

# Treatises and Technical Texts on Shipbuilding



10.01 *Misure de Navilii*

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- *Misure de Navilii* was found in the Biblioteca Nazionale Marciana in Venice
- A sheet of the manuscript dates back to 1567
- From its content and appearance (differences in style and ink used), it seems it was written discontinuously between the 60' and 80' of the 16th century
- It has been transcribed by Ugo Tucci in the work : "Architettura navale veneziana. Misure di vascelli della metà del Cinquecento." in *Bollettino dell'Atlante Linguistico Mediterraneo* 5/6, Firenze 1963-1964 and by M. Nicolardi in the work "Misure de Navilii. Un nuovo documento di costruzione navale veneziana della seconda metà del XVI secolo", in *Navis, Atti del II Convegno Nazionale di Archeologia, Storia, Etnologia Navale*, Cesenatico 13-14 aprile 2012, vol. 5".

- The manuscript contains four shipbuilding recipes: one for the construction of a galleon, two for round ships and one for a *naveta*.
- Together with the *Instructione sul modo di fare galere* written by Todaro de Nicolò and partially translated by F.C. Lane, it is the only manuscript known with information about the construction of round ships in the 16th century.
- It is the only source with precise information on the *naveta*, mentioned as "*chosa moderna*", "modern thing".



This is a ship that is smaller than the usual round ships ("naveta" literally means "little ship"). It will be widely spread at the end of the 16th century, during the crisis of the Arsenal of Venice.

- From the handwriting, it looks that the manuscript was written by only one author
- The author is anonymous
- A note in the manuscript tells us something about him: "*1582 dì a 8 zenzer, fu cresudo i calafai, per il Coleio, dai do soldi fino ali oto, de più di quello che avive per avanti e schomenzò a tocar cresimento a dì dito.*"

*"On January 8<sup>th</sup>, 1582 the salary of the calafati was raised by the Collegio (the board of the Arsenal) from 2 to 8 money, that is more than what was given before and the raising of the salary started on the afore mentioned day.*"



This could mean that the author was a "calafato", an employee of the Arsenal specialized in making the hulls waterproof.

- *Misure de Navilii* is a manuscript composed of 3 sheets of paper that give 4 recipes for shipbuilding
- It is part of a bigger miscellaneous manuscript composed of 22 sheets in total, all supposedly written by the same author, that is divided in 2 parts:



The first part is a concise chronicle of the events of the History of Venice. The writing is uniform, both in style and graphic appearance



The second part is made of the papers grouped under the title "Misure de Navilii", title found in the manuscript itself. The writing is irregular both in style and graphic appearance. Several different inks were used

- There are no drawings or diagrams illustrating the recipes of the ships.
- The form of Venetian used is very similar to the one used in "Arte de far vaselli" by Teodoro de Nicolò, from the second half of the 16th century. Some nautical terms present in *Misure de Navilii* can not be found in any other text.

The sources used to help with the translation of the manuscript are:

- Venetian Naval Architecture about 1550 of F.C. Lane. This work contains a partial edition of the *Arte de fare vasselli*, by Todaro de Nicolò, and was the main source used to help the translation of this manuscript.
- Italian Naval Architecture about 1445 of R.C. Anderson. This work contains a partial edition of the Manuscript of Trombetta, by Zorzi Timbotta da Modon.
- [https://brunelleschi.imss.fi.it/michaelofrhodes/manuscript/page\\_138b.html](https://brunelleschi.imss.fi.it/michaelofrhodes/manuscript/page_138b.html), website with the transcription and translation of some parts of the Book of Michael of Rhodes
- *Archeologie Navale*, vol 1 & 2, by Jal, accessible online at the Gallica digital library; the work contains a partial transcription and translation of the *Libro di Marineria* anonymous manuscript, also known as *Fabrica di Galere*.
- Vettor Fausto, (1490-1546), professor of greek and naval architect: a new light on the 16th century manuscript "*Misure di vascelli*" etc. Di..., proto dell'Arsenale di Venezia, by Lilia Campana. This is a master thesis that translates part of the afore mentioned manuscript.
- *Glossaire nautique : répertoire polyglotte de termes de marine anciens et modernes* by Jal. This is a dictionary of nautical terms from ancient times to the 19th century.
- *Dizionario del dialetto veneziano*, by Giuseppe Boerio, a dictionary of the Venetian dialect spoken in the 19th century. It is the most ancient dictionary of venetian dialect existing.

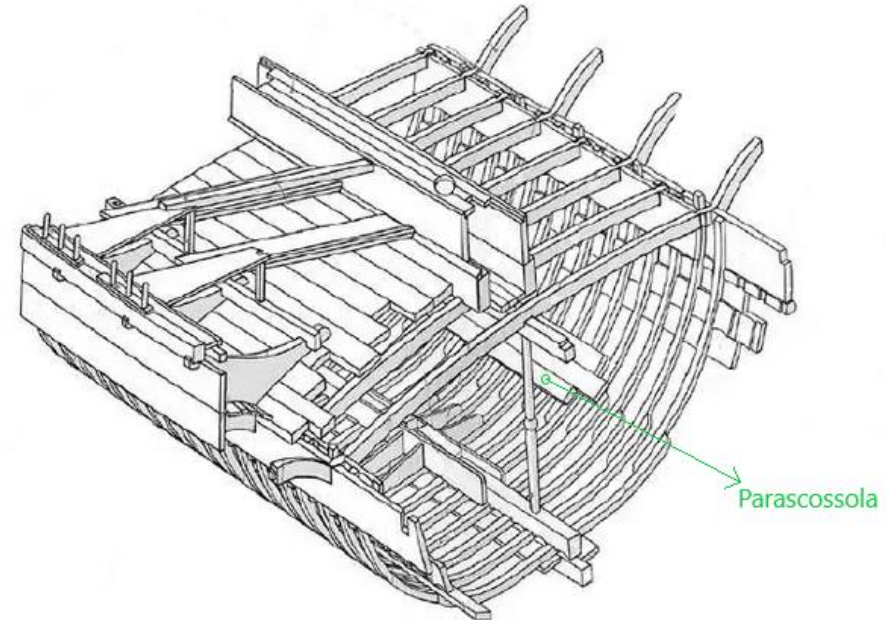
# Recurring terms: The *parascossola*

The *parascossola* (or *paraschazola*) is part of the inner planking: it is a longitudinal bilge stringer nailed to the junctions between floor timbers and futtocks that gives transversal strenght to the hull. It is a structurally important element and its position is often specified in the treatises.



Fig. 15.12. The *parascossola* of the 14th-century galley of San Marco in Boccalama (Venice; authors; by permission of the Ministro per i Beni le Attività Culturali).

Picture from "A hypothesis on the development of Mediterranean ship construction from Antiquity to the Late Middle Ages", Beltrame C. and Bondioli M.

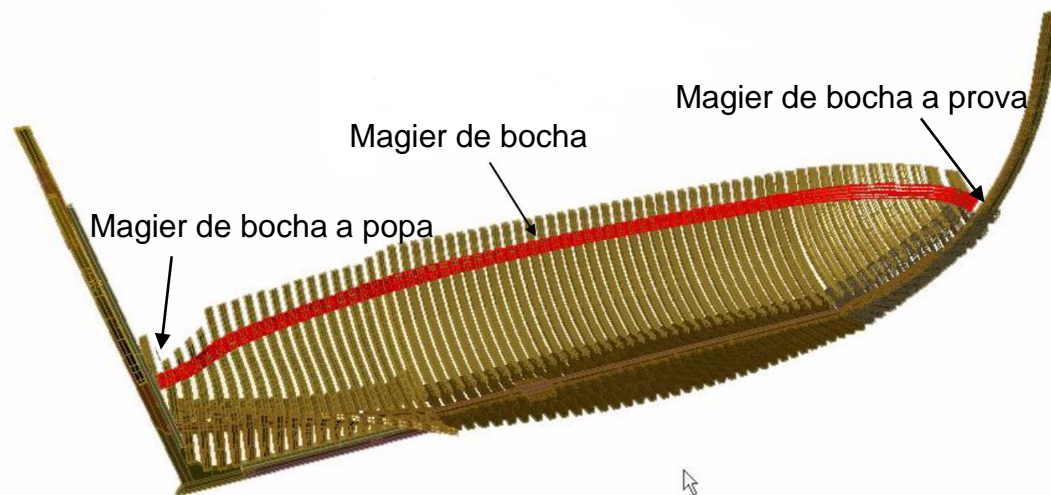


Edited drawing from Boschi, legnami, costruzioni navali. L'arsenale di Venezia fra XVI e XVIII secolo, A. Lazzarini

# Recurring terms: the *magier de bocha*



- The term "magier de bocha" is found in all the venetian manuscripts about shipbuilding.
- It is translated as "top clamp" and indicates a longitudinal stringer on which rest the transversal beams that sustain the deck.
- There is a top clamp for every deck of the ship, but in venetian manuscripts the first top clamp, "il primo maier de bocha", is mentioned almost exclusively. It is positioned at the height of the hold and above it there is the first deck.
- Manuscripts usually give the height where the first top clamp meets stem and sternpost (these points are called "*inpostura*" in Trombetta's manuscript) or where they meet the tail frames.
- Above the first top clamp starts the "partison del ramo", the widening of the upper part of the frames.

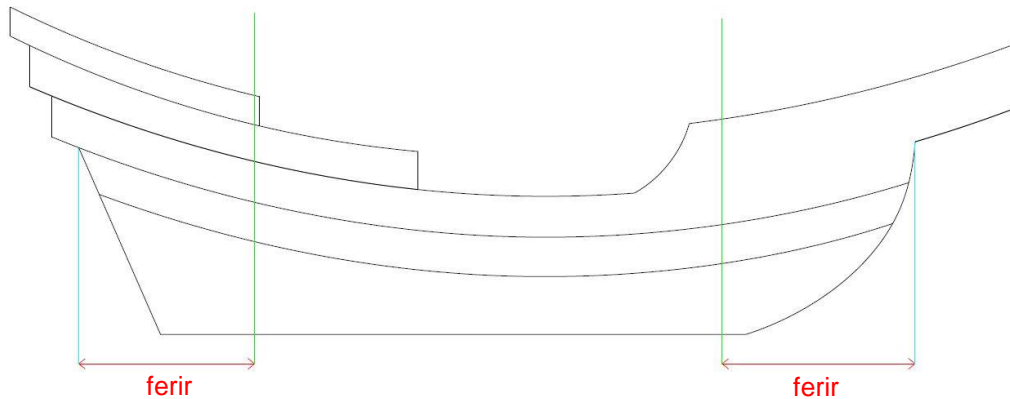


Drawing from "Early Modern Iberian Ships Tentative Glossary", by ...

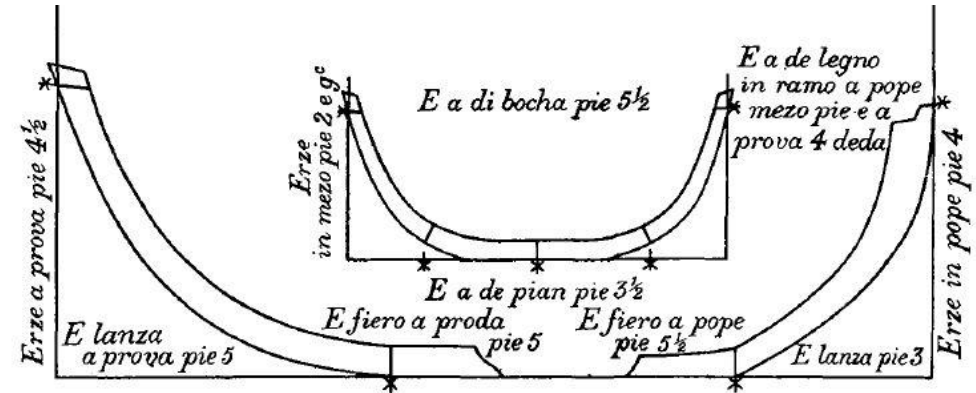


# Recurring terms: the *ferir*

The term "ferir" appears in this manuscript and in the *Arte de fare vasselli* of Todaro de Nicolò. It also appears in the verbal form "fiero", that has been interpreted as the present indicative of "ferir", in Trombetta's manuscript and in the book of Michael of Rhodes. It seems to indicate the distance between the "chavi de sestò", that are the tail frames, and the posts. It is not clear though from what point on the posts should the distance be measured:



Lane interprets the *ferir* as the distance between the tail Frames and the perpendiculars dropped at the ends of the posts



From the drawings in Trombetta's manuscript it could seem that the *ferir* is measured from the perpendiculars dropped at the beam, at the points where the first deck meets the posts

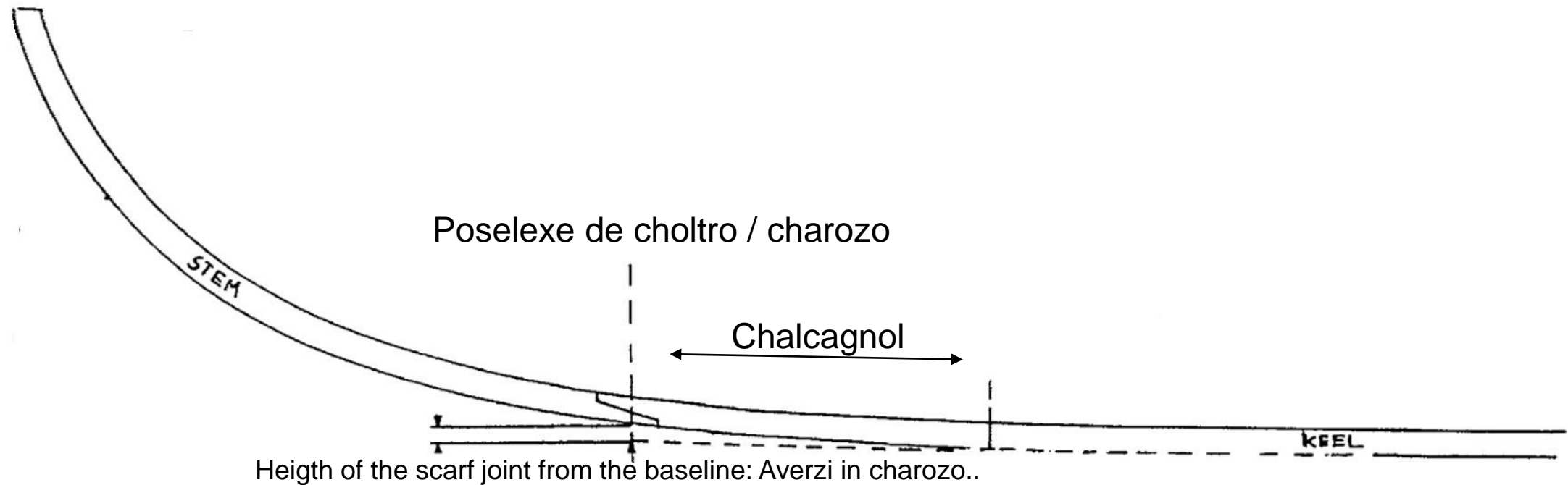
## Recurring terms: the *charozo*



- The term "charozo" is found in this manuscript and in Todaro's one.
- Lane translates it as "the rising of the floor", but this translation does not seem precise.
- Jal's dictionary says that "charozo" is a term used in Venetian shipyards to indicate a timber that connects the stem to the keel.
- Michael of Rhodes and Zorzi da Modon call the two timbers that connect stem and stern post to the keel "chalcagnoli".
- In this manuscript it seems that the *charozo* indicates the two points where the *chalcagnoli* meet the posts. These points are marked by two scarphs called *poselese del choltro*.
- The *poselese del choltro* are the points where the *partison de la stella* terminates.
- When the manuscript says "aversi in charozo..", or "de charozo..", it is giving the height of the *charozo* from the baseline.

# Recurring terms: the charozo

Edited drawing from "The ancient methods of designing hulls", by Bellabarba, the Mariner's Mirror 79, Vol 3.



## Uno galion de pasa 20.

Uno galion de pasa 20 in cholonba, vuol eser in bocha pie 34 et anchora quatro dea, perché i ge fa bizogno. De fondi pie 14, a voler sostentar el gran talgio. In trepie pie 23 1/2. In siepie pie 30. In regia pie 40 1/2. Ala banda viva, zoè ala tolda, larga pie 39. Al magier de bocha del chasaro larga pie 31 e tanto in cima. In pontal pie 10. In fra do coverte alto 19 pie 7 meno quarta. Soto la tolda alto pie 7. Soto el chasaro alto pie 7 meno quarta et de sora alto pie 5. El valangin dela bocha longo pie 18 et quel dela regia longo pie 21 [c. 211v] et quel de sora 20 longo pie 17. L'asta da prova alta pie 33, chaze pie 29, el valangin longo pie 36. La parascozola alta pie 9. El magier de bocha pie 19. El balaor longo ala via dele sogie pie 49, storte pie 5 1/2, fuera pie 17 indreto, alto davanti pie 18 1/2. Ala via del stilo alto in cima indreto pie 10. El ferir da prova pie 3. La stela sul charozo mezo pe' et la corba pie 3 quarta. Averde el chao de sesto da prova pie 30 1/2. Legno in ramo in su la chorba 21 dea 5. L'asta da pope tuto ala via del'asta alta pie 32. La parascozola alta pie 15. El maier de bocha alto pie 22 24. Larga in triganto pie 20. El primo zielo longo pie 13. L'altro longo pie 10. L'altro longo pie 6. Longa tuta la pupa pie 74. L'asta da pope chaze pie 14. El ferir da pope pie 14. La stela del charozo pie uno. La stela dela chorba pie 5 1/2. El chao de sesto da pope averde pie 28.

## UNITS OF MEASURE:

Deda (1 finger) = 2,17 cm

Piede (1 foot) = 34,7 cm

Passo (1 pace = 5 feet) = 1,735 m

1. Uno galion de pasa 20.

A galleon of 20 paces.

2. Uno galion de pasa 20 in cholonba, vuol eser in bocha pie 34 et anchora quatro dea, perché i ge fa bizogno.

A galleon of 20 paces on the keel needs to be 34 feet at the beam and four more fingers, because it needs it.

# From now to row .8 the manuscript gives the width of the midship frame taken at different heights.

3. De fondi pie 14, a voler sostentar el gran talgio. In trepie pie 23 1/2.

The ship is 14 feet wide at the floor, in order to bear the big size. At three feet above the floor it is 23 ½ feet wide.

4. In siepie pie 30.

At six feet above the floor it is 30 feet.

5. In regia pie 40 1/2.

At the maximum width, at the height of the second deck, it is 40 ½ large.

6. Ala banda viva, zoè ala tolda, larga pie 39.

At the "banda viva", meaning at the top deck, it is 39 feet large.

# It is not clear what "banda viva" means here. From the diagrams in Theodoro's manuscript Lane infers that the "banda" is kind of a stringer let into the deck beams, but this is not the case here. It is unclear why the "banda" is called "viva" here. Usually what is below the flooding line is called "opera viva" (living work) and what is above it "opera morta" (dead work).

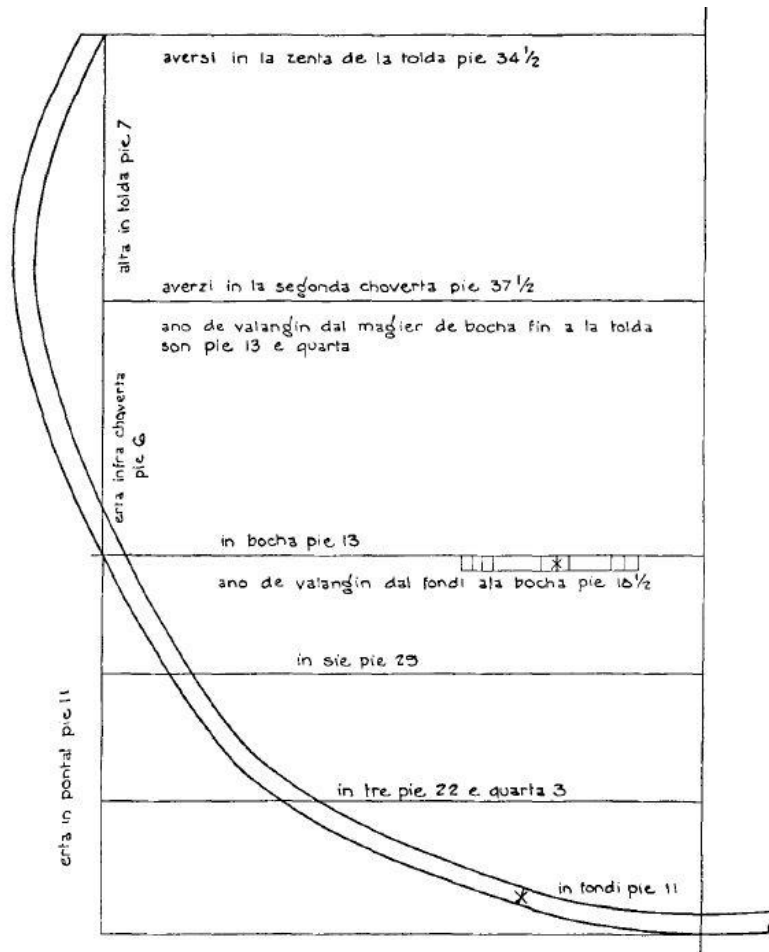
7. Al magier de bocha del chasaro larga pie 31 e tanto in cima.

At the top clamp of the aftcastle the ship is 31 feet large and the same at the top.

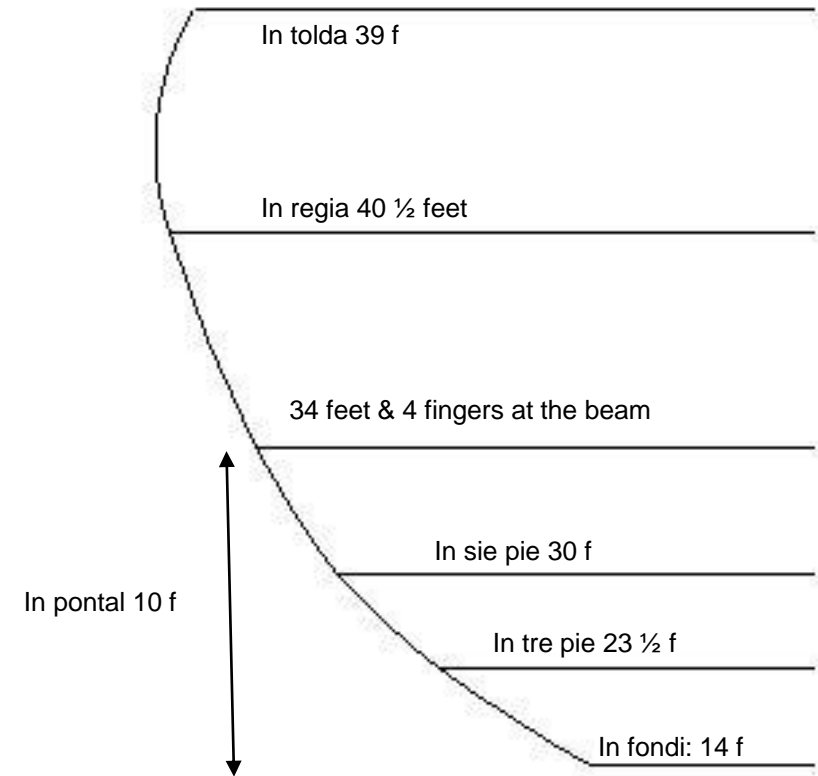
8. In pontal pie 10.

The depth is 10 feet.

# Master frame of the galleon



Todaro's master frame



Misure de Navilii's master frame

9. In fra do coverte alto 19 pie 7 meno quarta.

Between the two decks (first and second deck) there are 7 feet minus  $\frac{1}{4}$ .

# There is clearly a mistake in the transcription of the manuscript in this point: "19" Must be taken out, since the sentence doesn't make sense neither grammatically nor architecturally; 19 feet distance between the two decks is in fact too much.

10. Soto la tolda alto pie 7.

Under the top deck there are 7 feet of height.

11. El valangin dela bocha longo pie 18 et quel dela regia longo pie 21 et quel de sora longo pie 17

The curve (of the midship frame) going from the floor to the beam is 18 feet long, the curve from the beam to the point of maximum width of the frame is 21 feet long and the one above (going from the "regia" to the "tolda") is 17 feet long.

12. L'asta da prova alta pie 33, chaze pie 29, el valangin longo pie 36.

The stem is 33 feet high, rakes 29 feet, the curve is 36 feet long.

The verb "chazer" does not appear in any other Venetian manuscript of the time nor in Boerio's dictionary and its meaning could be deduced only from the context.

13. La parascozola alta pie 9.

The bottom stringer is 9 feet high.



14. El magier de bocha pie 19.

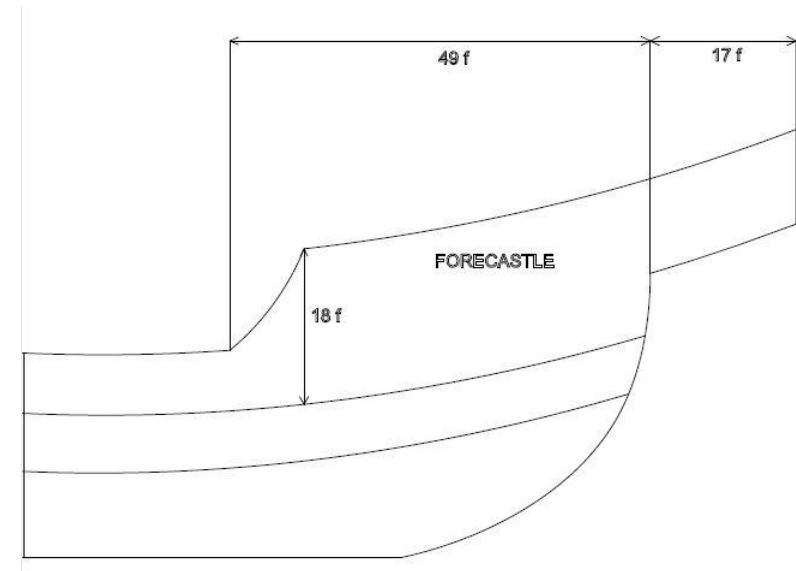
The top clamp is 19 feet high.

# It is probably saying how high is the point where the top clamp meets the stem of the ship

15. El balaor longo ala via dele sogie pie 49, storte pie 5 1/2, fuera pie 17 indreto, alto davanti pie 18 1/2.

The forecastle is 49 feet long along the length of its strakes, the *storte* are 5 1/2 feet, it extends 17 feet straight on, it is 18 1/2 feet high in its fore part.

# It is not clear what "storte" means. In Italian "Storto" identifies something that is not right. Jal says that a "storta" is indeed whatever part of a ship that is curved. It is not clear if "storte" indicates here a specific part of the ship (in this case the translation would be: The storte are 3 3/4 feet) or if it is used as an adjective of the last plural feminine noun (storte is feminine plural declination), that is "sogie". In this case the translation would be: "The strakes of the forecastle are 3 3/4 feet curved".



16. Ala via del stilo alto in cima indreto pie 10.

At the projection of the forecastle, on the top, the galleon is 10 feet high.

#Lane translates "stilo" as "projection of the forecastle" without explaining why he does so. It is not clear where the forecastle is projected. In naval architecture "stilo" indicates a vertical rod that is used to sustain something.

El ferir da prova pie 3.

The distance from the fore tail frame to the stem is 3 feet.

#There is clearly a mistake, or in the manuscript or in the transcription: it's impossible that the ferir is so small, it would mean that the fore tail frame rests on the stem and not on the keel. Looking at the "ferir da prova" in Todaro's manuscript, 33 feet would be a reasonable length

17. La stela sul *charozo*\* mezo pe' et la corba pie 3 quarta.

The rising of the floors at the point where the stem meets the keel is ½ feet and the stella of the tail frame is 3 ¼ feet.

# a visual interpretation of what charozo could be is found in the next slide. It is not completely sure that the "chorba", terms that generally indicates a frame, corresponds to the tail frame here, but it looks reasonable.

18. Averze el chao de sesto da prova pie 30 1/2.

The fore tail frame is 30 ½ feet wide (at its maximum width).

Legno in ramo in su la chorba dea 5.

The narrowing at the top of the frame is 5 fingers.

L'asta da pope tuto ala via del'asta alta pie 32.  
The sternpost is 32 feet high along all its length

La parascozola alta pie 15.  
The bottom stringer is 15 feet high (at the stern)

El maier de bocha alto pie 24.  
The top clamp at the stern post is 24 feet high

Larga in triganto pie 20.  
The ship is 20 feet large at the transom

El primo zielo longo pie 13.  
The first "zielo" is 13 feet long  
The term "zielo" cannot be found in any other venetian manuscript, so it's translation is uncertain. FINISCI

# Galleon



L'altro longo pie 10.  
The other one is 10 feet long

L'altro longo pie 6.  
The other one is 6 feet long

Longa tuta la pupa pie 74.  
All the stern is 74 feet long.

L'asta da pope chaze pie 14.  
The sternpost rakes 14 feet.

El ferir da pope pie 14.  
The distance from the aft tail frame to the sternpost is 14 feet.

La stela del charozo pie uno.

The rising of the floor at the point where the keel meets the sternpost is 1 foot.

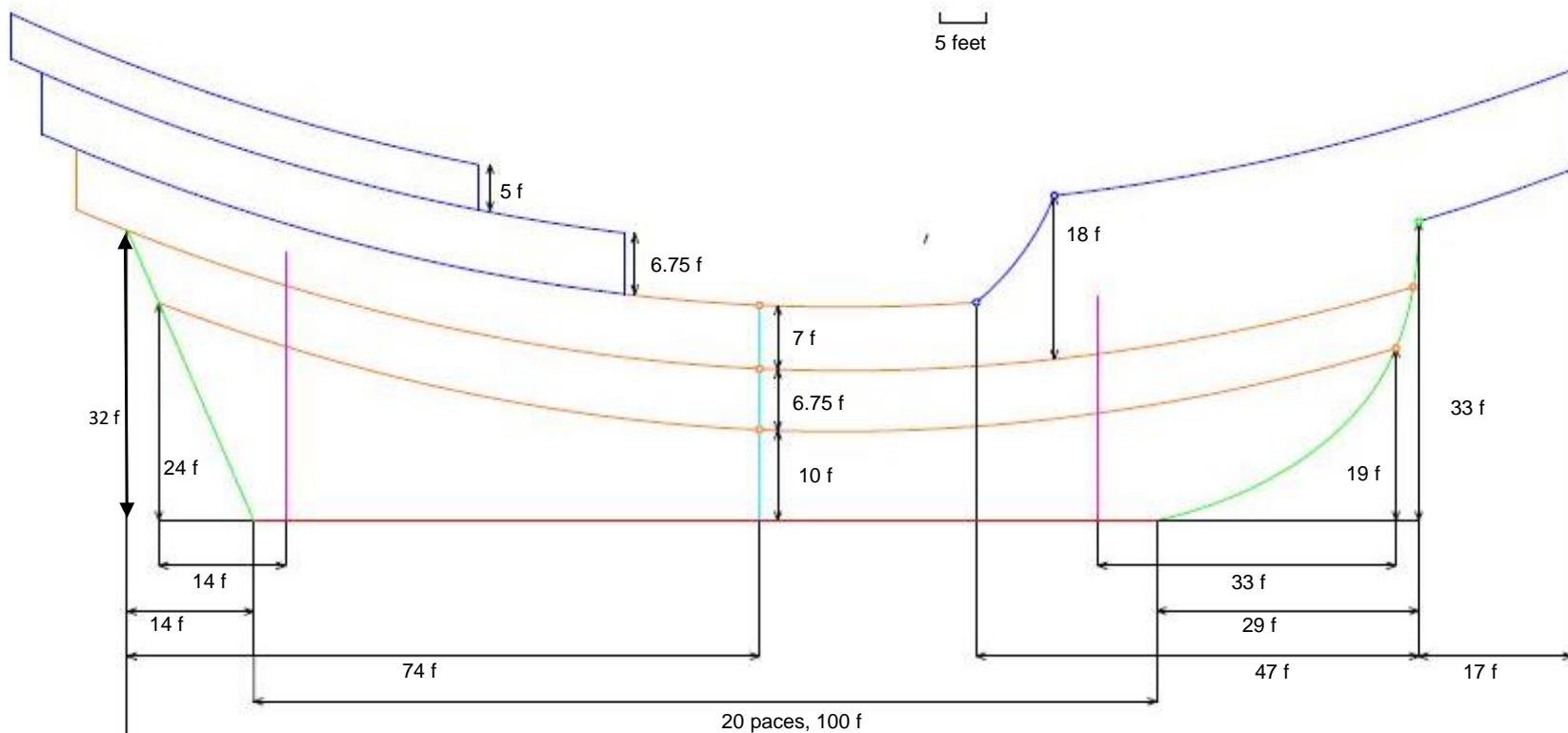
La stela dela chorba pie 5 1/2.

The rising of the floor of the frame is 5 ½ feet.

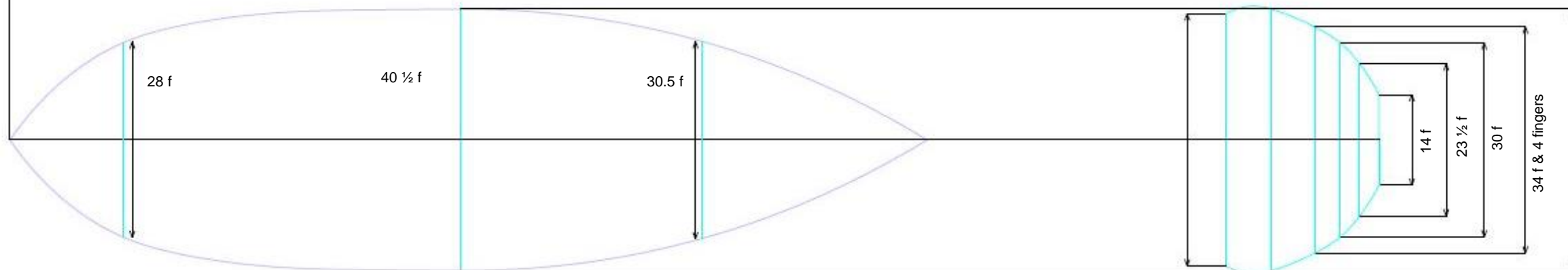
# It is probably speaking about the tail frame

El chao de sexto da pope averze pie 28.

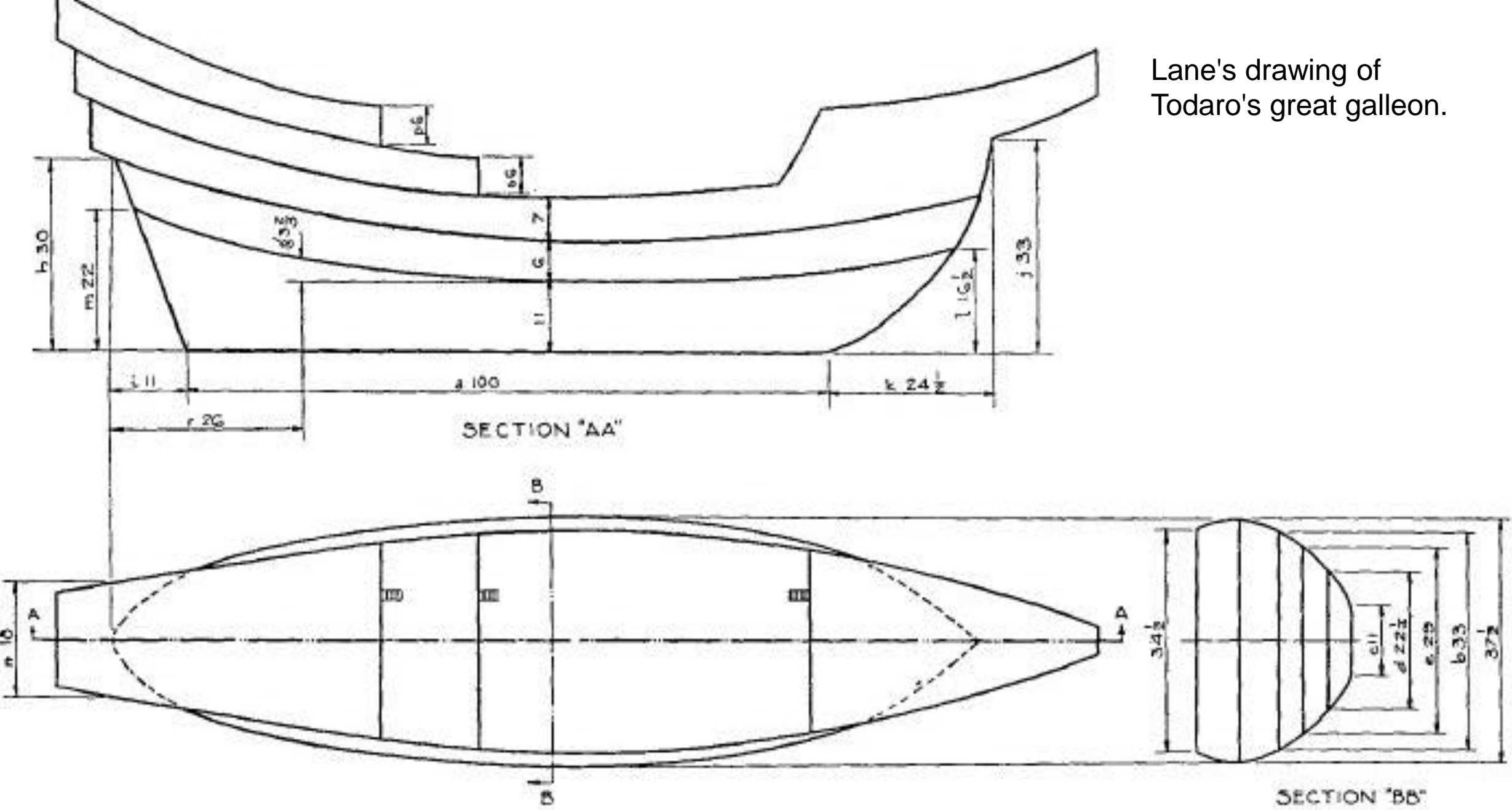
The aft tail frame is 28 feet wide.



Drawing of the galleon with the measures given in the manuscript. The top view measures are taken at the *regia*, at the height of the second deck.



Lane's drawing of  
Todaro's great galleon.



Some possible mistakes in the manuscript and difficulties in its interpretation don't allow to make a sure reconstruction of the lines plans of the galleon. The uncertainties are:

- We do not know for sure how the "ferir" (the distance between the tail frames and the posts) is measured, if as the distance between the tail frames and the perpendiculars dropped at the top of the posts or as the distance between the tail frames and the perpendiculars dropped at the height of the first deck, in the point where the deck meets the posts.
- The "ferir da prova" had to be guessed, since the measure given in the manuscript is physically impossible
- We are not sure how the rake of the posts should be measured. In the *Fabbrica di Galere* of Michael of Rhodes it seems that the rake at the stern is measured at the height of the top of the transom and the rake at the stem is measured at the height of the *maier de bocha*, that is the height of the first deck. Lane measures the rake at the height of the top of both the posts, and so was done here.
- We are not sure about the curvature of the stem
- We are not sure about from what point the height of the forecastle should be measured. Lane measures it from the second deck, and so was done here.



## Chosa moderna 1567.

Prima una naveta de pasa 9 in charena. In bocha pie 20. In pontal pie 6 1/2. De fondi pie 8 1/2. In trepie pie 15. In siepie pie 18. In fra do choverte alta pie 4. In regia pie 22 1/2. L'asta da prova alta pie 17, chaze pie 14. Alta la parascozola pie 3 1/2. El primo maier de bocha alto pie 17 1/2. L'asta da pope alta pie 14 1/2, chaze pie 8. Larga in triganto pie 11 et in cima serà larga pie 7. Alta la parascozola pie 5 quarta. Alto el maier de bocha pie 11. Una zenta sora el maier de boca, alta pie 3. La sogia del balaor longa ala via pie 23 1/2. Storte pie 2 1/2. Averze onde va la sogia, zoè al brando, pie 16 1/2. Dentro dele sogie, el chan su l'asta longo al'oro dentro dela sogia pie 7. I forchami del volto da largo del'asta al'oro de fuera in dreto pie 13 1/2 et resto fuera sarave [c. 211r] puocho più de pie 8. De magier de bocha de mezo chasareto alto pie 5 et l'altra batagiola alta pie 2 1/2. Larga la friza in zima pie 17. Longo 'sto chasaro pie 26. El chao de sesto da prova si va sula cholonba et si va da prova a pope pie 2. El chao de sesto da pope si va in sula cholonba et si va da pope a prova pie 8. La stela da pope dela chorba, zoè el 17, el chao de sesto pie 1 1/2; el 15 pie uno e quarta; el 10 mezo pe'; el 5 tre dea; l'un niente. El chao de sesto da prova à de stela uno pe', zoè el 17; el 15 quarte 3; el 10 una quarta; el 5 mezo deo. Le lumiere el chanto va sula zennta 18 dela banda el primo cielo longo ala via pie 5 1/2. Inchavao mezo pe'. L'altro ziolo longo pie tre, inchavao dea 6 et el dreto longo pie 6.

La partizon del sesto longa pie 2. Legno in ramo in la chorba dea 2. Legno in ramo int'el forchame dea 4.

## Naveta

*Chosa moderna 1567.*

### Naveta (Little ship)

*Modern thing 1567.*

Prima una naveta de pasa 9 in charena.

First a naveta of 9 paces on the keel.

In bocha pie 20.

It is 20 feet wide at the beam

In pontal pie 6 1/2.

The depth of the hold is 6 ½ feet

De fondi pie 8 1/2.

It is 8 ½ feet wide at the floor

In trepie pie 15.

In trepie (3 feet above the floor) it is 15 feet wide

In siepie pie 18.

In siepie (6 feet above the floor) it is 18 feet wide

In fra do choverte alta pie 4.

It is 4 feet high between the two decks

In regia pie 22 1/2.

At the maximum width, at the height of the second deck it is 22 ½ wide

# Naveta



L'asta da prova alta pie 17, chaze pie 14.

The stem is 17 feet high, rakes 14 feet

Alta la parascozola pie 3 1/2.

The bottom stringer is 3 ½ feet high

El primo maier de bocha alto pie 11.

The first top clamp is 11 feet high

# probably at the point where it meets the stem

L'asta da pope alta pie 14 1/2, chaze pie 8.

The sternpost is 14 ½ feet high, rakes 8 feet

Larga in triganto pie 11 et in cima serà larga pie 7.

The ship is 11 feet wide at the transom

Alta la parascozola pie 5 quarta.

The bottom stringer is 5 ¼ feet high

Alto el maier de bocha pie 11.

The top clamp is 11 feet high

# Probably at the point where it meets the stern post

Una zenta sora el maier de boca, alta pie 3.

A wale above the top clamp is 3 feet high

La sogia del balaor longa ala via pie 23 1/2.

The strake of the forecastle is 23 ½ long on its way.

Storte pie 2 ½.

The storte are 2 ½ feet.

# It is not clear what the *storte* are precisely. As a nautical term, in Italian "storto" indicates whatever component of the ship that is not straight.

Averze onde va la sogia, zoè al brando, pie 16 1/2.

In the point where the strake lies, meaning at the deadwork, the ship is 16 ½ (wide).

# "brando" generally indicates the deadwork. This sentence could mean that at the top deck the ship is 16 ½ feet wide.

Dentro dele sogie, el chan su l'asta longo al'oro dentro dela sogia pie 7.

On the inner part of the strakes, they have 7 feet on the post along the inner edge of the strake.

# the meaning of this sentence is obscure.

I forchami del volto da largo del'asta al'oro de fuora in dreto pie 13 1/2 et resto fuora sarave puocho più de pie 8.

The futtocks (forchami) of the fore part of the ships (volto) are 13 ½ feet straight from the post to the outer edge (oro) and the rest, on the outside (fuora), is little more than 8 feet.

# this is a literal translation whose meaning is obscure

De magier de bocha de mezo chasareto alto pie 5 et l'altra batagiola alta pie 2 1/2.

From the middle top clam the aft castle is 5 feet high and the other castle (the fore castle) is 2 ½ feet high.

# the "magier de bocha" de mezo, literally "the top clamp of the middle", could be the second top clamp, the longitudinal stringer on which rest the ends of the beams that sustain the second deck. The term "batagiola" ("battigiola") is found in Trombetta's manuscript, where apparently means "forecastle"

Larga la friza in zima pie 17.

The *friza* is 17 feet large at the top.

#“friza” might be the ancient venetian term for the italian “frezza”/ “freccia” and the french “flèche”. About the term “freccia”, Jal’s dictionary for nautical terms says that in ancient galleys “freccia” was a beam positioned on the aftcastle that sustained the pavilion of the castle.

Longo ‘sto chasaro pie 26.

This (aft)castle is 26 feet long.

El chao de sesto da prova si va sula cholonba et si va da prova a pope pie 2.

The fore tail frame rests on the keel and from bow to stern there are 2 feet.

# it is probably giving the precise position of the tail frame, that should be at 2 feet going from bow to stern. It must mean "two feets measured from the chalchagnol", the point where the keel meets the post, and not from the end of the post, since this rakes 14 feet

El chao de sesto da pope si va in sula cholonba et si va da pope a prova pie 8.

The aft tail frame rests on the keel and from stern to bow there are 2 feet

# same as above on regards to the position of tail frame



La stela da pope dela chorba, zoè el 17, el chao de sesto pie 1 1/2; el 15 pie uno e quarta; el 10 mezo pe'; el 5 tre dea; l'un niente.

The stella of the frame at the bow, meaning the 17th frame, that is the tail frame, is 1 ½ foot; the stella of the 15th frame is 15 ¼ feet; the stella of the 10th frame is ½ foot; the frame of the fifth frame is 3 fingers; the first frame has no stella.

# clearly, it's counting the frames from midship to the stern, so the first frame should be the midship frame

El chao de sesto da prova à de stela uno pe', zoè el 17; el 15 quarte 3; el 10 una quarta; el 5 mezo deo.

The stella of the fore tail frame, meaning the 17th frame, is one foot; the stella of the 15th frame is ¾ feet; the stella of the 10th frame is ¼ feet; the stella of the fifth frame is ½ finger.

Le lumiere el chanto va sula zennta dela banda el primo cielo longo ala via pie 5 1/2. Inchavao mezo pe'

# a dot should be put after "banda" to have a syntactically correct sentence, that becomes :

Le lumiere el chanto va sula zennta dela banda. El primo cielo longo ala via pie 5 1/2. Inchavao mezo pe'

The first sentence, from "the lumiere" to "banda" couldn't be translated. It literally is: **The lumiere the chanto goes on the wale of the banda.**

The word "chanto" couldn't be found in any other venetian manuscript nor in Jal's dictionary. "Lumiera" is not found in any other venetian manuscript either, but it must correspond to the french "lumière", that Jal describes as a channel running parallel to the keel of the galleys that brings the bilge water to the pump of the ship. In this manuscript it looks that the channel is divided in 3 parts called "cieli". The term "banda" is found in the Fabrica di Galere and in Todaro's manuscript. It seems to indicate sort of a longitudinal stringer lying on the top deck of the ship.

From the first dot on, the translation continues like this: **The first *cielo* is 5 ½ feet long on its way. It is ½ foot hollowed out.**

L'altro ziolo longo pie tre, inchavao dea 6 et el dreto longo pie 6.

The other ziolo is 3 feet long and 6 fingers hollowed and the straight one is 6 feet long.

La partizon del sesto longa pie 2.

The narrowing of the floor timbers from midship to the tail frames is 2 feet.

# It is most likely speaking of the "partison de fondi", the narrowing of the floor timbers from midship to the tail frames. Indeed, "sesto" generally indicates all the floor timbers in the central part of the hull, between the two "chavi de sesto", the tail frames.

Legno in ramo in la chorba dea 2.

The widening of the top part of the frames in the frame is 2 fingers.

"Ramo" refers to the "partison del ramo", the widening of the futtocks at the height of the "magier de bocha", the top clamp of the first deck. The widening of the futtocks is maximum at the tail frames and goes to zero at the midship frame. It is not clear to what "chorba", to what frame is the manuscript referring to here.

Legno in ramo int'el forchame dea 4.

The widening of the futtocks is 4 fingers.

## Nave (14 paces keel)



Una nave de passa 14 in cholonba 23. In bocha pie 29. De fondi pie 11. In trepie pie 19 1/2. In siepie pie 25. In pontal pie 7 1/2. In fra do choverte pie 6 1/2 et soto la tolda pie 5 1/2. Soto el chasaro pie 5 1/2 et d'alto pie 3 1/2. Averze in regia pie 34 1/2. La friza del chasaro larga pie 24. L'asta da prova alta pie 27, chaze pie 26. La paraschozola alta pie 5 1/2. El primo maier de bobcha 24 alto pie 15. Et la regia alta pie 21. L'asta da pope alta ala via pie 25, chaze pie 11. Alta la paraschozola pie 10. Alto el maier de bocha [c. 212r] indreto pie 17. Larga in triganto pie 16 quarta. Larga in cima pie 13. Longo el chasaro pie 58. Longa la tolda pie 40. El primo cielo dela lumiera longo pie 9, inchavao quarte 3. L'altro longo pie 5 quarta. L'altro longo pie 4 et da là in sima longo pie 10. Le zente 25 uno pe' et mezo de chanpo drento le sogie del balor longa ala via pie 36. Storte pie 3 quarte 3. Alto el primo maier de bocha ala via del stilo pie 5 quarta in sima indreto pie 4 1/2. L'altro alto pie 3 1/2. In cima pie 2 quarta. La chresta de galo alta pie 3 1/2 et in 26 zima pie 4. Largo el brando pie 24. El balaor fuera indreto pie 12 1/2. El ferir da pope pie 11 e quel da prova pie 3. Le chorbe va sula cholonba. La stela da pope pie \*\*\*. La stela da prova pie \*\*\*.

# Nave (14 paces keel)



Una nave de passa 14 in cholonba.

NAVE WITH 14 paces KEEL (24.29 m)

In bocha pie 29

At the beam it is 29 feet (18,06 m)

De fondi pie 11.

At the floor it is 11 feet (3,82 m)

In trepie pie 19 1/2.

At three feet above the floor it is 19 ½ feet wide (6,77 m)

In siepie pie 25.

At six feet above the floor it is 25 feet wide (8.87 m)

# Nave (14 paces keel)



In pontal pie 7 1/2.

The depth (# from the beam to the keel) is 7 ½ feet

In fra do choverte pie 6 1/2 et soto la tolda pie 5 1/2.

There are 6 ½ feet between the 2 decks (# between first and second deck I think) and 5 ½ feet under the top deck.

Soto el chasaro pie 5 1/2 et d'alto pie 3 1/2.

There are 5 ½ feet under the (aft)castle and 3 ½ feet of height

# The castle should be 3 ½ feet high

Averze in regia pie 34 1/2.

At the maximum width, at the height of the second deck you have 34 ½ of width

# Nave (14 paces keel)



La friza del chasaro larga pie 24.

The *friza* of the castle is 24 feet large

# see in the translation of naveta's sheet what friza could be

L'asta da prova alta pie 27, chaze pie 26.

The stem is 27 feet high, it rakes 26 feet

La paraschozola alta pie 5 1/2.

The bottom stringer is 5 ½ feet high

El primo maier de bobcha alto pie 15.

The first top clamp is 15 feet high.

# This is probably the height of the top clamp where it meets the stem.

# Nave (14 paces keel)



- L'asta da pope alta ala via pie 25, chaze pie 11.
- The sternpost is 25 feet high on its way, rakes 11 feet.
  
- Alta la paraschozola pie 10. Alto el maier de bocha indreto pie 17.
- The bottom stringer is 10 feet high (abaft). The top clamp is 17 feet high.
- # It's probably giving the height of the points where parascossola and maier de bocha meet the sternpost
  
- Larga in triganto pie 16 quarta.
- The ship is 16 feet large at the transom (at the point of the maximum width)
  
- Larga in cima pie 13.
- The ship is 13 feet long at the top (of the transom).



## Nave (14 paces keel)



Longo el chasaro piè 58.

The aft castle is 58 feet long.

Longa la tolda pie 40.

The top deck is 40 feet long.

El primo cielo dela lumiera longo pie 9, inchavao quarte 3.

The first *cielo* of the *lumiera* is 9 feet long,  $\frac{3}{4}$  feet hollowed out.

L'altro longo pie 5 quarta.

The other one is 5  $\frac{1}{4}$  feet long.

L'altro longo pie 4 et da là in sima longo pie 10.

The other one is 4 feet long and from there to the top it's 10 feet long

# see the translation of the galleon's sheet for the possible meaning of "cielo" and "lumiera". It is not clear to what top is the manuscript talking about

# Nave (14 paces keel)



Le zente uno pe' et mezo de chanpo drento le sogie del balor longa ala via pie 36.

# There could be a mistake here in the transcription, meaning that 2 sentences are put together without punctuation. I would put a dot after “drento”.  
From that point to the end the translation is:

the strakes of the forecastle are 36 feet long on their way.

From the beginning to “drento” the literal translation is :

The wales have 1 foot and a half of room (“chanpo”) in between.

# “drento” corresponds to the italian “dentro”, that literally means “inside” and can be used as “in between”. It is not clear of what wales is the manuscript talking about and how many wales are there, since 1 ½ foot of space in between them looks a small distance

# Nave (14 paces keel)



Storte pie 3 quarte 3.

The *storte* are 3  $\frac{3}{4}$  feet

# It is not clear what *storte* are. In Italian "Storto" identifies something that is not straight. Jal's dictionary says that a "storta" is indeed whatever part of a ship that is curved.

Alto el primo maier de bocha ala via del stilo pie 5 quarta in sima indreto pie 4  $\frac{1}{2}$ .

The first top clamp is 5  $\frac{1}{4}$  feet at the projection of the fore castle, on the top it is 4  $\frac{1}{2}$  feet.

# this sentence is very unclear, since it is not clear what "stilo" is precisely. Lane translates it as "projection of the first castle" without giving any further information.

L'altro alto pie 3  $\frac{1}{2}$ .

In cima pie 2 quarta.

The other top clamp is 3  $\frac{1}{2}$  feet high. It is 2  $\frac{1}{4}$  feet on the top

# Nave (14 paces keel)



Storte pie 3 quarte 3.

The *storte* are 3  $\frac{3}{4}$  feet

# It is not clear what *storte* are. In Italian "Storto" identifies something that is not straight. Jal's dictionary says that a "storta" is indeed whatever part of a ship that is curved.

Alto el primo maier de bocha ala via del stilo pie 5 quarta in sima indreto pie 4  $\frac{1}{2}$ .

The first top clamp is 5  $\frac{1}{4}$  feet at the projection of the fore castle, on the top it is 4  $\frac{1}{2}$  feet.

# this sentence is very unclear, since it is not clear what "stilo" is precisely. Lane translates it as "projection of the first castle" without giving any further information.

L'altro alto pie 3  $\frac{1}{2}$ .

In cima pie 2 quarta.

The other top clamp is 3  $\frac{1}{2}$  feet high. It is 2  $\frac{1}{4}$  feet on the top

# it is not clear of what "top" is the manuscript talking about

# Nave (14 paces keel)



La chresta de galo alta pie 3 1/2 et in 26 zima pie 4.

The “chresta de galo is 3 ½ high and at the top of frame 26 it is 4 feet (wide).

# “chresta de galo” is not found in any other venetian manuscript nor in Jal's dictionary. The “galo” must be a part of the ship (maybe it's a way to indicate the whole ship, since the word "galo" resembles "galion") and the “chresta” is its top. Literally, “chresta de galo” means cockscomb. The number “26” should indicate a frame, but it could also be a transcription mistake, since the sentence makes more sense if we take out “26”.

Largo el brando piè 24.

The top of the deadwork is 24 feet wide

# This could be the width of the ship at the *tolda*, the top deck.

El balaor fuora indreto pie 12 1/2.

The forecastle extends 12 ½ feet straight on.

# This should mean that the forecastle protrudes 12 feet in the fore direction from the profile of the ship

# Nave (14 paces keel)



El ferir da pope pie 11 e quel da prova pie 3.

The distance between the aft tail frame and the sternpost is 11 feet and the distance between the fore tail frame and the stem is 3 feet.

Le chorbe va sula cholonba.

The frames are positioned on the keel

Why is the manuscript specifying this? Where else should the frames be positioned?

La stela da pope pie \*\*\*.

La stela da prova pie \*\*\*.

The rising of the floors at the stern \*\*\*

The rising of the floors at the bow \*\*\*

## Nave (15 paces keel)



Prima una nave<sup>12</sup> longa pasa 15 pie 3. L'asta da prova alta pie 30, chaze pie 24. L'asta da pope alta in dreto pie 27, chaze pie 10 1/2. De fondi pie 12. In pontal pie 9 men quarto. In fra do choverte alto pie 7 1/2. In triganto larga pie 19. Larga in sima pie 14. El primo maier de boca a pope alto in dreto pie 19 1/2 et a prova alto pie 17 1/2. La parascozola da pope in dreto alta pie 10 quarto et a prova alta pie 6 1/2. El ferir da pope pie 16 et quel da prova pie 6. Charozo da pupa, onde va el chao de sesto, pie 2 meno quarto, zoè el 25; el 20 uno pe' e quarto; el 15 dea 9; el 10 dea 4; el 5 uno deo. A prova la stela dela corba da pupa uno pe' 1/2 et quela da prova uno pe' e dea do. La partizon longa pie 2 et quarte 3. Legno in ramo in la chorba una quarta.<sup>13</sup>

La lumiera al primo cielo, longo in dreto, pie 19 1/2, inchavao quarte 3. L'altro longo pie 5, inchavao dea 5. El chaton de sora, drento de l'altro, mezo pe'. A prova, dala regia perfina soto la sogia, alto pie 13. In fra do coverte alta pie 7. In zima de prova, dal frizeto per infina in zima del'asta, zoè la coverta dela regia, pie 12 quarte 3. In cima dala coverta dela tolda perfina soto el chan, alta pie 5. L'ogio grando pie 3 1/2. Alto da la coverta uno pe 1/2, alargo da l'asta pie 2. Le soie del balaor longe ala via pie 40 1/2. Sentinae pie 5. Largo el brando pie 28.

El forchame del volto va per mezo el chalchagniol.

La prima forcha va sul 7 a pupa. La tolda longa pie 40. Le falchonere vive, una alargo de l'altra, pie 8. Alto dala rema soto la soia pie 6. Soto la tolda alto pie 7. Soto el chasaro alto pie 6 1/2 et de sora pie 4. L'altra chovert«a» alta pie 5 dea do, un'altra in cima longa 814, alta pie 5. Larga la friza pie 27. El 15 [c. 210v] primo magier de boca del balaor ala via del stilo alto pie 5. Uno pe' e mezo de balchon. L'altro maier de bocha pie 4. La chresta de galo alta pie 5 ala via del stilo. El primo maier de bocha a prova in dreto alto pie 4. Alto quuel 16 d'alto, dala sogia perfina al'oro de sora in dreto, pie 6 1/2. La chresta de galo longa pie 18 1/2, alta a prova ala via del stilo pie 6. Un altro ziolo da pope, onde va le chontene un'altra man de lumiere che va più fuora dele altre, pie 2 1/2. In dreto el magier de bocha a pupa alto pie 6 e si scontra al chomio dela chontena longo el ziolo pie 5, inchavao mezo pe'. El dreto dela lumiera longo pie 6. El chanpo dele cente pie 2 1/2. Dala tolda al'oro de sora dela centa alta pie 3. Largo el balaor in zima pie 19.



## Nave (15 paces keel)



Prima una nave longa pasa 15 pie 3.

First, a ship 15 paces and 3 feet long.

L'asta da prova alta pie 30, chaze pie 24.

The stem is 30 feet high, rakes 24 feet.

L'asta da pope alta in dreto pie 27, chaze pie 10 1/2.

The sternpost is 27 feet high straight on, rakes 10 ½ feet

De fondi pie 12.

The floor is 12 feet.

In pontal pie 9 men quarto.

It is 9 feet minus ¼ at the hold.

## *Nave (15 paces keel)*



In fra do choverte alto pie 7 1/2.

There are 7 ½ feet of height between the 2 decks

In triganto larga pie 19.

The ship is 19 feet large at the transom (at its maximum width)

Larga in sima pie 14.

The ship is 14 feet large at the top (of the transom)

El primo maier de boca a pope alto in dreto pie 19 1/2 et a prova alto pie 17 1/2.

The first top clamp at the stern it is 19 ½ straight on and 17 ½ high at the bow.

La parascozola da pope in dreto alta pie 10 quarto et a prova alta pie 6 1/2.

The bottom stringer at the stern is 10 ¼ feet high straight on and it is 6 ½ feet high at the bow.

# Nave (15 paces keel)



El ferir da pope pie 16 et quel da prova pie 6.

The distance between the sternpost and the aft tail frame is 16 feet and the distance between the stem and the fore tail frame is 6 feet.

Charozo da pupa, onde va el chao de sesto, pie 2 meno quarto, zoè el 25; el 20 uno pe' e quarto; el 15 dea 9; el 10 dea 4; el 5 uno deo.

The height of the floor from the baseline at the stern, where the tail frame is located, meaning at the 25th frame, is 2 minus  $\frac{1}{4}$  feet high; the 20th frame is 2 minus  $\frac{1}{4}$  feet, the 15 frame is nine fingers, the 10th frame is 4 fingers, the 5 frame one finger

# It should mean that the “charozo” of the 20th frame is 2 minus  $\frac{1}{4}$  feet, the charozo of the 15th frame is nine fingers etc, meaning that the rising of the floor at the 20th frame is 2 minus  $\frac{1}{4}$  feet... It looks like that the chavo de sesto, so the aft tail frame, is the 25th frame. This means that the author of the manuscript is counting the frames starting from midship, so that the midship frame is frame 1 and the tail frame is frame 25. The fact that in this manuscript the chavo de sesto is the 25th frame means that there are 25 frames from midship to the aft tail frame. Theodoro says that in a merchantmen there are 25 frames at bow and 25 frames at stern in which the *partison the fondi*, so the narrowing of the floor, takes place. This means that also the merchantmen that Theodoro's is describing has 25 frames between the midship frame and the aft tail frame, since the *partison de fondi* starts midship and terminates at the tail frames.

# Nave (15 paces keel)



A prova la stela dela corba da pupa uno pe' 1/2 et quela da prova uno pe' e dea do.

At bow the *stella* of the aft tail frame is 1 ½ feet and the *stella* of the fore tail frame is 1 foot and 2 fingers.

There must be a mistake in the transcription or in the manuscript itself: “a prova”, in the beginning of the sentence, has no sense, since it's talking about the aft tail frame; it should be taken out.

La partizon longa pie 2 et quarte 3. Legno in ramo in la chorba una quarta.

The partison is 2 ¾ feet

# It is probably talking about the partison de fondi at the midship frame.

Legno in ramo in la chorba una quarta.

The widening of the top part of the frame is ¼

It could be talking about the *partison del ramo*, the widening of the top part of the frame, at the tail frame.

# Nave (15 paces keel)



La lumiera al primo cielo, longo in dreto, pie 19 1/2, inchavao quarte 3. L'altro longo pie 5, inchavao dea 5.

The lumiera at the first cielo is 19 ½ feet long straight on, hollowed out ¾. The other cielo is 5 feet long, 5 fingers hollowed out.

El chaton de sora, drento de l'altro, mezo pe'.

The chaton on the top, inside the other one, is half a foot

# "chaton" is not found in any other venetian manuscript nor in Jal's dictionary. In the Michael of Rhodes's book the term "schaton" is present: it indicates the furthest part of the keel that touches the rudder. It's unlikely that the manuscript is referring to this timber.

A prova, dala regia perfina soto la sogia, alto pie 13.

At the bow, from the point of maximum width at the height of the second deck to a point under the strake, there are 13 feet of height

# "sogia" generally indicates a strake, so it's hard to guess to what timber it is precisely referring to

# Nave (15 paces keel)



In fra do coverte alta pie 7.

The ship is 7 feet tall between the 2 decks

# presumably between first and second deck

In zima de prova, dal frizeto per infina in zima del'asta, zoè la coverta dela regia, pie 12 quarte 3.

At the top of the bow, from the waterway, meaning from the second deck, until the top of the post it is 12  $\frac{3}{4}$  feet

# frizeto should correspond to the "frixetto" found in The Book of Michael of Rhodes and translated as "waterway", timber running along the edge of the deck, fitted over the ends of the deck-beams and inside the futtocks, serving to strengthen the connection between deck and sides and as a gutter to carry off deck-water

In cima dala coverta dela tolda perfina soto el chan, alta pie 5.

At the top, from the top deck to behind the *chan*, it is 5 feet high

# the term "chan" couldn't be found anywhere.

# Nave (15 paces keel)



L'ogio grando pie 3 1/2.

The big hawse-hole is 3 ½ feet (of diameter perhaps)

The term “ogio” is not found in the other manuscripts, but Boerio dictionary states that “ochio” is one of the two hawse-holes at the bow through which the anchor cable runs.

Alto da la coverta uno pe 1/2, alargo da l'asta pie 2.

It is 1 ½ feet high from the deck, 2 feet far from the post (the stem).

Le soie del balaor longe ala via pie 40 1/2.

The strakes of the forestle are 40 ½ feet long on their way.

Sentinae pie 5.

The bilge is 5 feet

# it probably means 5 feet high

# Nave (15 paces keel)



Largo el brando pie 28.

The ship is 28 feet wide at the top of the deadwork

# presumably at the height of the tolda, at the top deck.

El forchame del volto va per mezo el chalchagniol.

La prima forcha va sul 7 a pupa.

The first futtock goes on the seventh frame at the stern

# it's counting the frames from midship to the post. Unclear meaning. Are there no futtocks in the first 6 frames?

La tolda longa pie 40.

The top deck is 40 feet long



# Nave (15 paces keel)



Le falchonere vive, una alargo de l'altra, pie 8.

The falchonere are 8 feet (distant) the one from the other.

# The "falchon" is a piece of artillery, a small channon (it appears in the *Fabrica di Galere*, translated by Jal). The term "falchonere" was not found in the manuscripts, but it must be sort of a space where the cannons were placed.

Alto dala rema soto la soia pie 6.

From the oars under the strake (of the deck) the height is 6 feet

Soto la tolda alto pie 7.

Under the top deck the ship is 7 feet high

Soto el chasaro *alto pie 6 1/2 et de sora pie 4.*

*Under the aft castle there are 6 ½ of height and above there are 4 feet*

# *it's probably giving the height of first and second castle*

# Nave (15 paces keel)



*L'altra chovert<a> alta pie 5 dea do, un'altra in cima longa 814, alta pie 5.*

*The other deck is 5 feet and 2 fingers high, another one on the top is 14 feet long, 5 feet high*

*# it's unclear of what decks is the manuscript talking about*

*Larga la friza pie 27.*

*The friza is 27 feet wide*

*El primo magier de boca del balaor ala via del stilo alto pie 5.*

*The first top clamp at the projection of the first castle is 5 feet long*

*Uno pe' e mezo de balchon.*

*The balchon is 1 ½ foot.*

*# it's very uncertain how to translate "balchon". The word was not found in other venetian manuscripts. Jal's dictionary translate it as "échafaud", "étage", that has the general meaning of "platform". Another meaning of the word found by Jal is the one of gallery located on the aft part of a ship. None of these meanings look very plausible given the 1 ½ measure provided by the manuscript*

## Nave (15 paces keel)



L'altro maier de bocha pie 4.

The other top clamp is 4 feet high

# what other top clamp?

La chresta de galo alta pie 5 ala via del stilo.

The chresta de galo is 5 feet at the projection of the fore castle

# see above for "chresta de galo" and "stilo".

El primo maier de bocha a prova in dreto alto pie 4.

The first top clamp at the bow is 4 feet high straight on

Alto quel d'alto, dala sogia perfina al'oro de sora in dreto, pie 6 1/2.

La chresta de galo longa pie 18 1/2, alta a prova ala via del stilo pie 6.

The chresta de galo is 18 ½ feet, it is 6 feet high at the bow, on the projection of the fore castle.

## Nave (15 paces keel)



Un altro ziolo da pope, onde va le chontene un'altra man de lumiere che va più fuori dele altre, pie 2 1/2.

Another cielo at the stern, where the chontene are located, has another group of lumiere that extend more outward than the others, 2 ½ feet

# this is completely obscure. "Chontene" is not found in any manuscript nor in Jal's dictionary

In dreto el magier de bocha a pupa alto pie 6 e si scontra al chomio dela chontena longo el ziolo pie 5, inchavao mezo pe'.

The top clamp at the stern is 6 feet high and it meets the "chomio dela chontena". The ziolo is long 5 feet, hollowed out ½ foot.

In the transcription a dot should be put after "chontena". The term "chomio" is not found in any other manuscript.

El dreto dela lumiera longo pie 6.

The straight part of the lumiera is 6 feet long.

# Nave (15 paces keel)



El chanpo dele cente pie 2 1/2.

The space of the wales is 2 ½ feet

# it could mean that the space between the wales is 2 ½ feet

Dala tolda al'oro de sora dela centa alta pie 3.

From the top deck to the edge above the wale the ship is 3 feet high

Largo el balaor in zima pie 19.

The forecastle at the top is 19 feet long

List of terms not found in any other Venetian written source, whose meaning is uncertain



- *chazer*, verb, in all the 4 parts
- *zielo* (cielo), in all the 4 parts
- *chan*, in nave with a 15 paces long keel
- *chanto*, in naveta's part
- *balchon*, in nave with a 15 paces long keel
- *chomio*, in nave with a 15 paces long keel
- *chontena*, in nave with a 15 paces long keel
- *chaton*, in nave with a 15 paces long keel
- *chresta de galo*, in all the four parts
- *storte*, in all the four parts