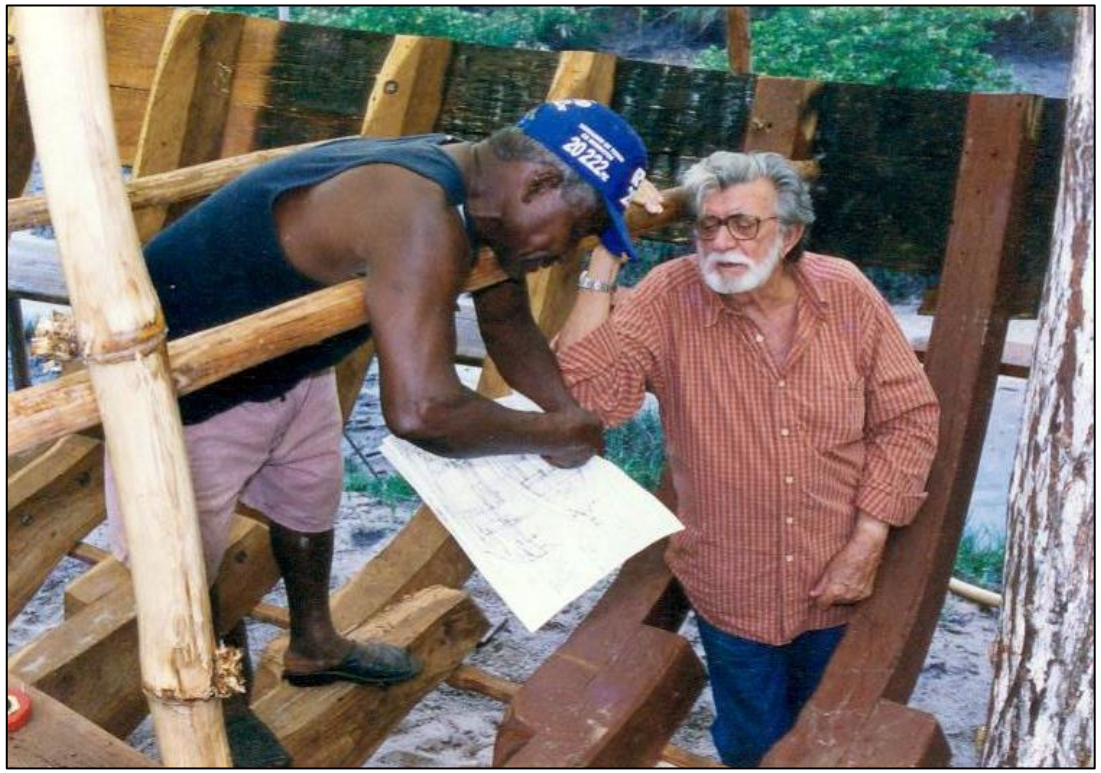
The garboards (*tábuas de resbordo*) are sometimes laid last, with a characteristic sharp angle on the forward hood.

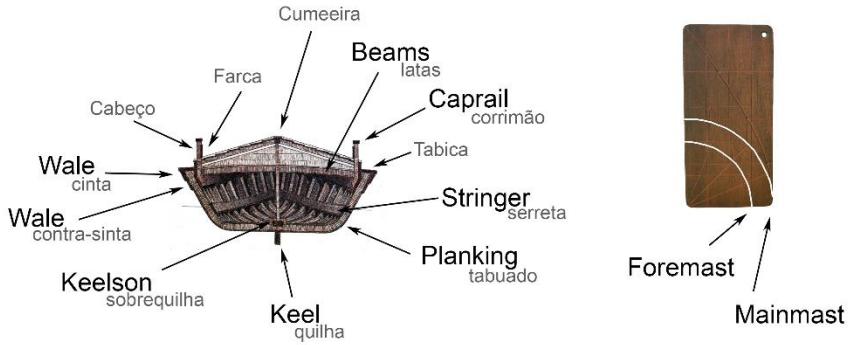
There is no rabbet (*alefriz*) along the keel. Only the bow and stern knees have rabbets to receive the planking hoods.

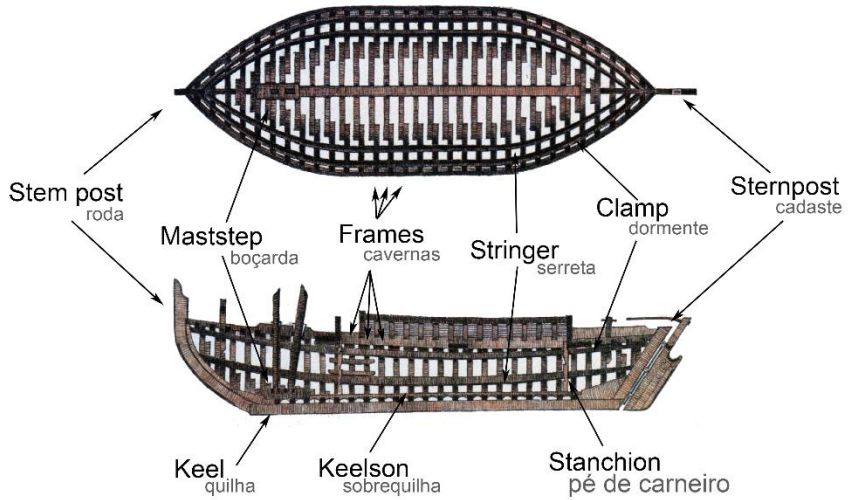


Our visit to Valença was a success: all shipwrights opened their houses and showed us their notes, their molds and their *graminhos*.

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.



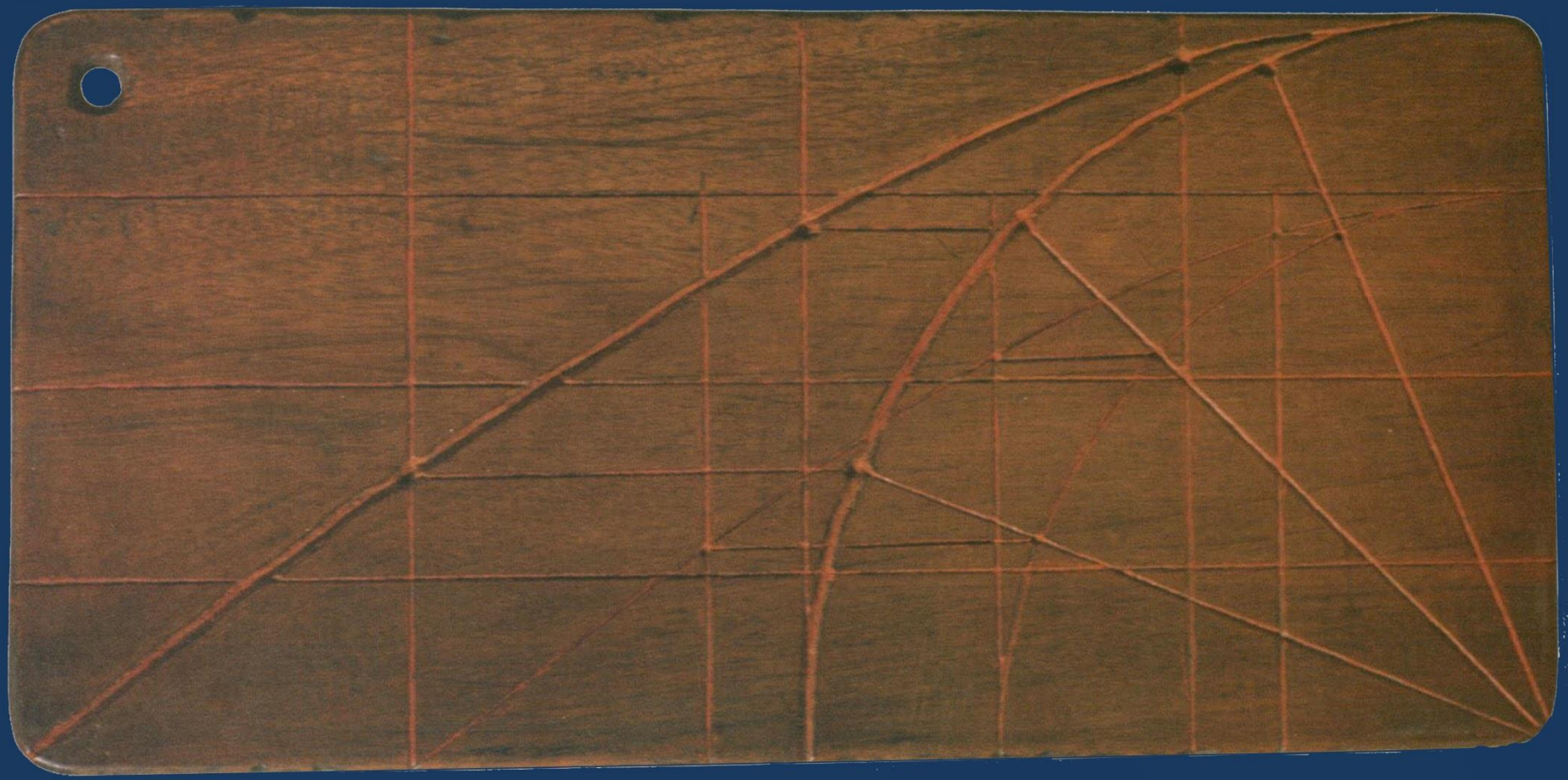




Lev Smarcevski's book, *A alma do saveiro*, presents a very interesting *graminho*, which sheds light on the whole molding methods used in Baía, and mentioned in John Patrick Sarsfield's work, unfinished after his tragic and untimely death.

John Patrick Sarsfield

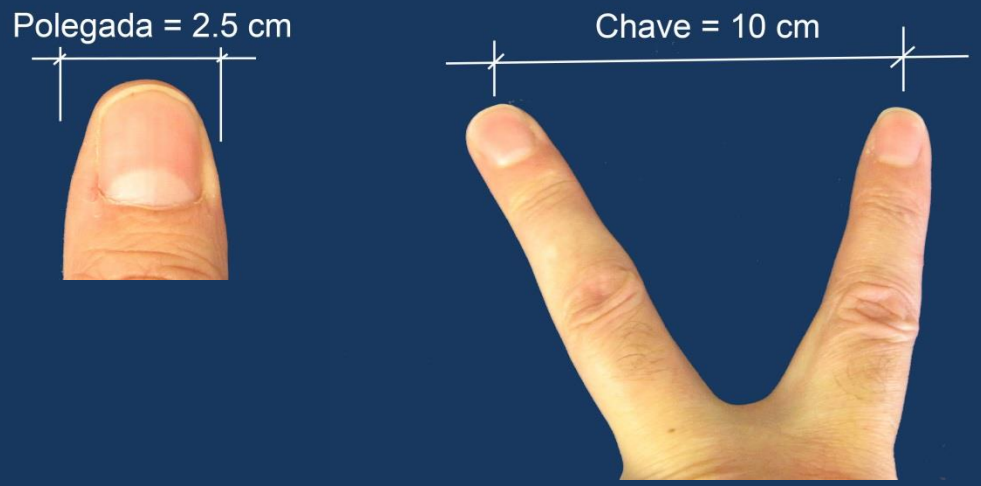
Lev Smalevski explained one of these *graminhos*, belonging to shipwright João Bezerra:



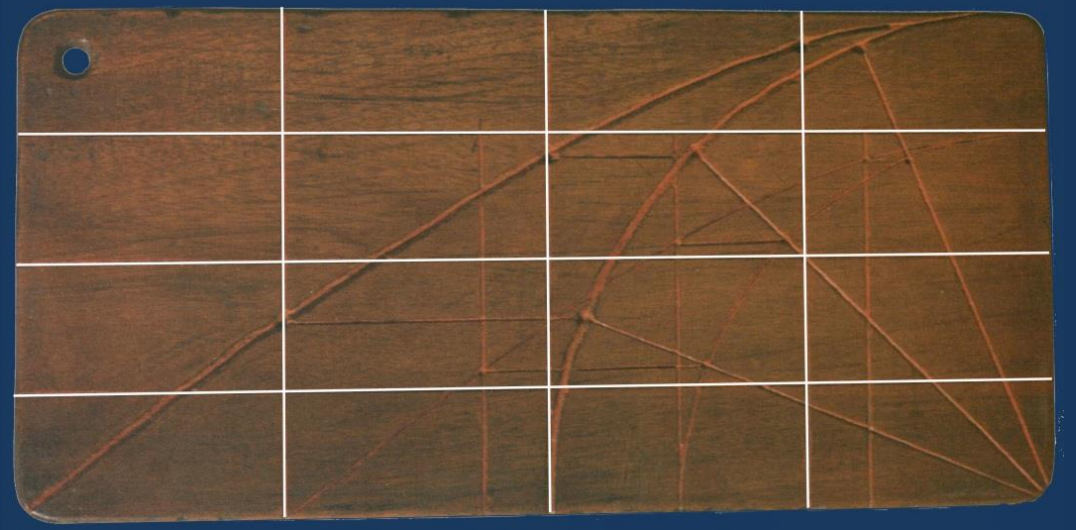
The size of the *graminho* is the section of the keel. It contains the sections of the most important timber of a boat.

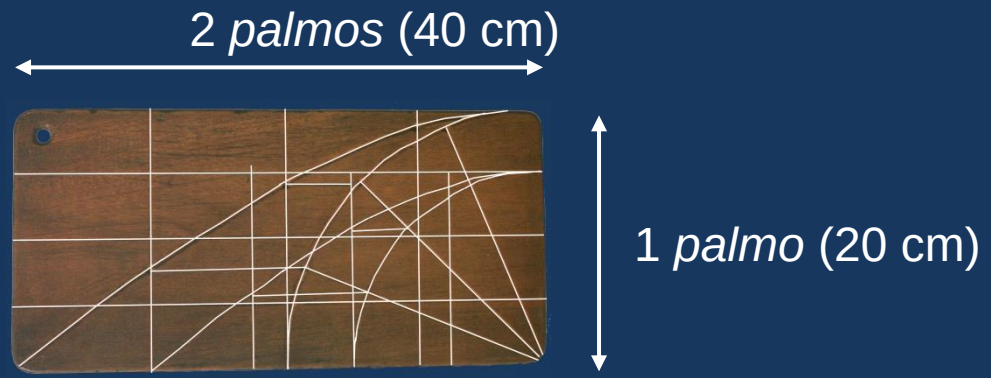
It is a very important tool when the shipwright goes to the forest to cut the timbers.

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



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





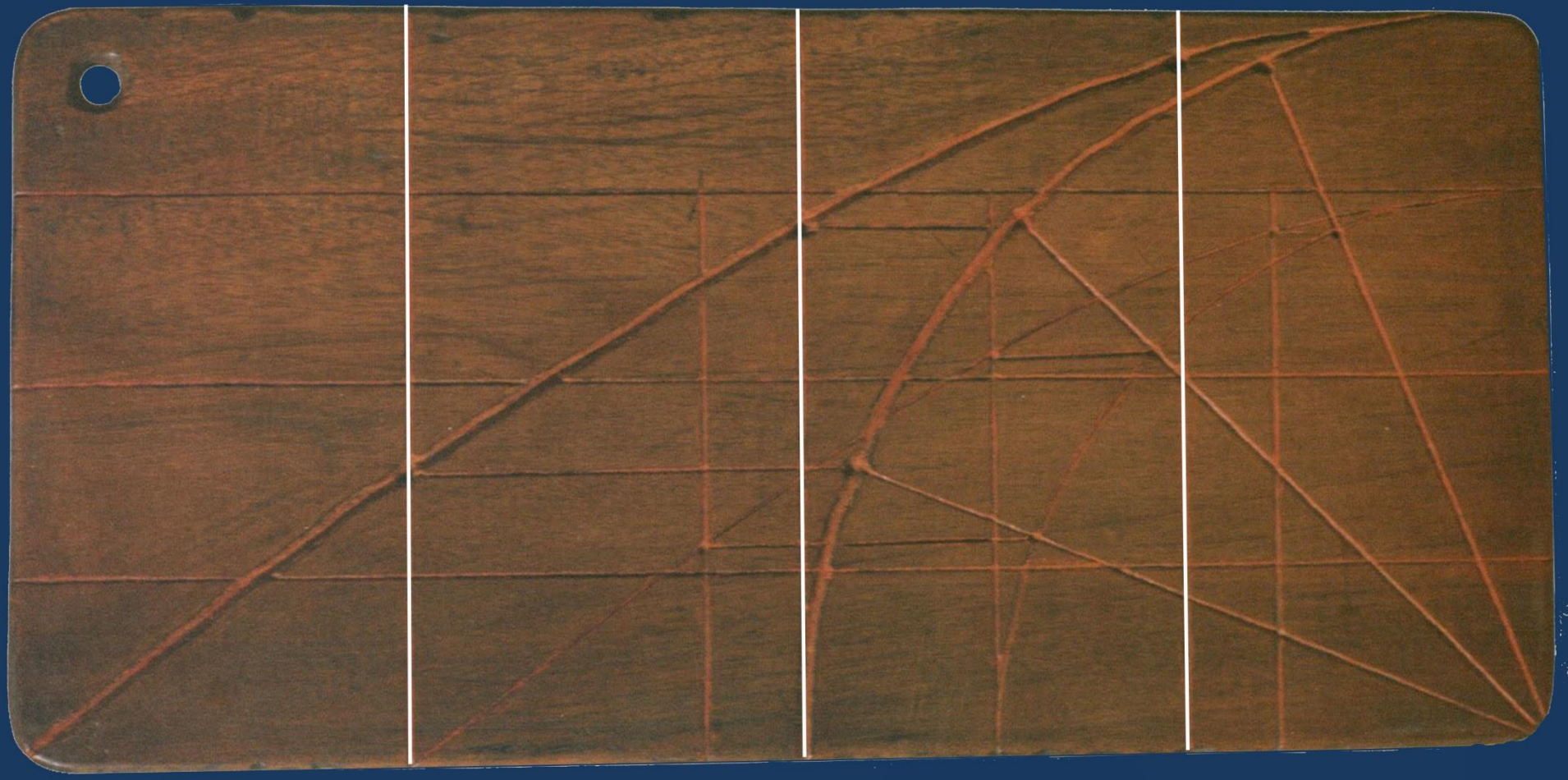
For a boat 100 *palmos* long (LOA = 20 m), the keel molded dimension should be h = LOA/50 = 40 cm, and its sided dimention b = h/2 = 20 cm.

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

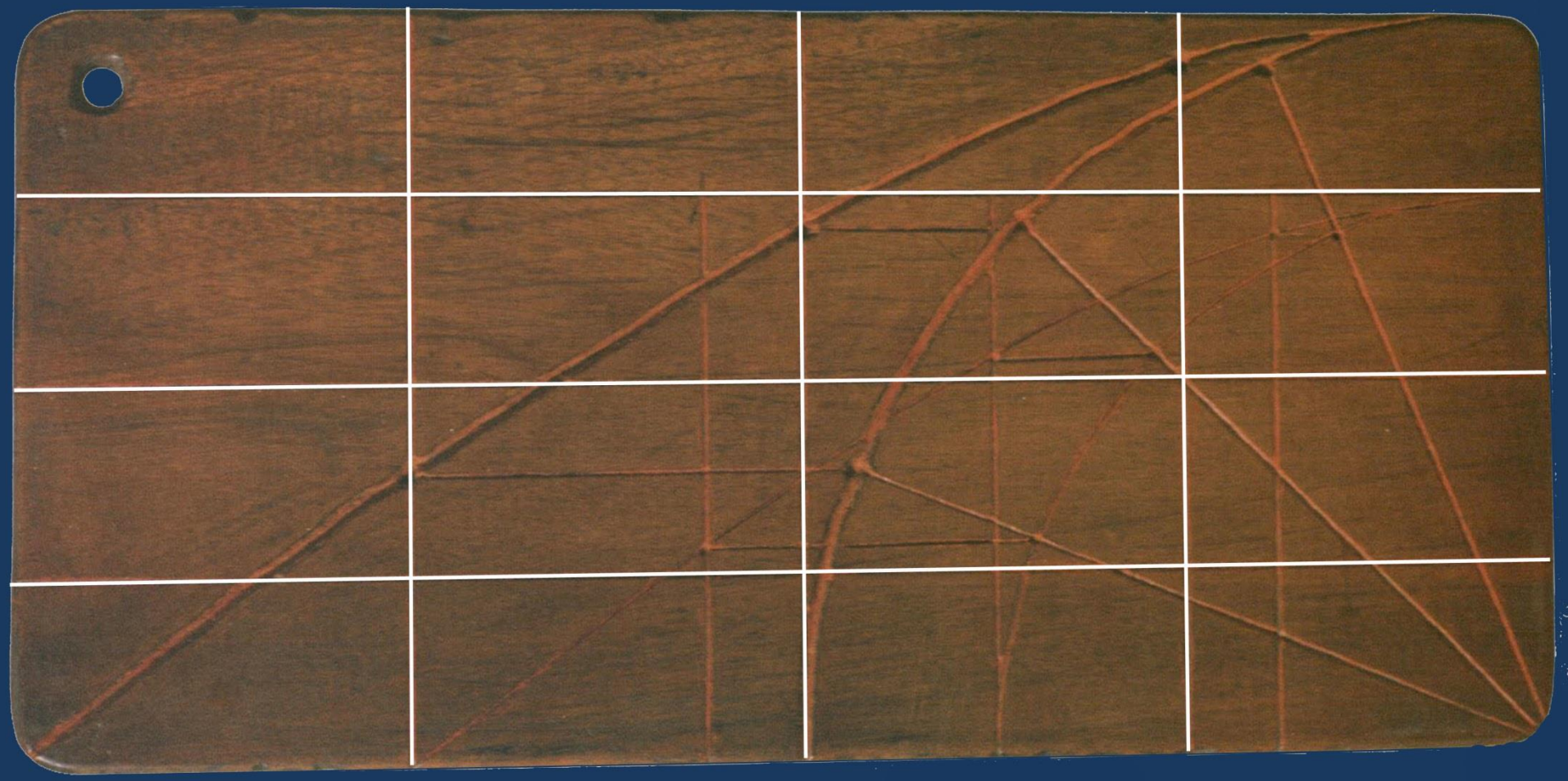
This hull will have a capacity of 100/2 = 50 *toneladas* (each 2 palmos of length overall are equivalent to 1 *tonelada* of capacity).

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

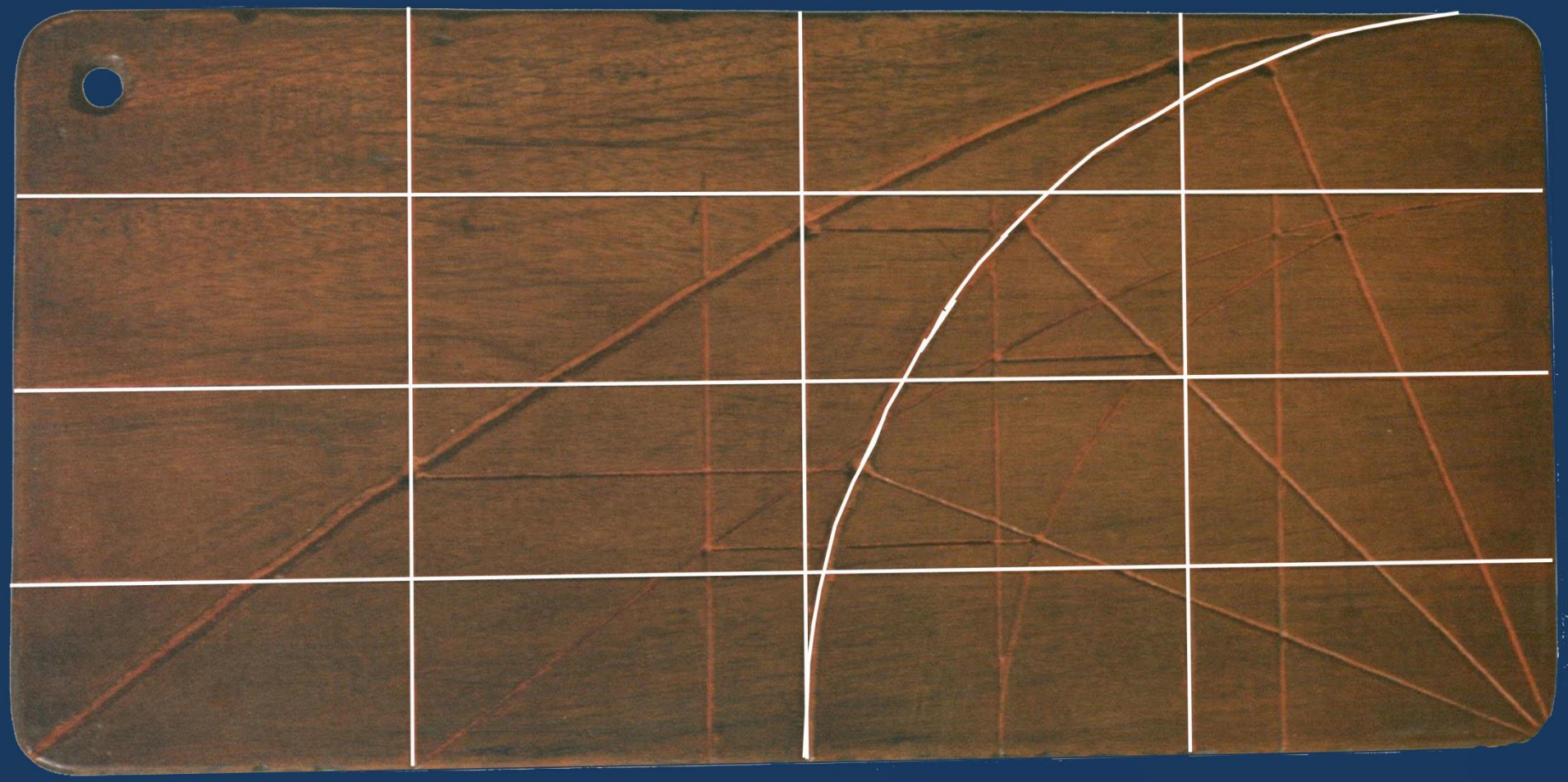
First one divides the *graminho* vertically into four parts:



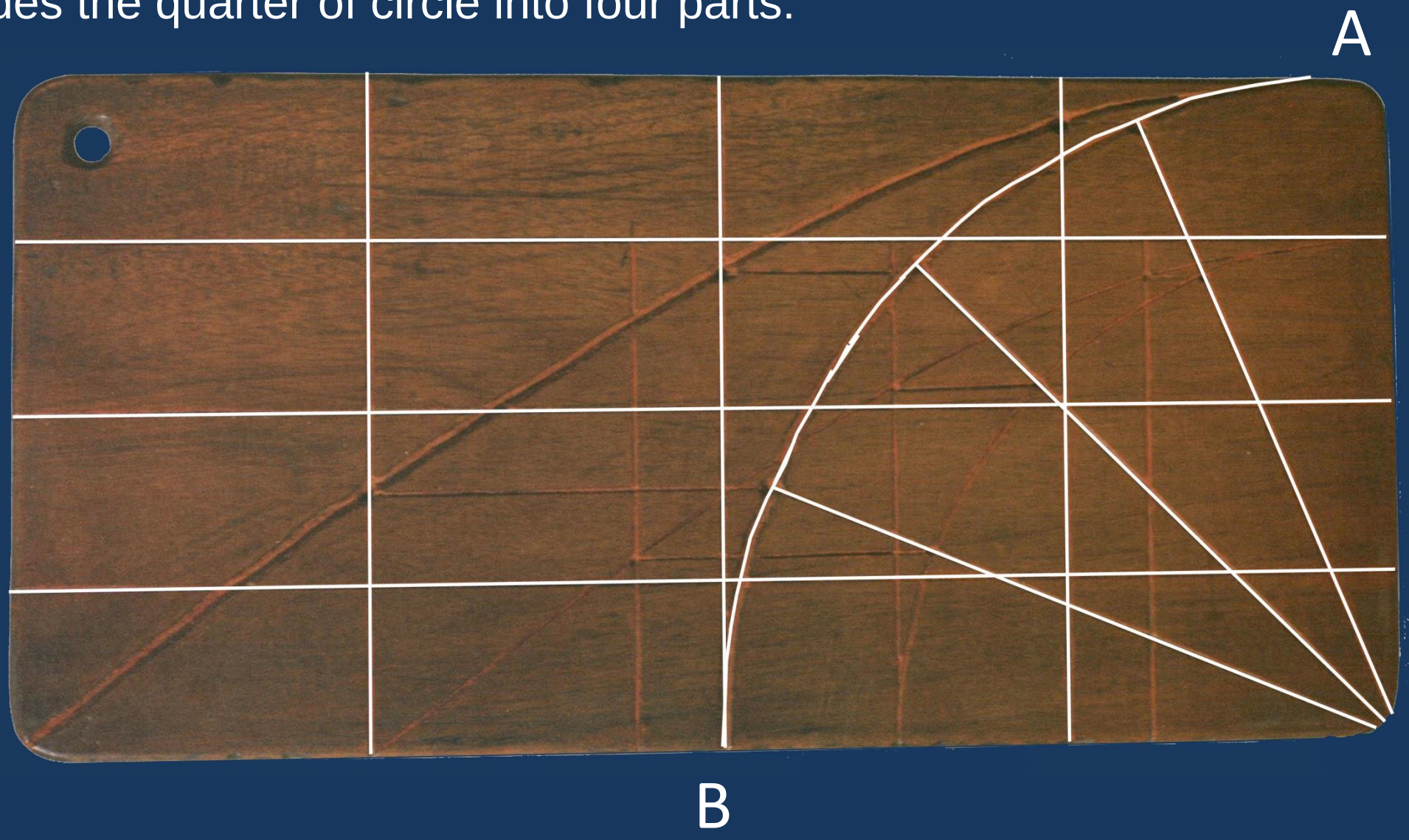
Then horizontally, also into four parts:



Then one traces the quarter of circle AB:

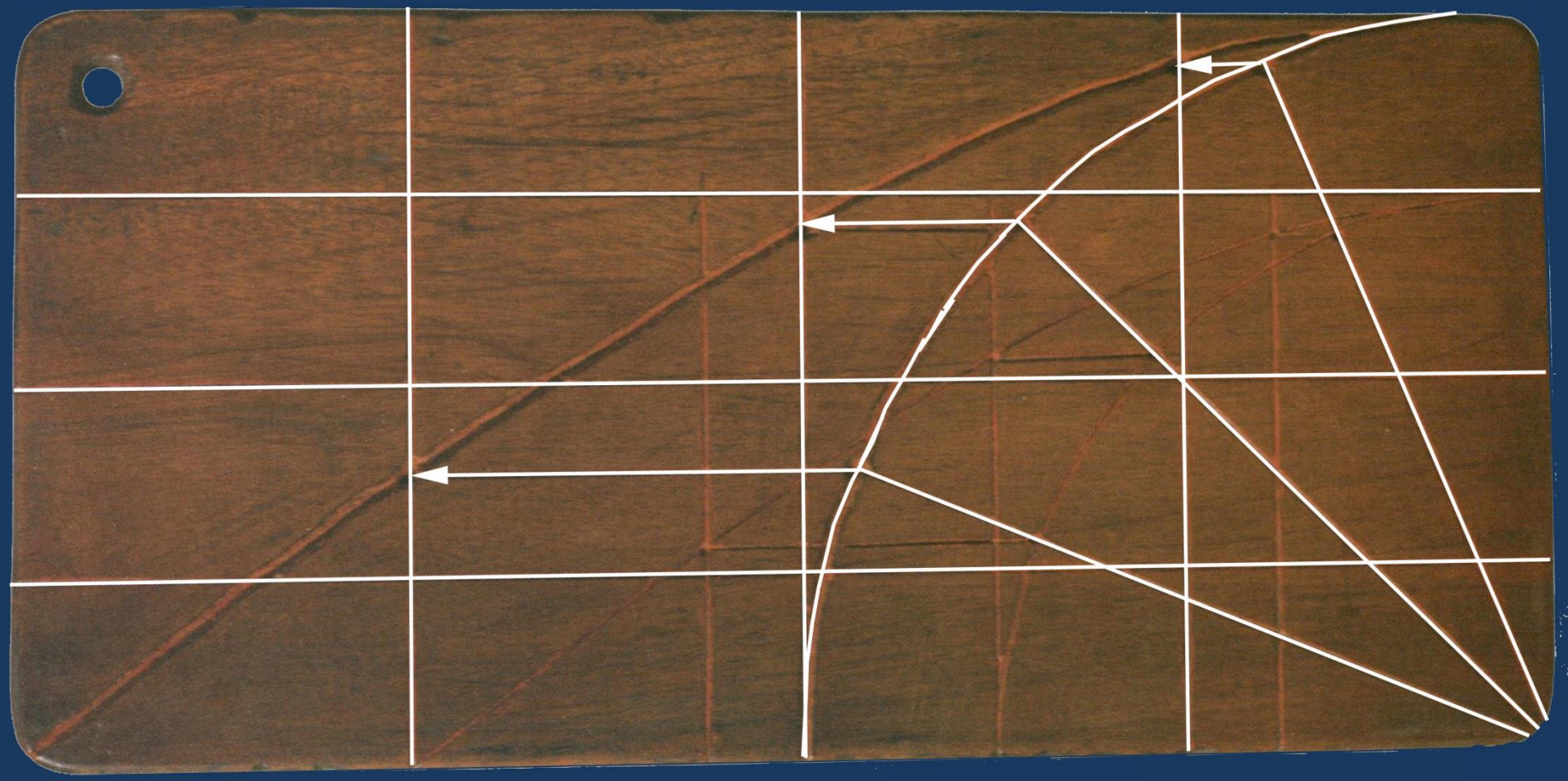


Divides the quarter of circle into four parts:



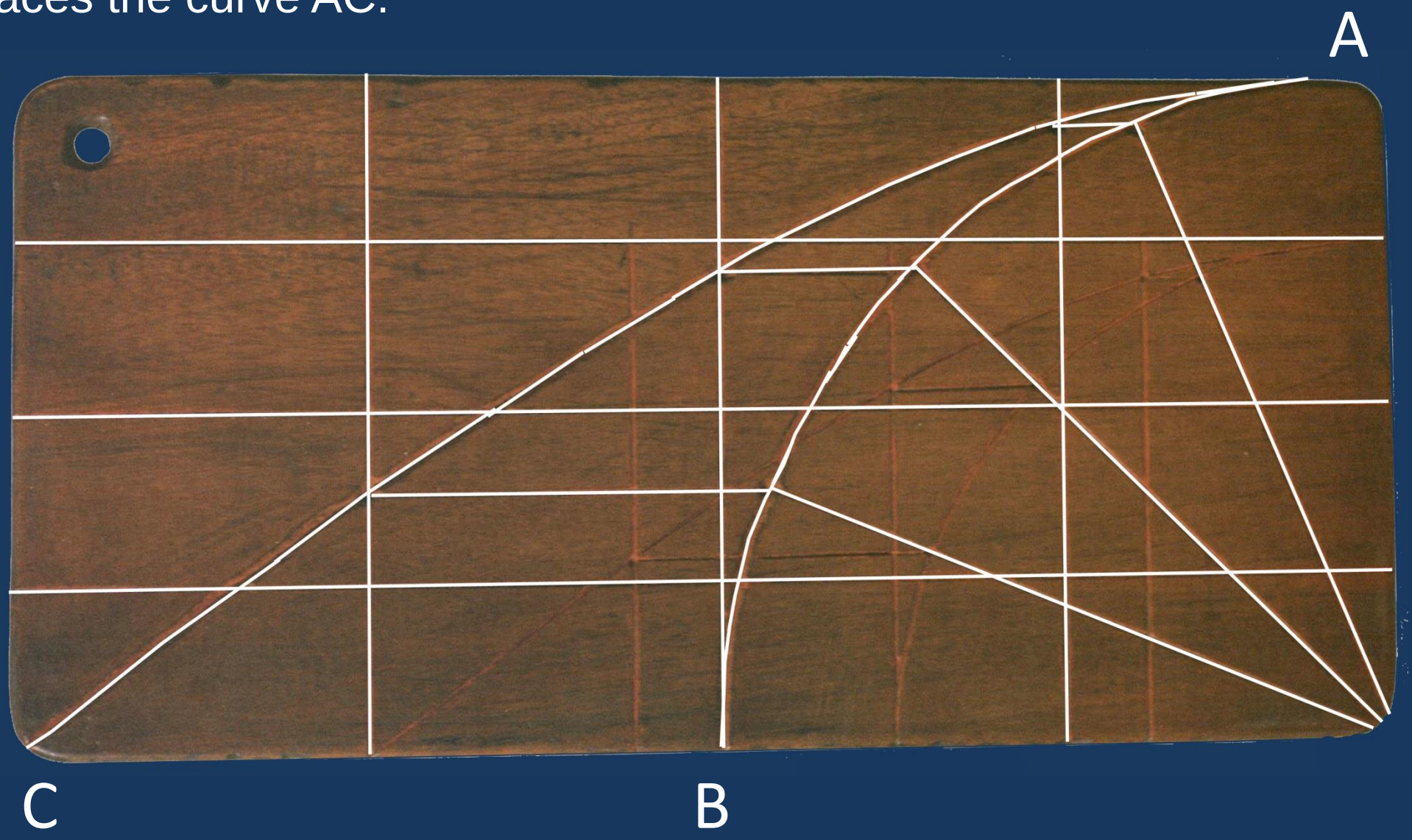
Extends the lines horizontally into the vertical lines:

A

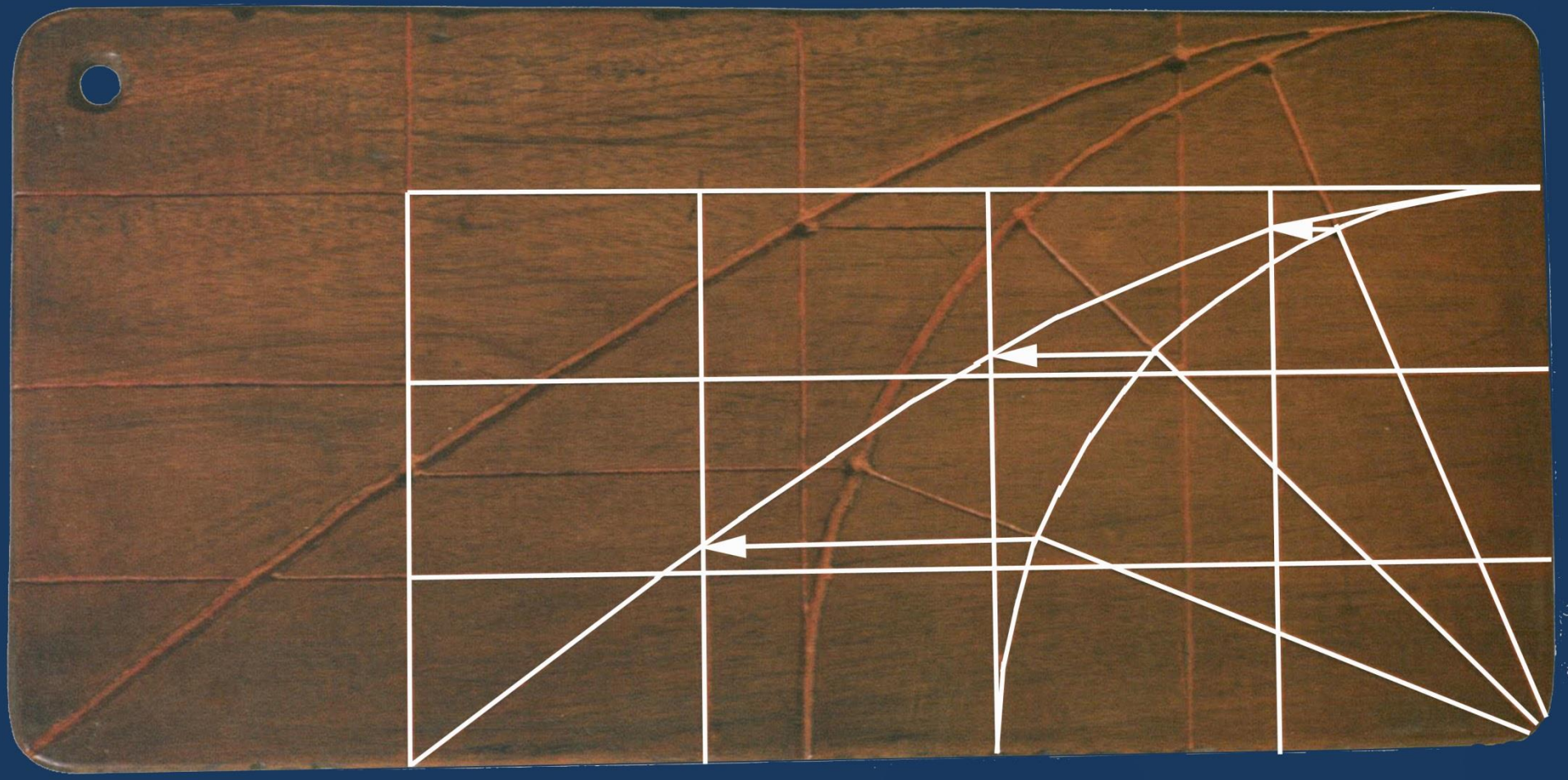


B

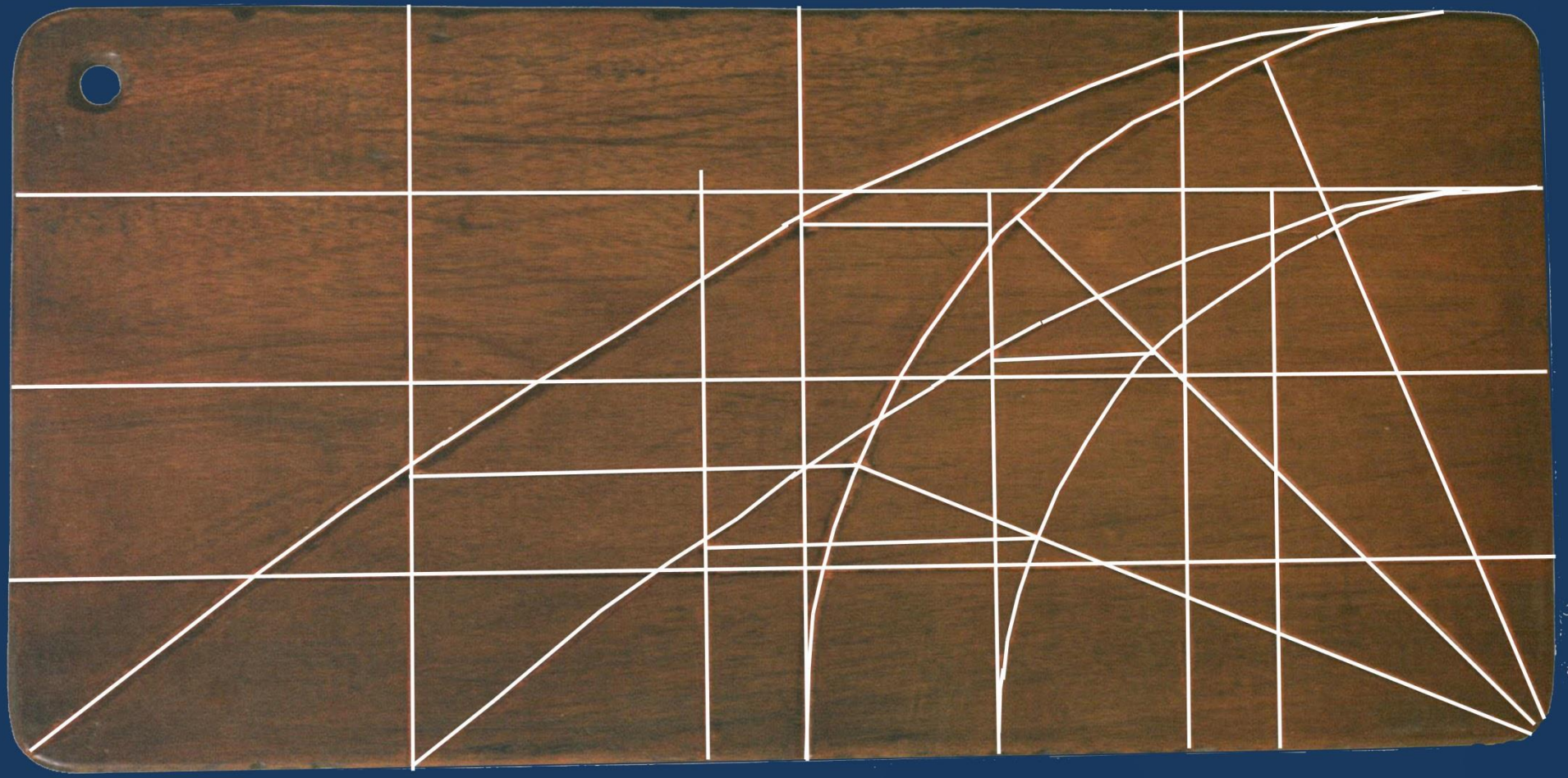
And traces the curve AC:



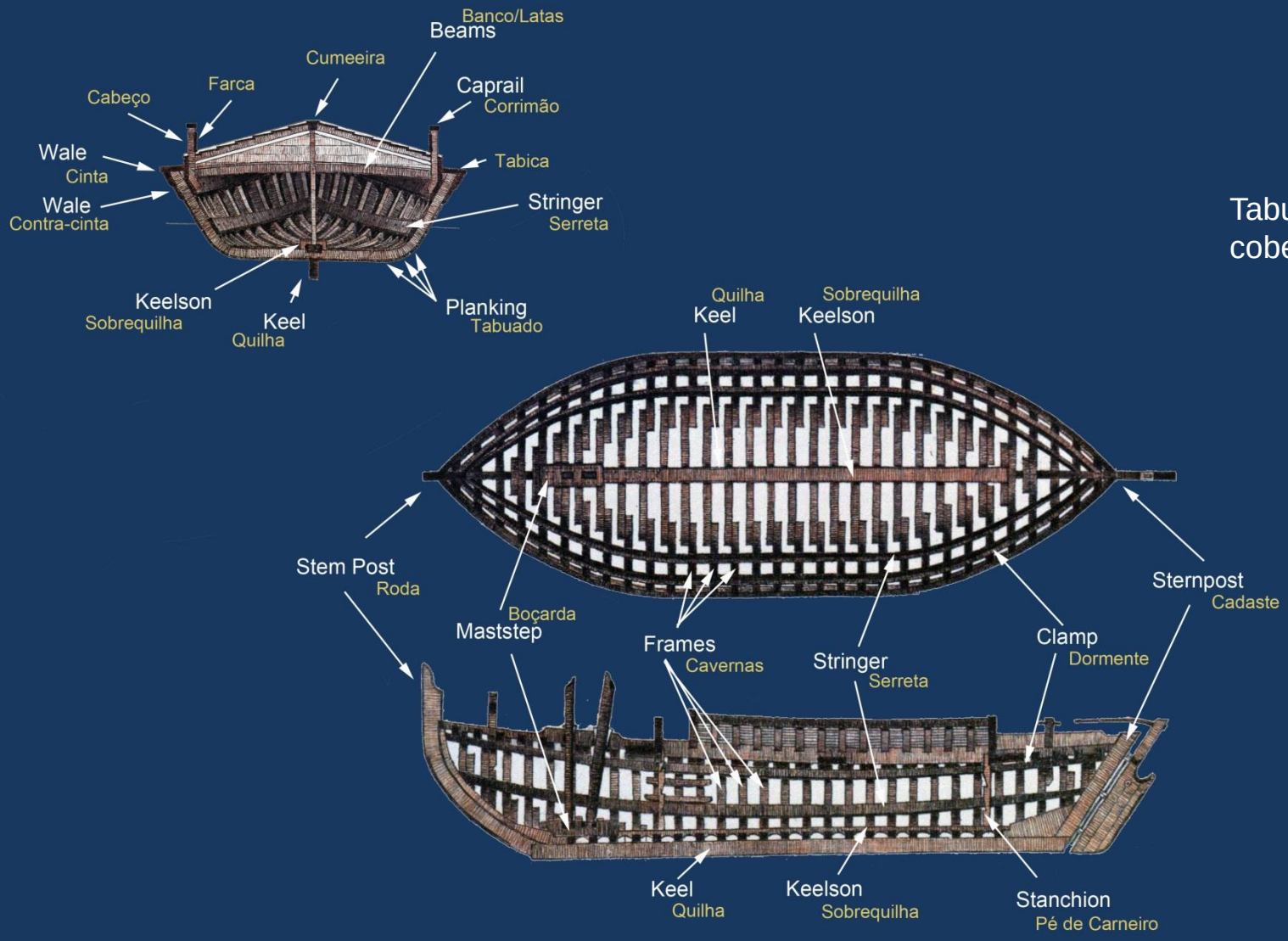
Then one repeats the procedure on a smaller rectangle (¾ x ¾ of the original):



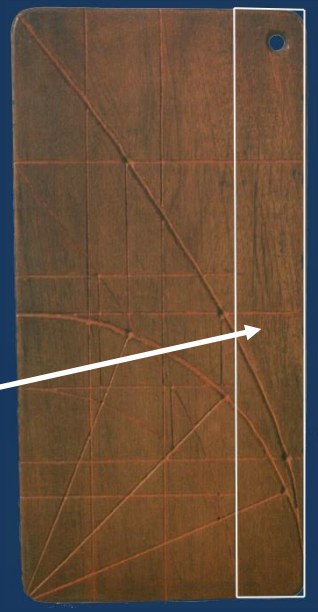
The complete *graminho* looks like this:



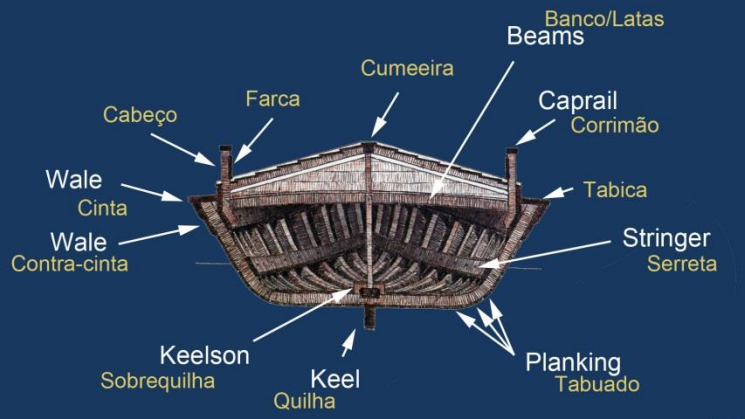
All the principal timbers necessary to build a *saveiro* are represented in this *graminho*:

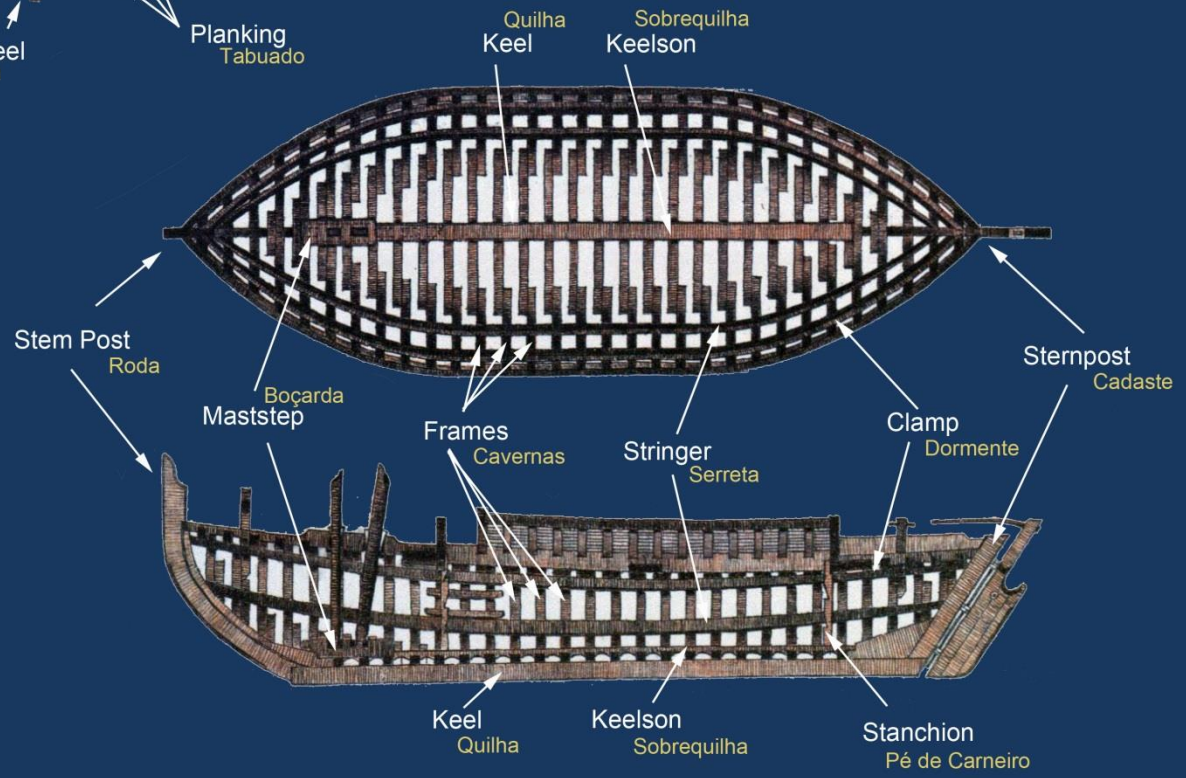


Tabuado do casco, cobertura e farca.

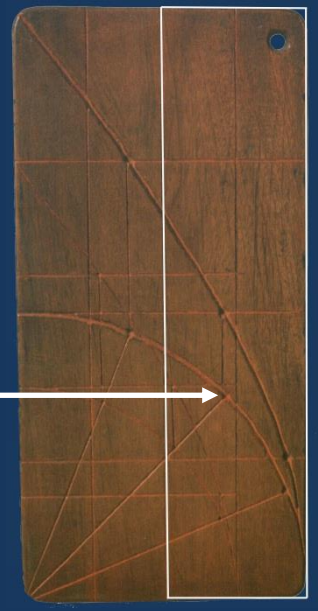


All the principal timbers necessary to build a *saveiro* are here:

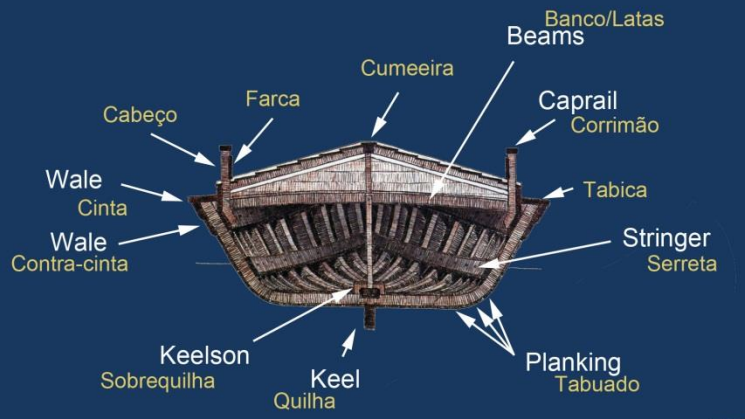


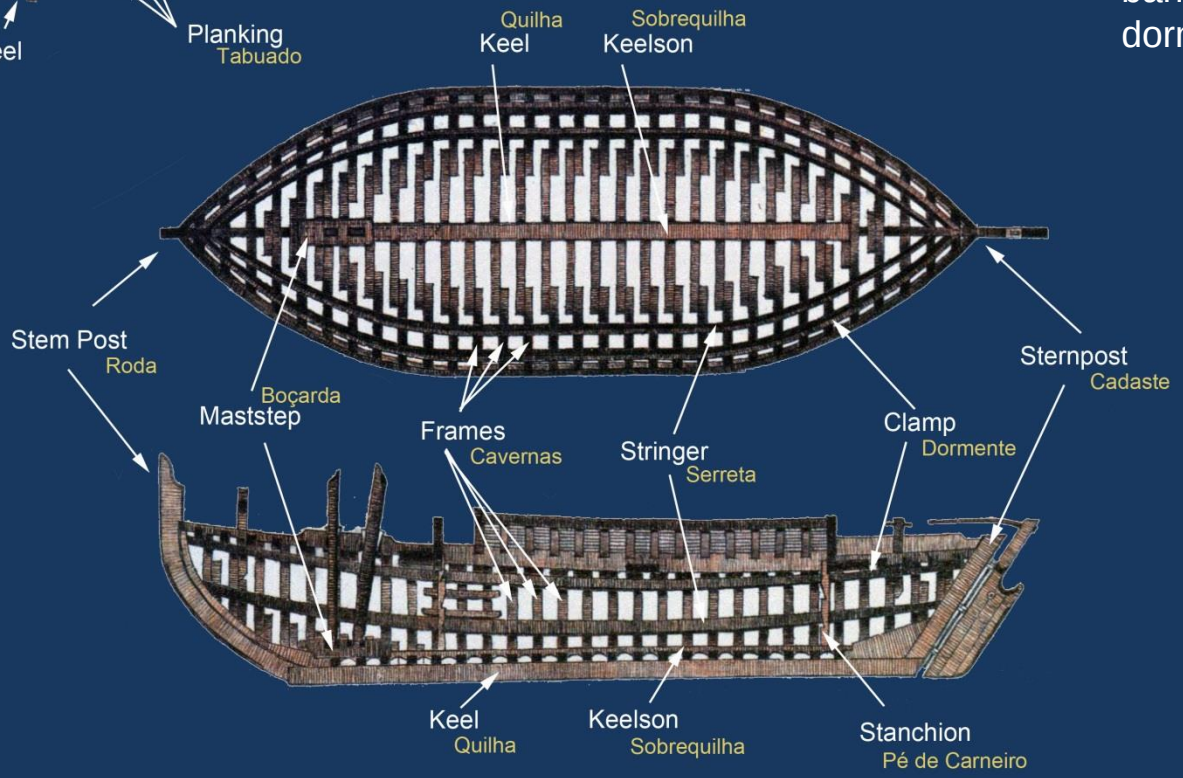


Contra-cinta, serreta e cabeços.

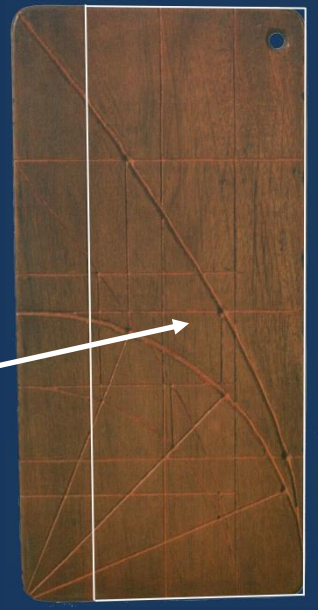


All the principal timbers necessary to build a *saveiro* are here:

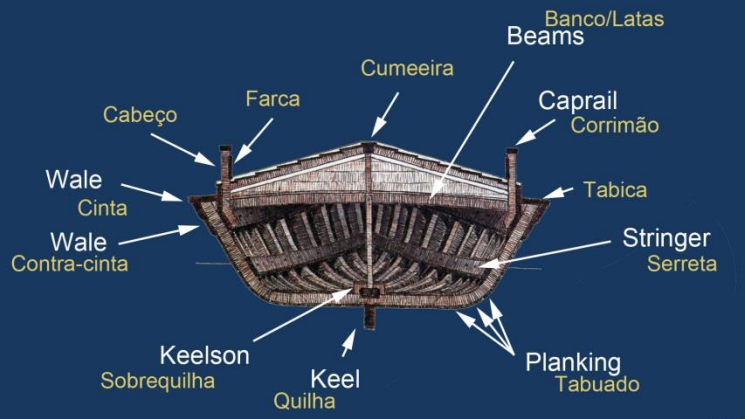


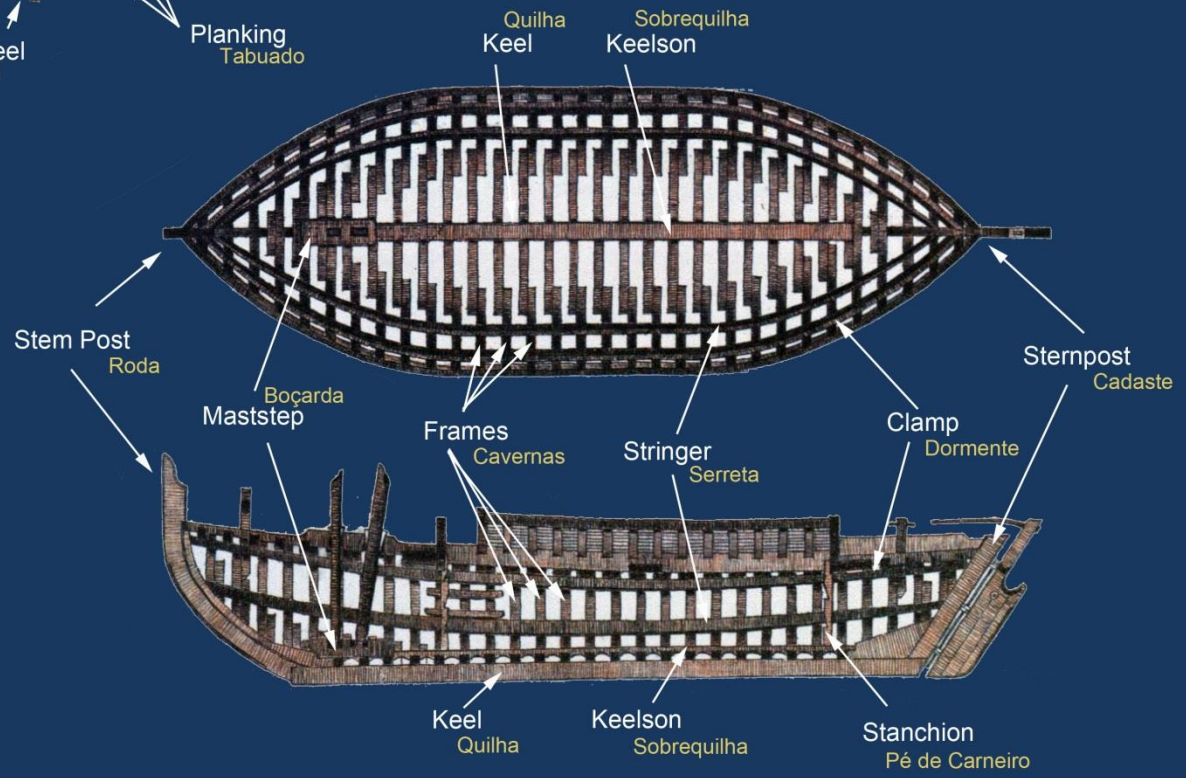


Cinta, tabica, banco e dormente.

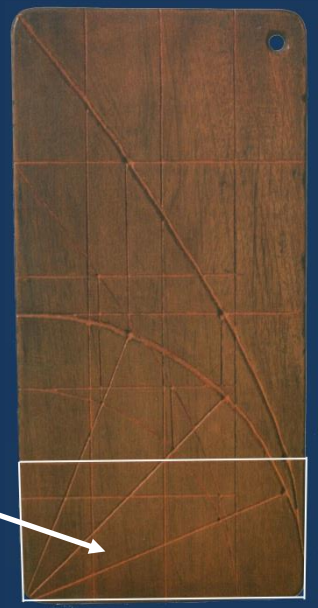


All the principal timbers necessary to build a *saveiro* are here:

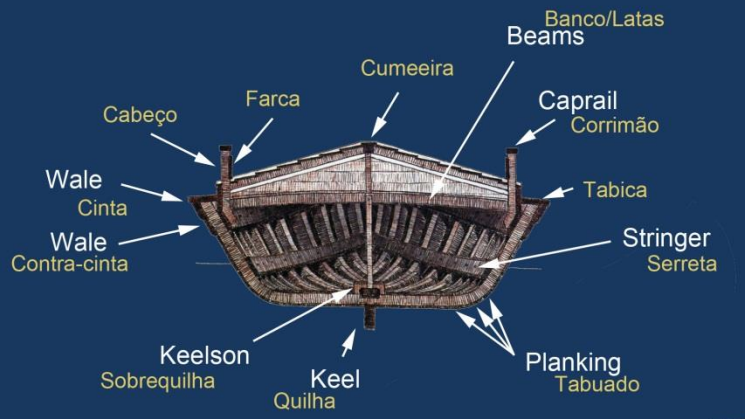


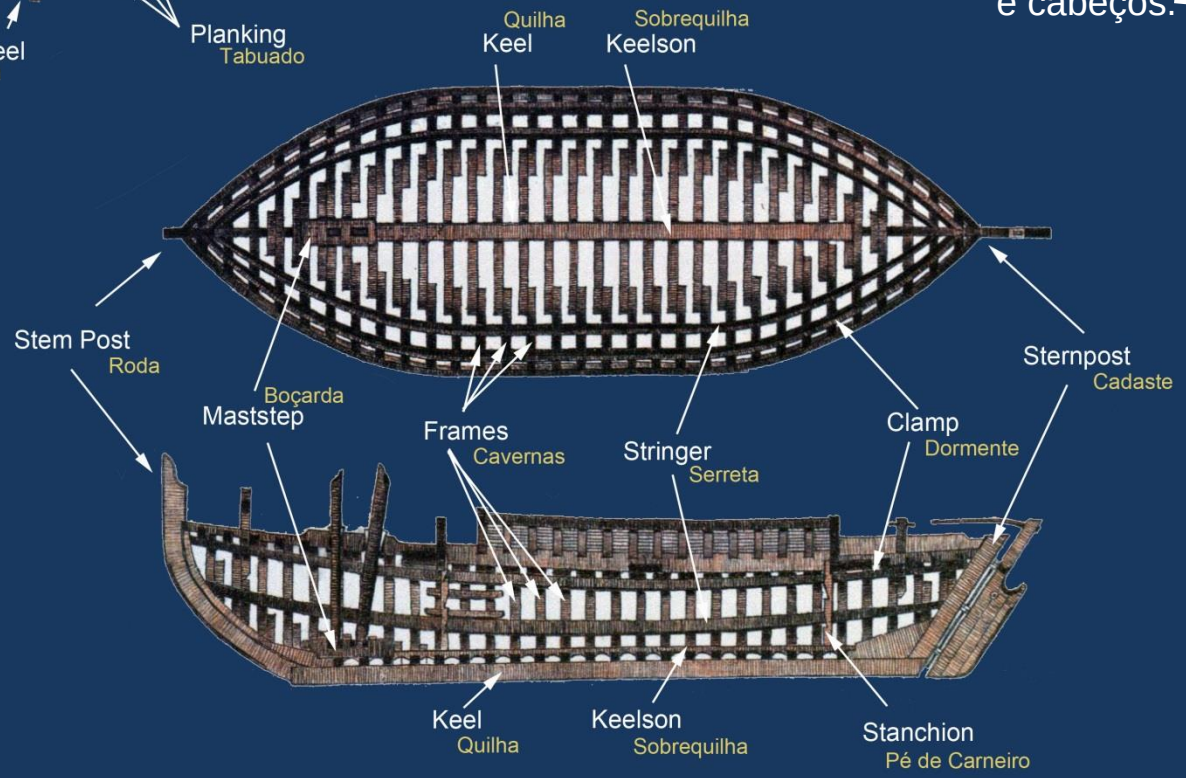


Corrimão.

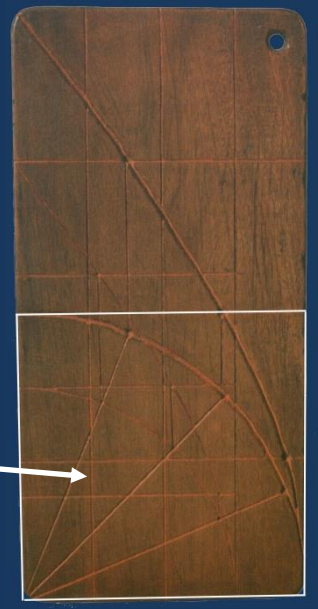


All the principal timbers necessary to build a *saveiro* are here:



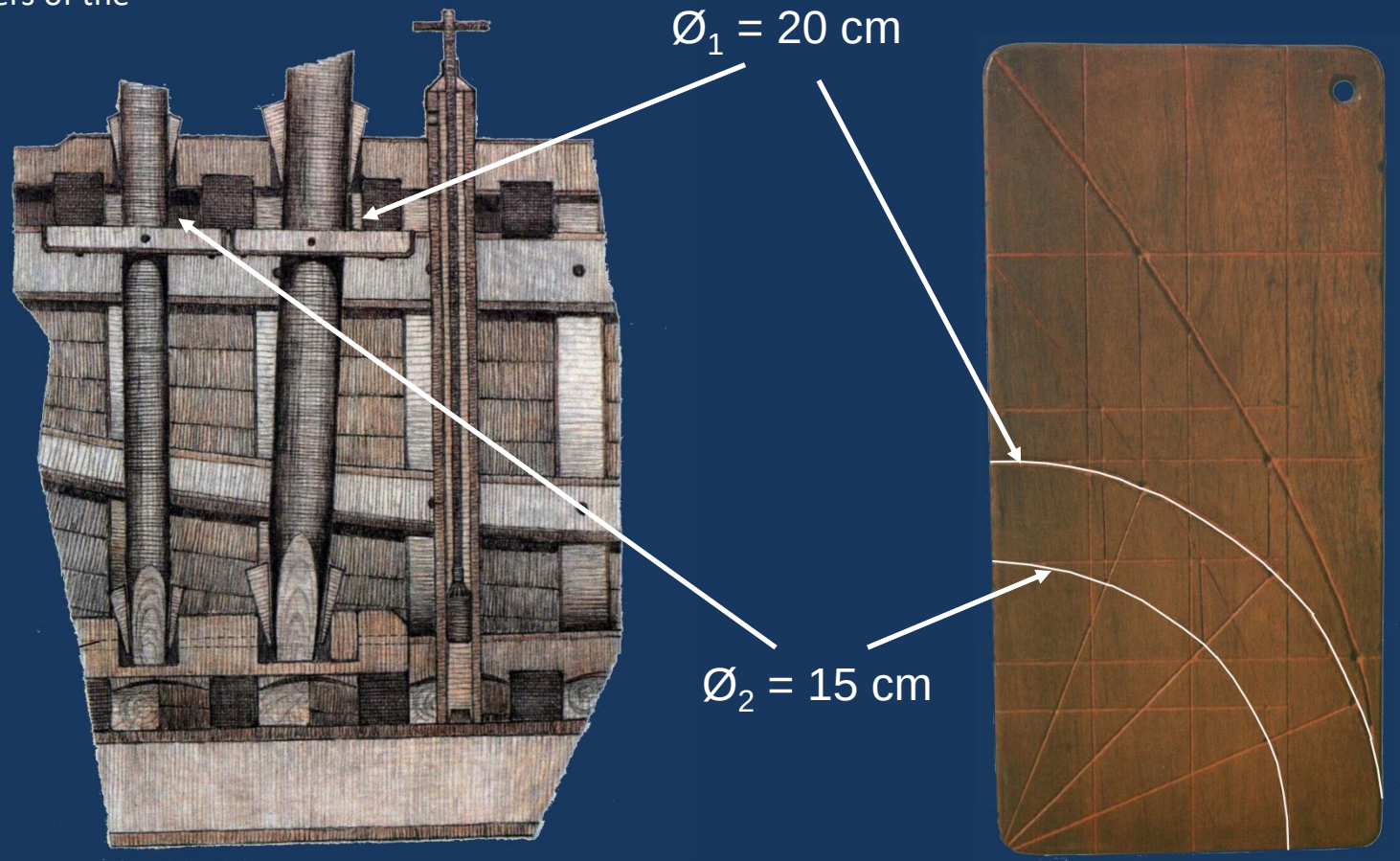


Cavernas, braços, latas, cumeeira, pé de carneiro e cabeços.

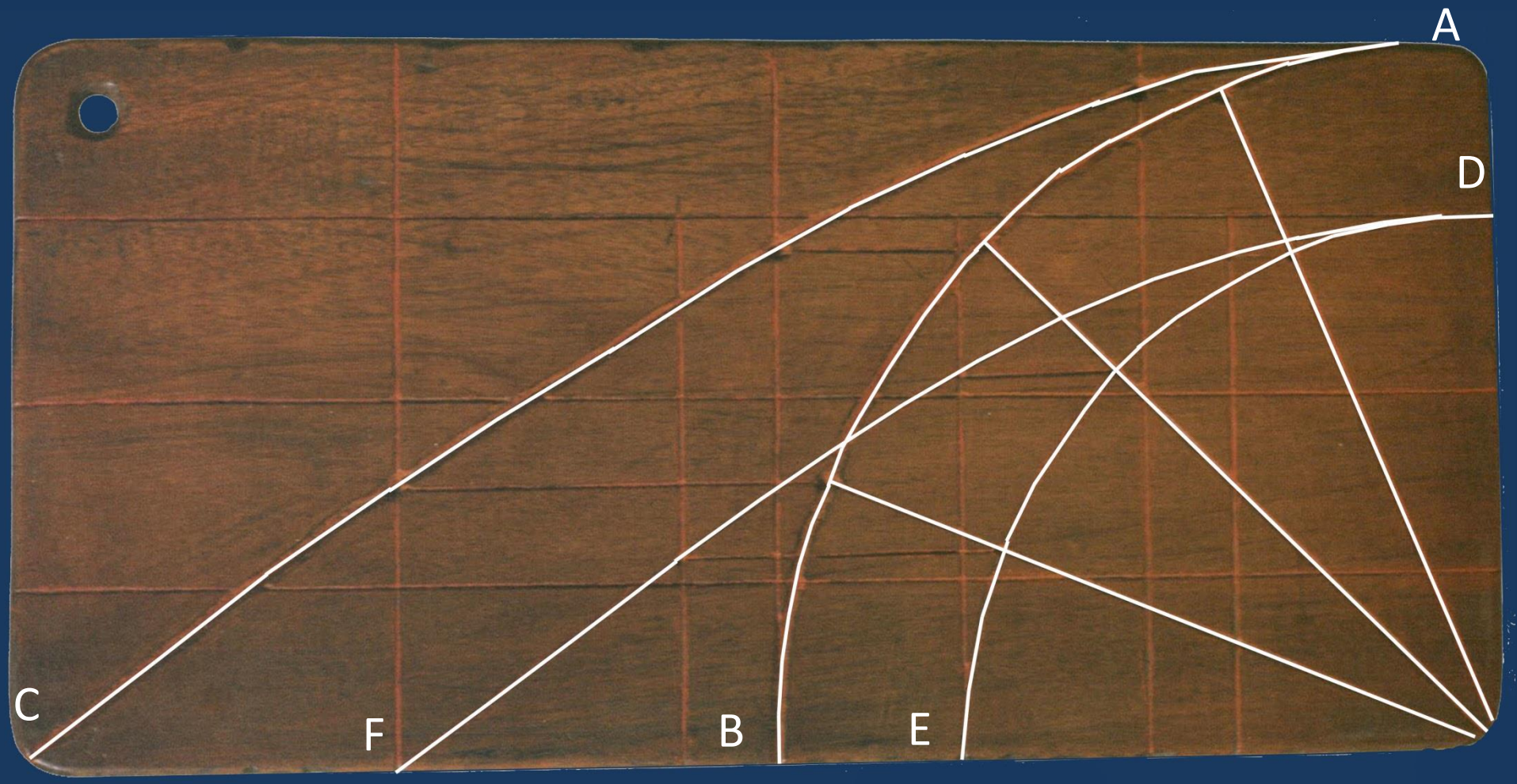


All the principal timbers necessary to build a *saveiro* are here:

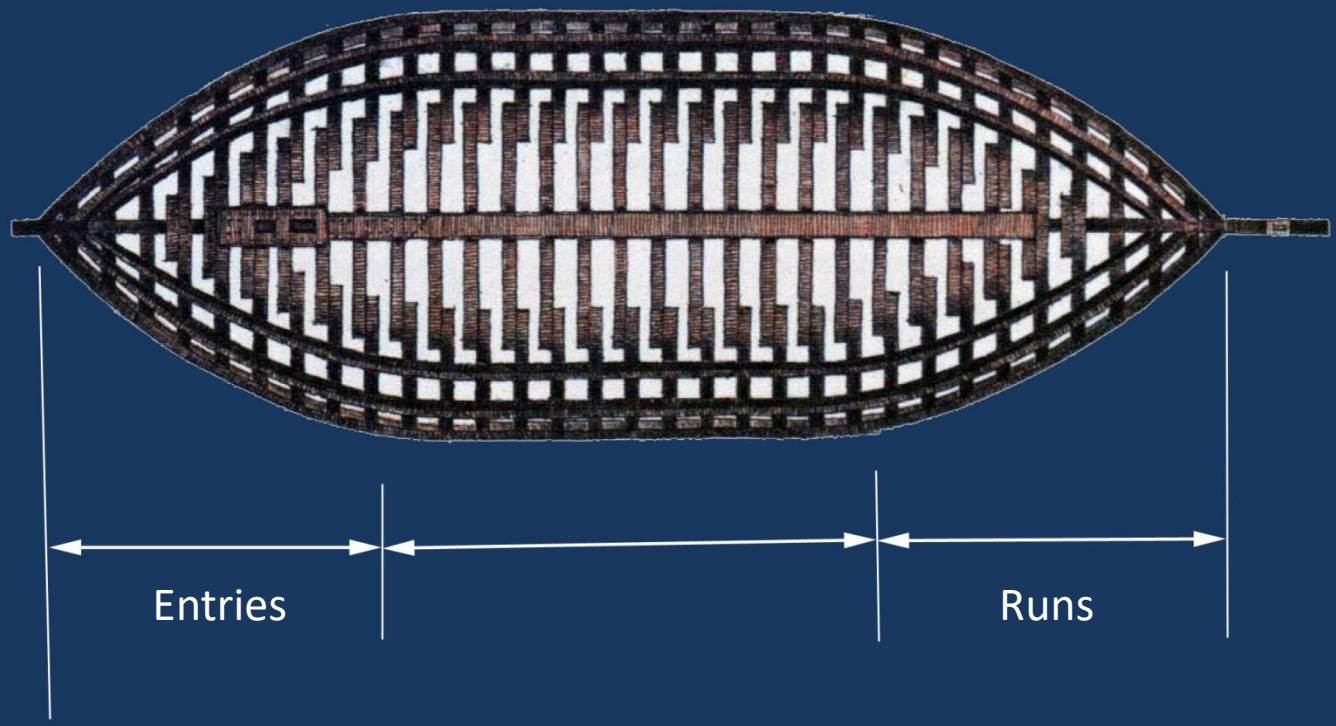
The diameters of the masts:



The narrowing and rising curves are probably represented in the *graminho* as well, as mentioned by John Patrick Sarsfield, but are unfortunately not explained by Lev Smarcevski, as they were not by Sarsfield:

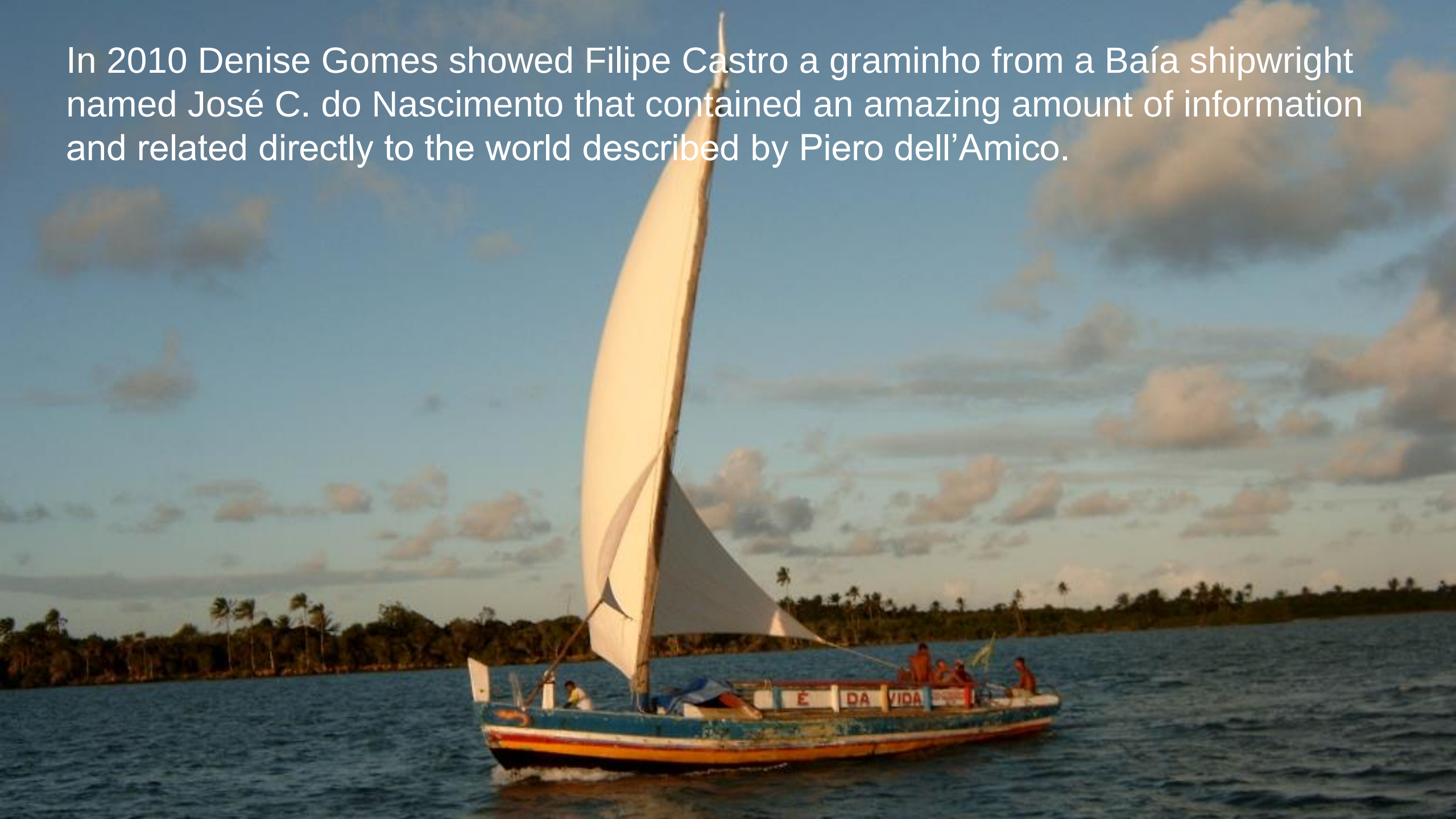


The complexity, sophistication, and diversity of solutions alluded to or documented by Sarsfield and Smarcevski call for an extensive and detailed study of this amazing shipbuilding tradition.

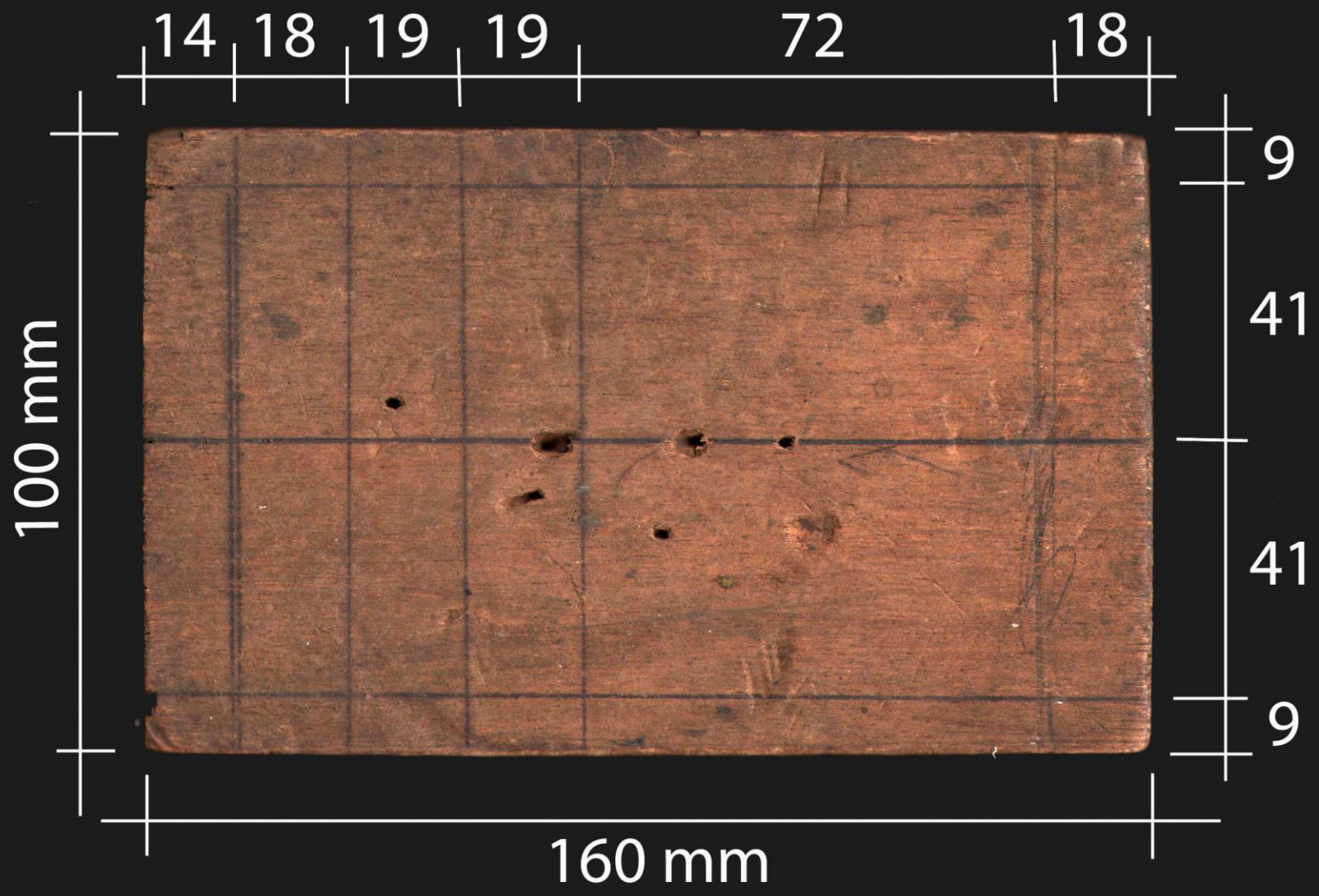


How are the entries and runs obtained by shipwright João Bezerra? Curves AC and DF suggest the use of the *mezzaluna*, already mentioned by Sarsfield.

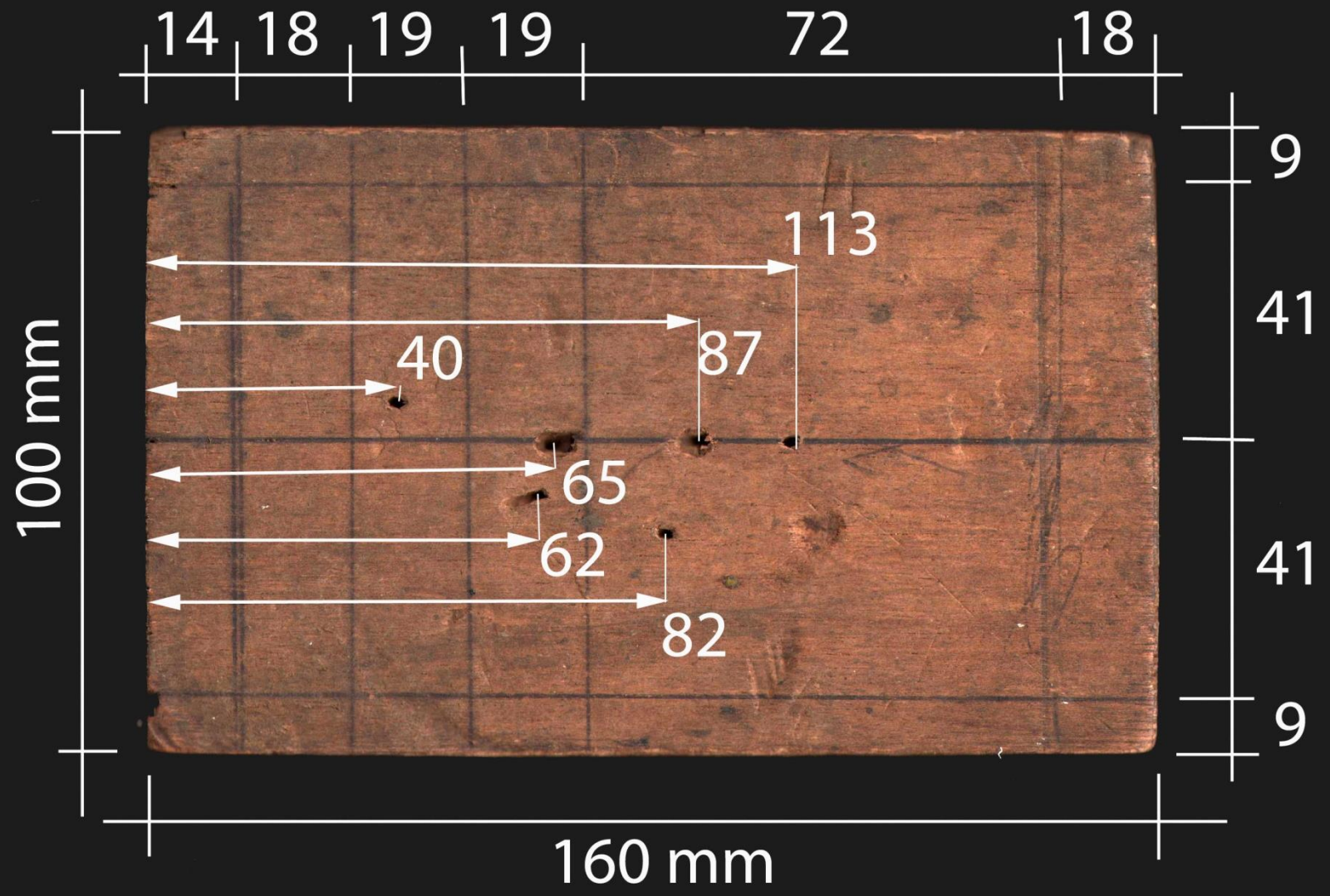
In 2010 Denise Gomes showed Filipe Castro a graminho from a Baía shipwright named José C. do Nascimento that contained an amazing amount of information and related directly to the world described by Piero dell'Amico.



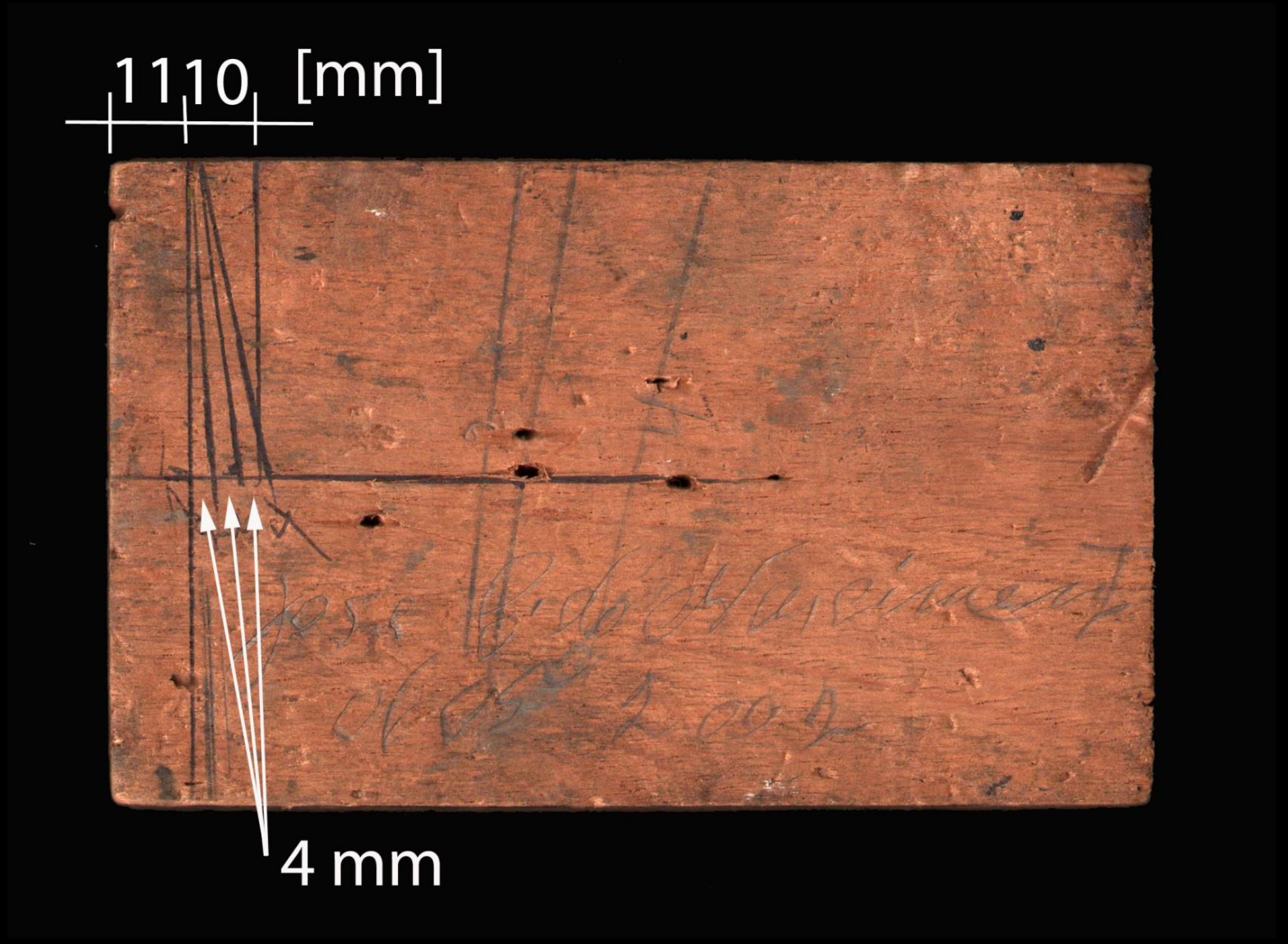
For the time being we have measured this *graminho* and prepared a list of questions to start an extensive enquiry and collect more of these aids.



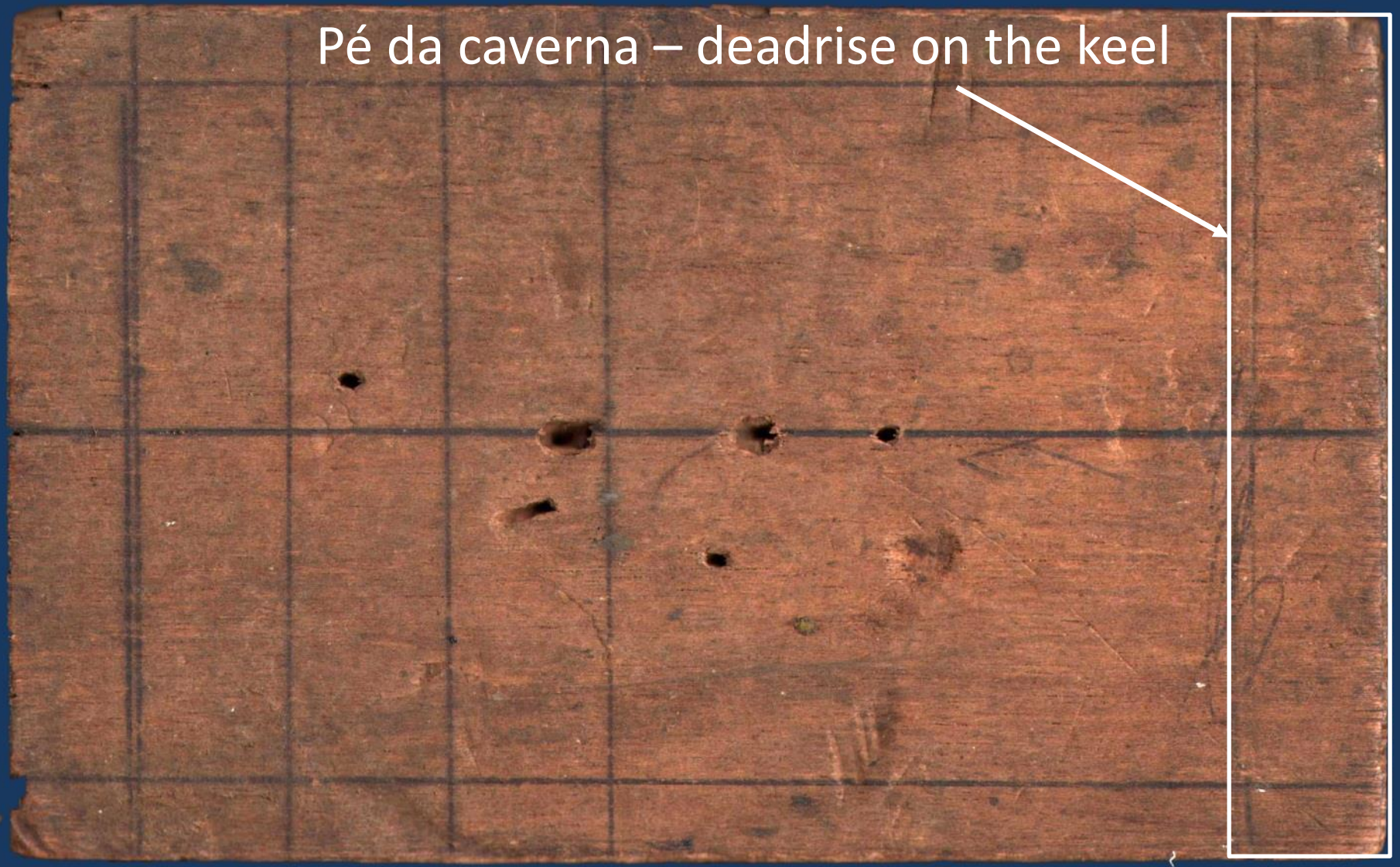
At this point we know that this *graminho* applies to small boats, *saveiros*, with a simple round stem post, for fishing and transport of goods, or for *escunas*, more decorated, for tourism.



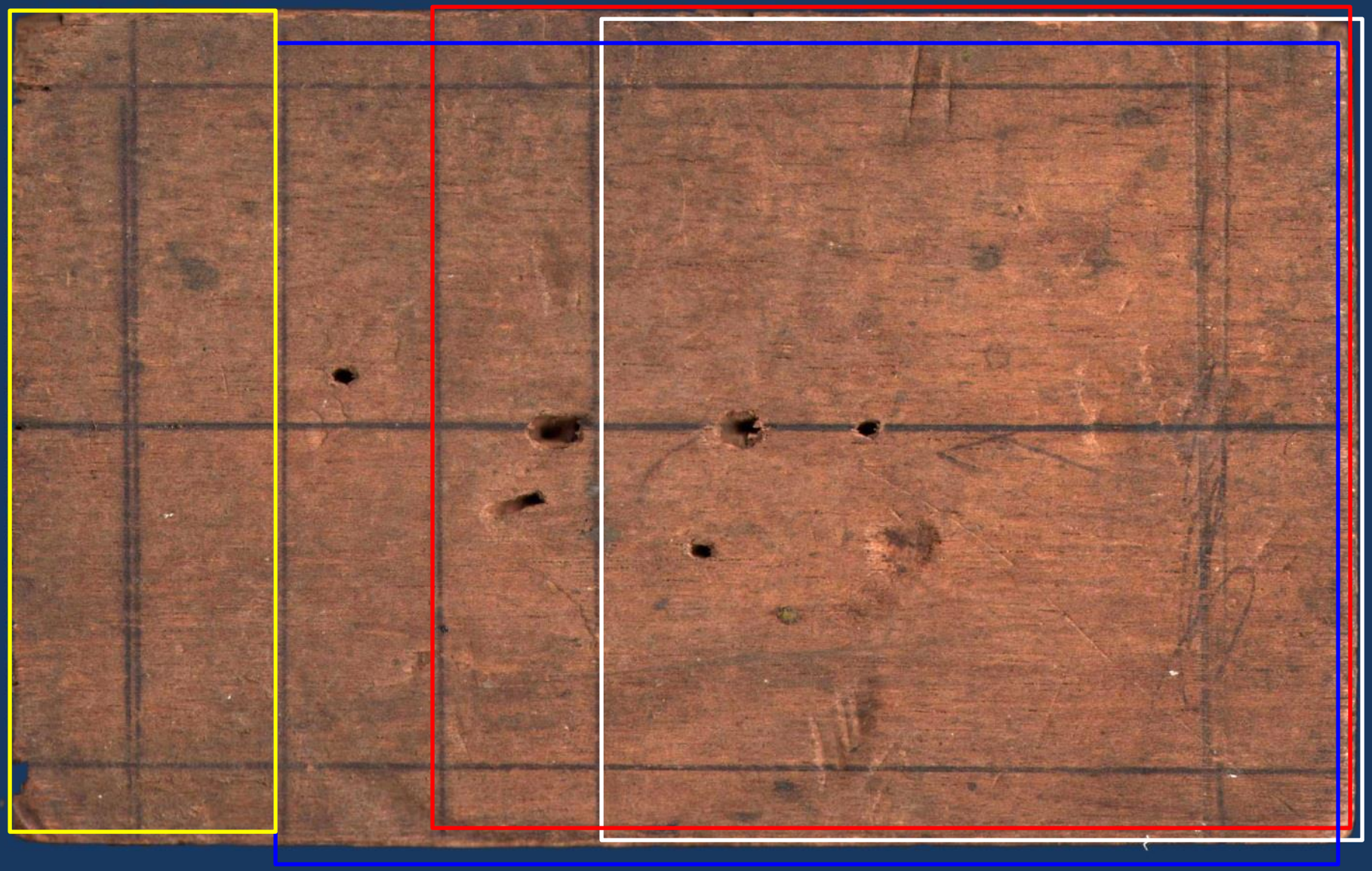
Its study promises to yield some more clues that will hopefully shed some light on this amazing shipbuilding tradition.



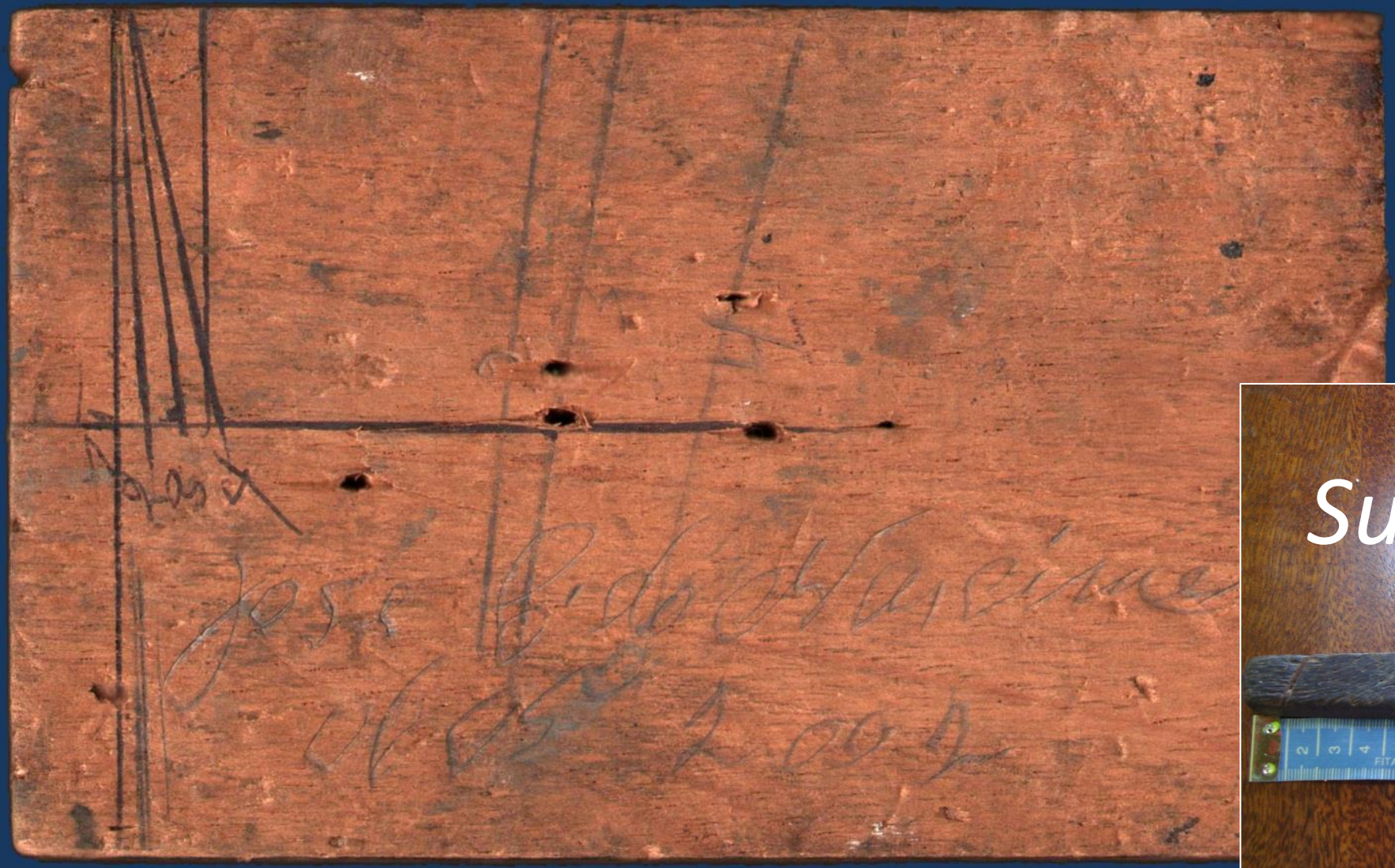
Mestre João Bezerra told us that:

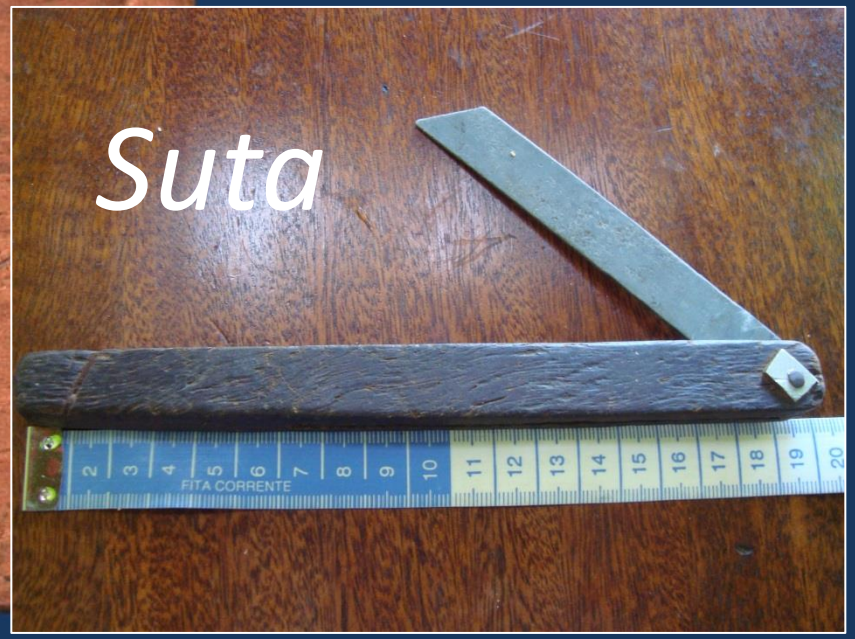


The remaining rectangles indicate the scantlings of other timbers:

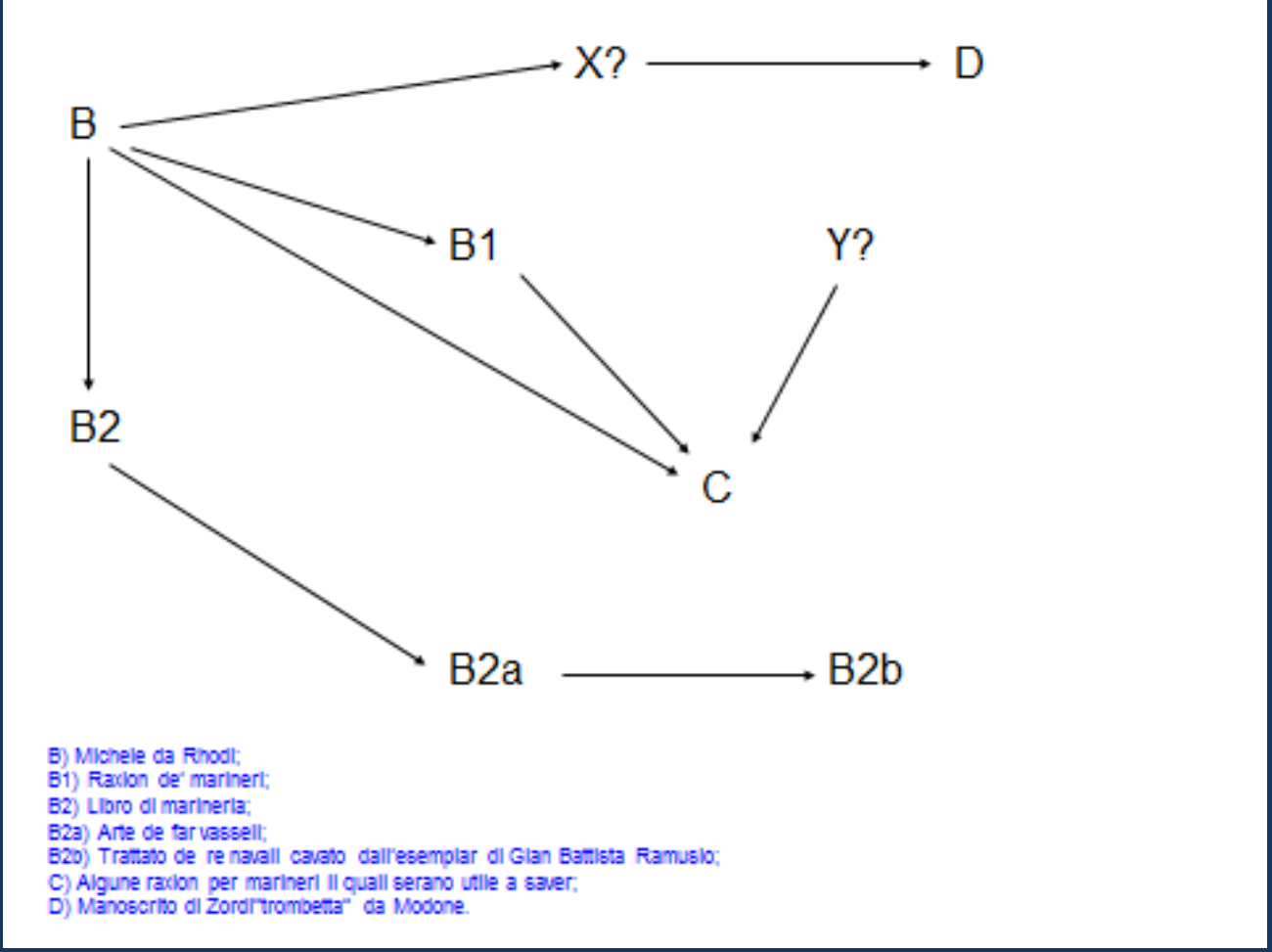


These converging lines are used to determine the narrowing of the bottom of the boat, which in this case is 5 cm on each side. These angles are transferred to the boat with a bevel gage, the *suta*.



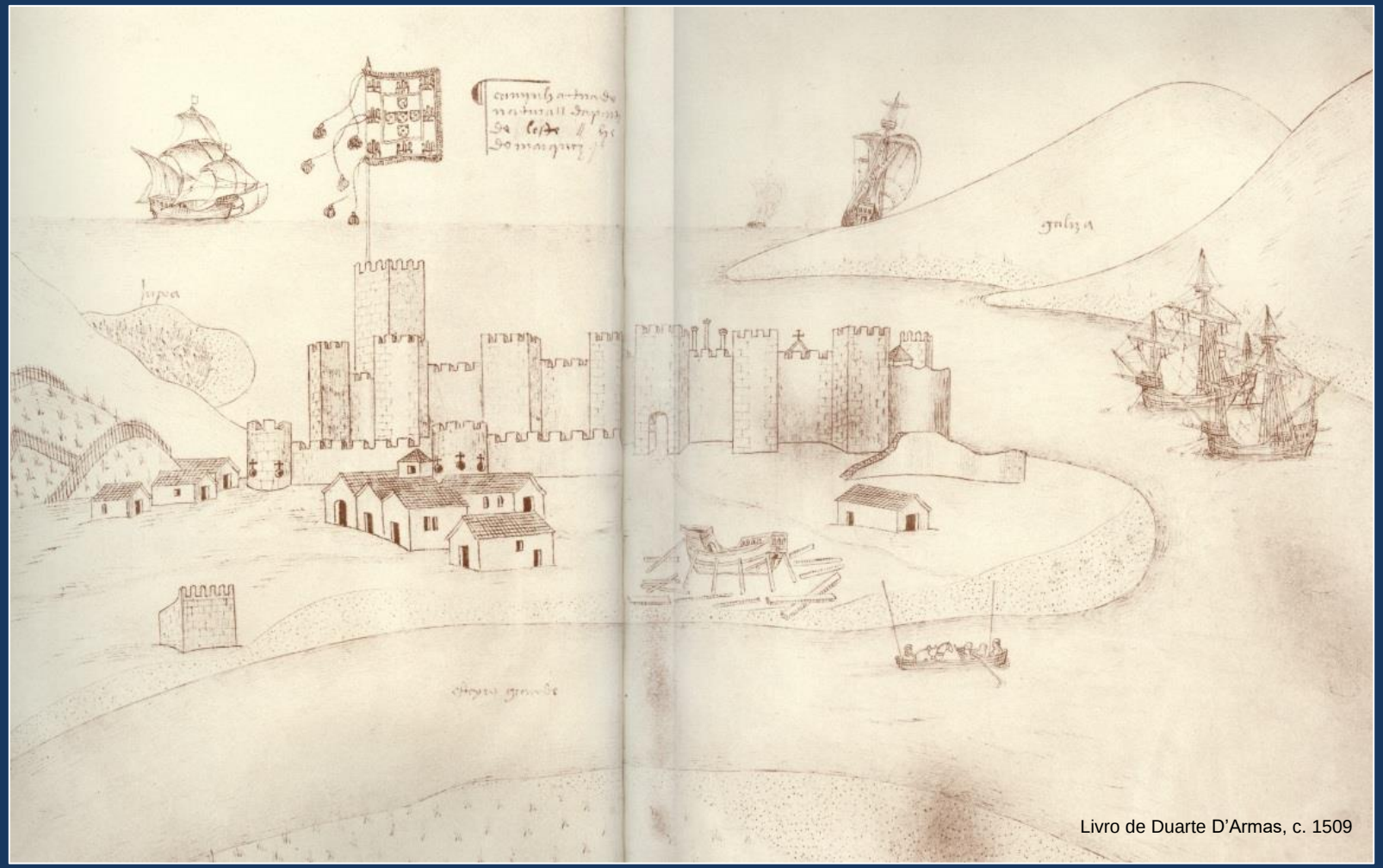


Given the advanced age of many of these shipwrights, we can only hope to build a library of solutions that will hopefully allow us to find patterns and understand their origins and mechanism of transmission.

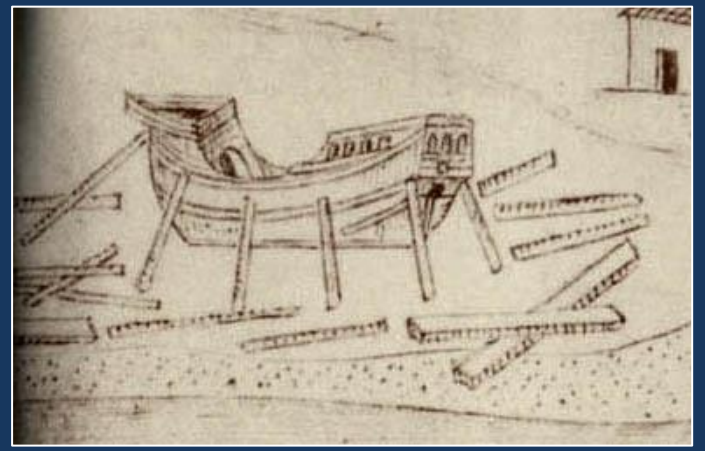


Franco Rossi's whole molding rules transmission model for 15th century Italy.

The study of this precious tradition, its origins and its story, presumably throughout the the past five centuries appears to us as an urgent and tremendously important project, which we intend to pursue in the incoming years.



Livro de Duarte D'Armas, c. 1509



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saveiros

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partially geometric methods

And from the archaelogical record:

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Thank You!