

ANCIENT PORT STRUCTURES

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few pictures

few texts



Nero coin (64 AD)



Stabiae fresco (1st c. AD)



Torlonia relief of Portus (ca. 200 AD)

MAILLEUR, S., 2020, "Imagining Roman ports. the contribution of iconography to the reconstruction of Roman Mediterranean portscapes of the Imperial Period", PhD Thesis, University of Southampton, (249 p).

Catalogue of Ancient Ports: **5657 places** (by 22/9/2022)

incl. **650** ports (**11.5%**) with *at least* one of the following structures:

BW	Breakwater, usually called mole by archaeologists	372
QU	Quay (masonry with berthing on one side), pier or jetty (masonry with berthing on two sides), or landing stage (jetty on piles)	363
PL	Pila, made of marine concrete containing pozzolana	50
MO	Mooring device (bollard, pierced block)	78
CN	Canal (for navigation or basin flushing and/or desiltation)	64
SL	Slipway to take ships in/out of the water	58
SH	Shipshed (usually including a slipway)	70
CO	Man-made basin excavated in the rock (e.g. Carthage's circular cothon)	24
LK	Limen Kleistos, "closable" harbour with a narrow entrance	88
PH	Lighthouse	166

Let's review these structures briefly ...

Beaching

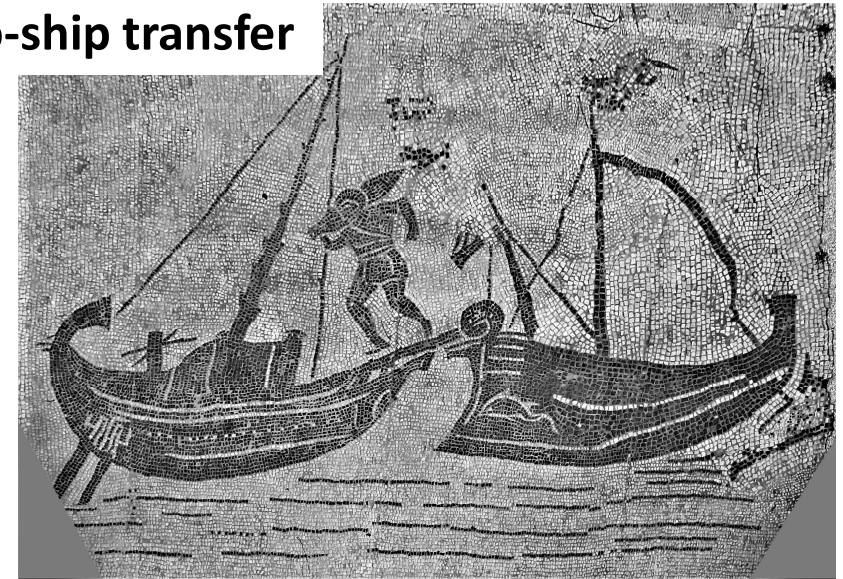
possible on sand,
but not on silts (too flat)
or shingle-pebbles (too steep)

*the most frequent
landing*



Unloading wood by wading labourers,
on 3rd c. mosaic found in Sousse.
(Picture by A. de Graauw, 2018, Bardo Mus, Tunis).

Ship-to-ship transfer



Ship-to-ship transfer
(Mosaic at Piazza delle Corporazioni N° 25, Ostia).



Unloading fish by wading labourers in **Senegal**.
Picture by Franck Boyer (Kamikazz Photo agency, Dakar).

VOTRUBA, G., (2017), “Did Vessels Beach in the Ancient Mediterranean? An assessment of the textual and visual evidence”,
The Mariner’s Mirror, Vol 103:1, (p 7-29).

RANKOV, B. (2012:139) « Trireme Olympias, the final report », Oxbow Books, (243 p).

TIMBER JETTIES



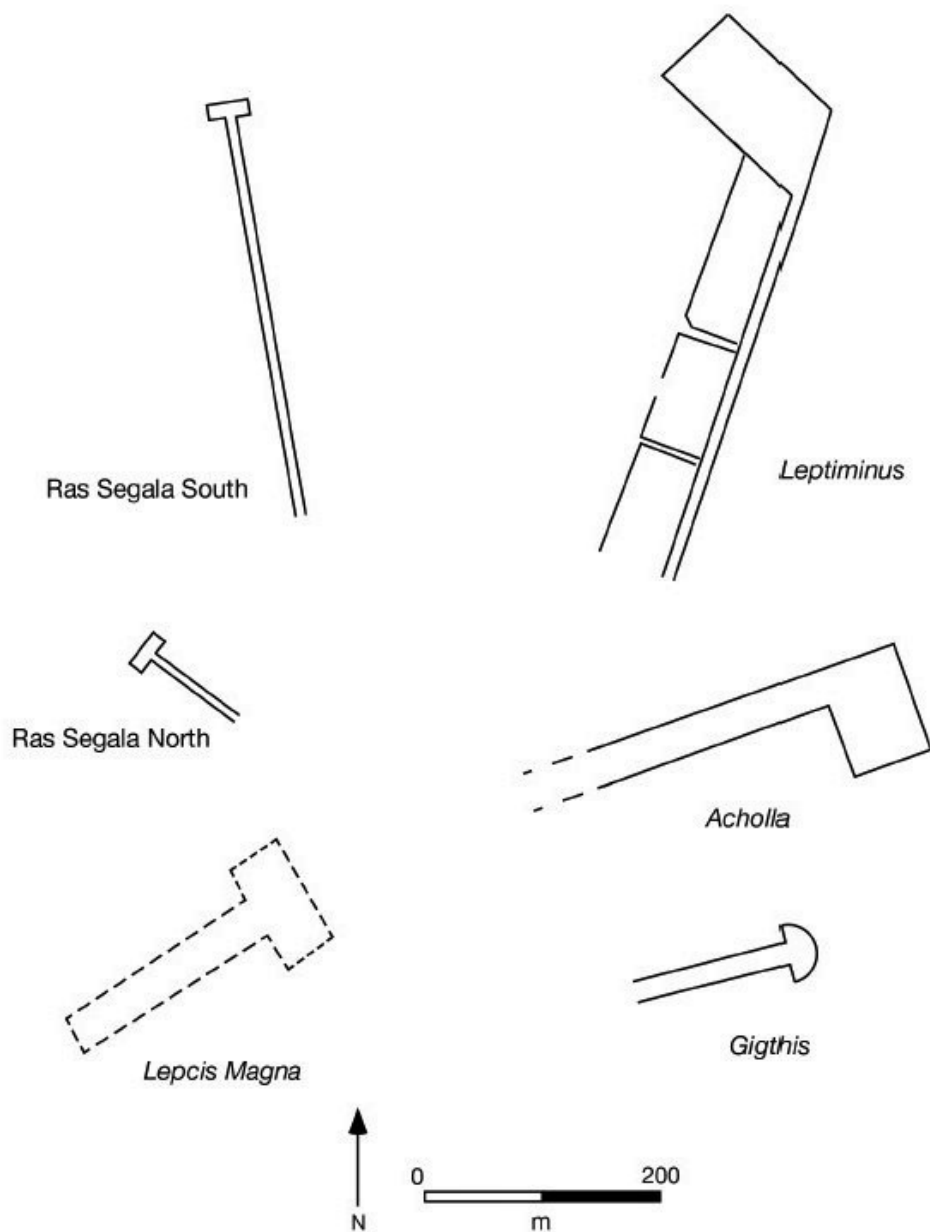
Remains of timber jetty at **Yenikapi** (Istanbul).



Timber jetty on **Stabia** fresco (detail), Pompei (1st c.).

Port du Bec (**Vendée**)





Jetties with a platform
in Tunisia



Acholla (Tunisia)
(Google Earth, 2018).

STONE, D., (2016), "The Jetty with Platform: A Distinctive Port Structure from North Africa", *Antiquités africaines*, N° 56-2016, (p 125-139).

MOLES – BREAKWATERS « VERTICAL » with ashlar & concrete

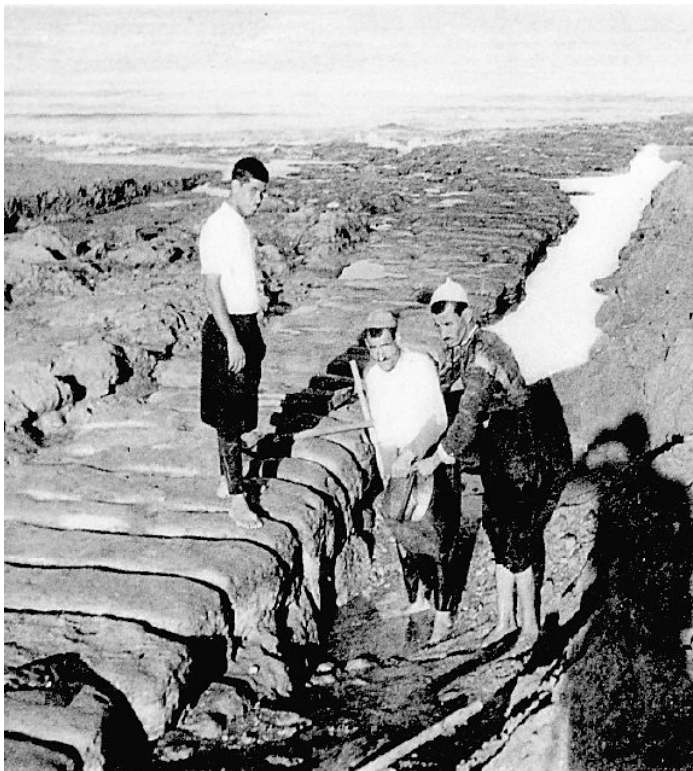


Tyre north mole built with ashlar headers, 800 BC (Noureddine, 2010)

Also at **Athlit, Amathus**, etc.



Seleucia Pieria Roman south mole built with ashlar headers, (Pamir, 2011)



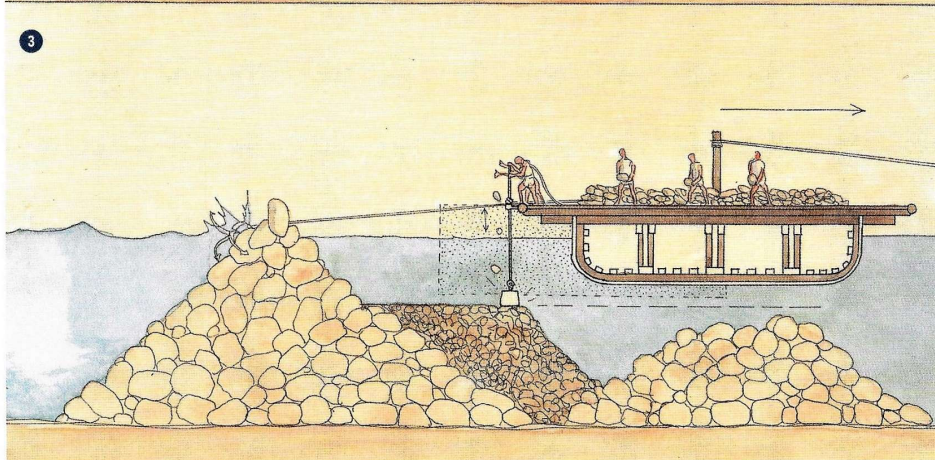
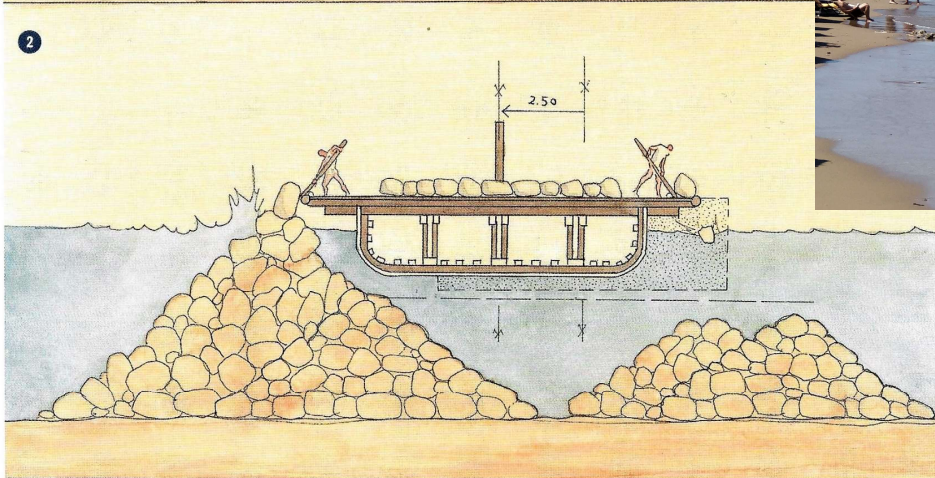
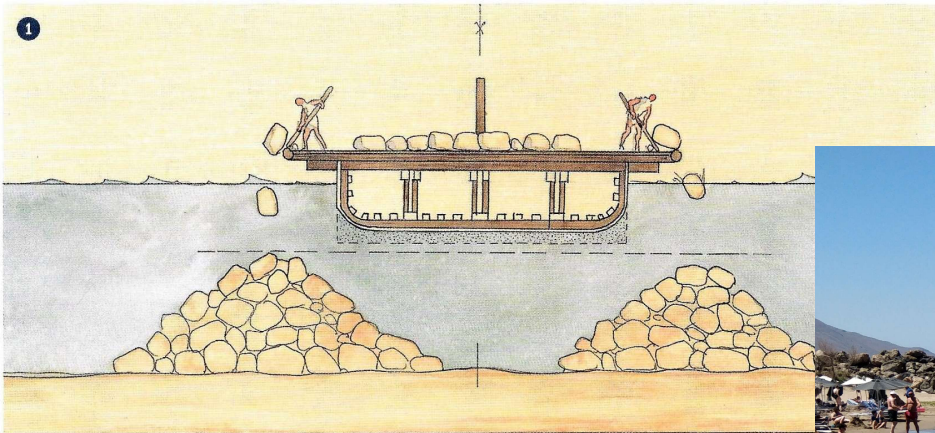
Tabbat el-Hammam mole built with ashlar headers, 900 BC (Braidwood, 1940)



Portus' north **concrete breakwater** showing imprints of transverse caisson beams (Photo de Graauw, 2011)

Wadi al-Jarf, ca. 2500 BC (Tallet, 2015)

MOLES – BREAKWATERS « SLOPING » rubble mounds



Construction of a rubble-mound breakwater
(Golvin, 2020)



Rubble-mound breakwater at **Kissamos** (Crete)
(Photo A. de Graauw, 2022)

Also at Samos, Cnide, etc.



Berm breakwater at **Leptis Magna**
(Photo A. de Graauw, 2001)



Double-line rubble-mound breakwaters at Carthage,
also at Paphos, Caesarea Maritima

and Aigina “cones” !

QUAYS



Timber quay wall of place Jules Verne, **Marseille** (Inrap 1993)

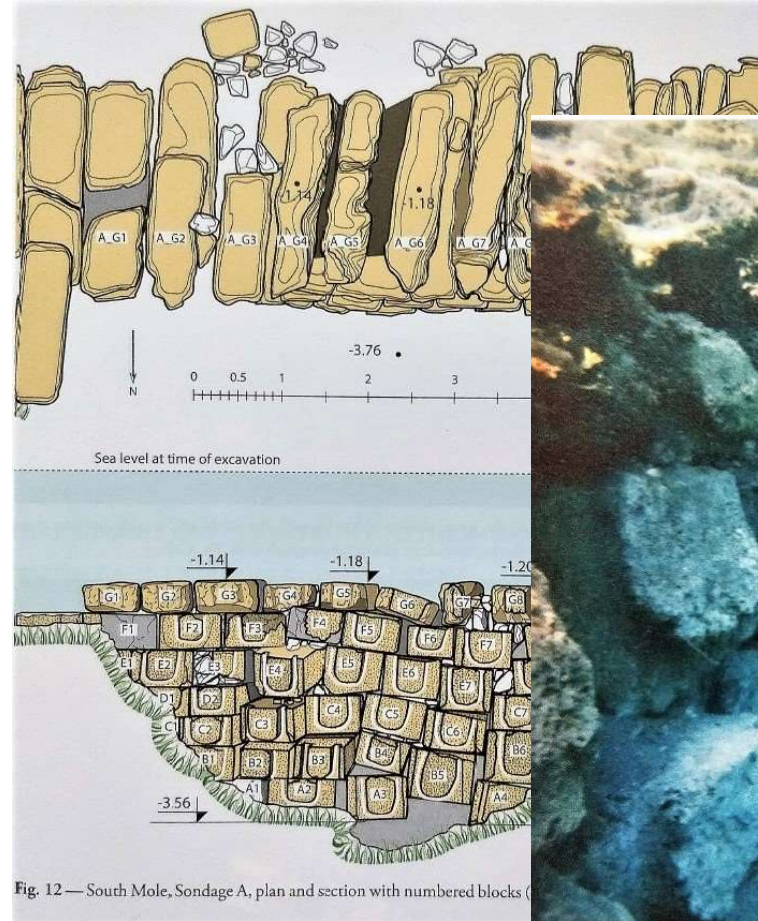
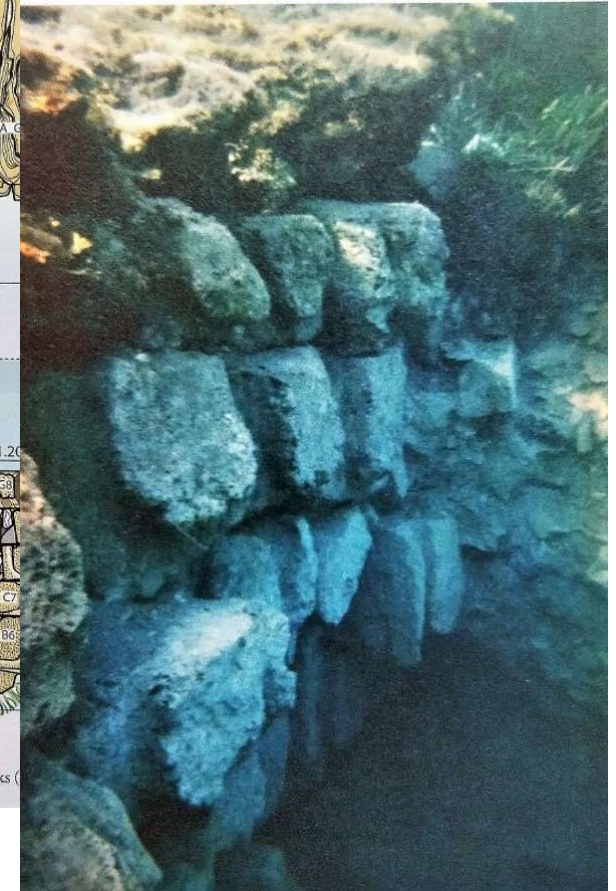


Fig. 12 — South Mole, Sondage A, plan and section with numbered blocks (Empereur, 2017)

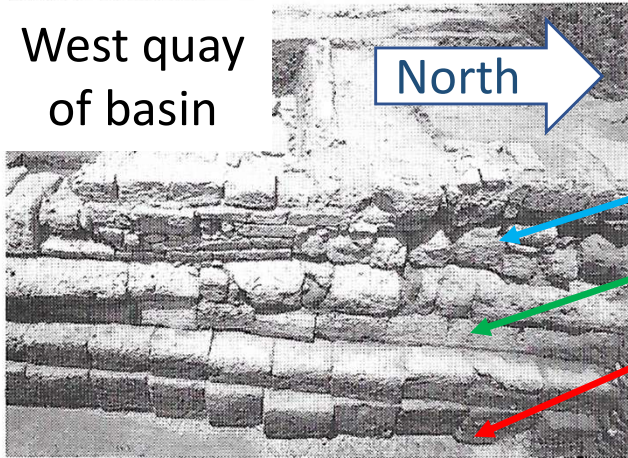
Hellenistic quay wall at **Amathus**, built with ashlar headers, 300 BC (Empereur, 2017)



Roman quay wall at **Marseille**, built with ashlar stretchers (Inrap, 2006)



Indus-era basin-wall at **Lothal**, built with fired mudbricks, ca. 2300 BC, (Wikipedia)



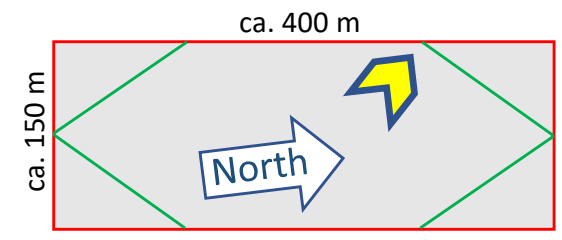
West quay of basin



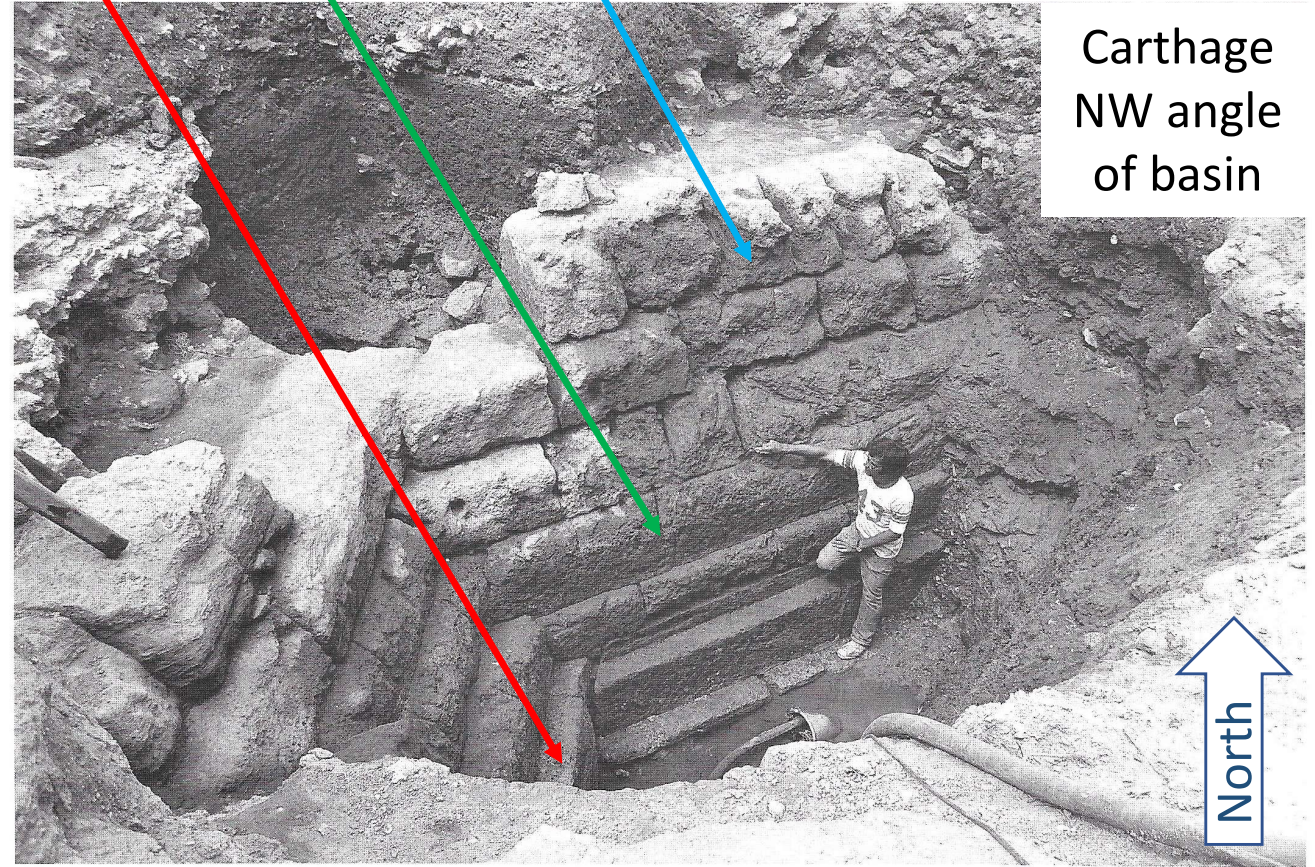
Byzantine

Roman

Punic



Le mur du quai occidental du port commercial de l'époque punique avec les reconstructions plus récentes des époques romaine et byzantine. Les deux ou trois assises les plus basses des blocs de grès massif datent de la période punique tardive (III^e-II^e siècle avant J.-C.). Les assises supérieures de pierres plus petites indiquent les reconstructions plus récentes des périodes romaine (peut-être IV^e siècle après J.-C.) et byzantine (peut-être début du VI^e siècle après J.-C.)



Carthage NW angle of basin

Le coin nord-ouest du port commercial romain (vu du sud). Cet angle oblique a été ajouté au début du II^e siècle après J.-C., afin de transformer le port rectangulaire de la période punique tardive et de lui donner une forme d'hexagone allongé. A gauche, on aperçoit le mur punique tardif, qui continuait à l'origine tout droit vers le nord, rejoignant la partie romaine ajoutée

Pilae at **Portus Iulius**
(Google Earth, 2007).



Around 50 places with pilae
but only *three* are proven arched moles

+ Tarraco (Terrado, 2019)? + Nicomedia (Texier, 1839)? + Portus??



Puteoli breakwater on **Stabia** fresco (detail), Pompei (1st c.).



Arched breakwaters at the isle of **Nisida**,
by Bartolomeo Picchiatti (1635) (looking southward).



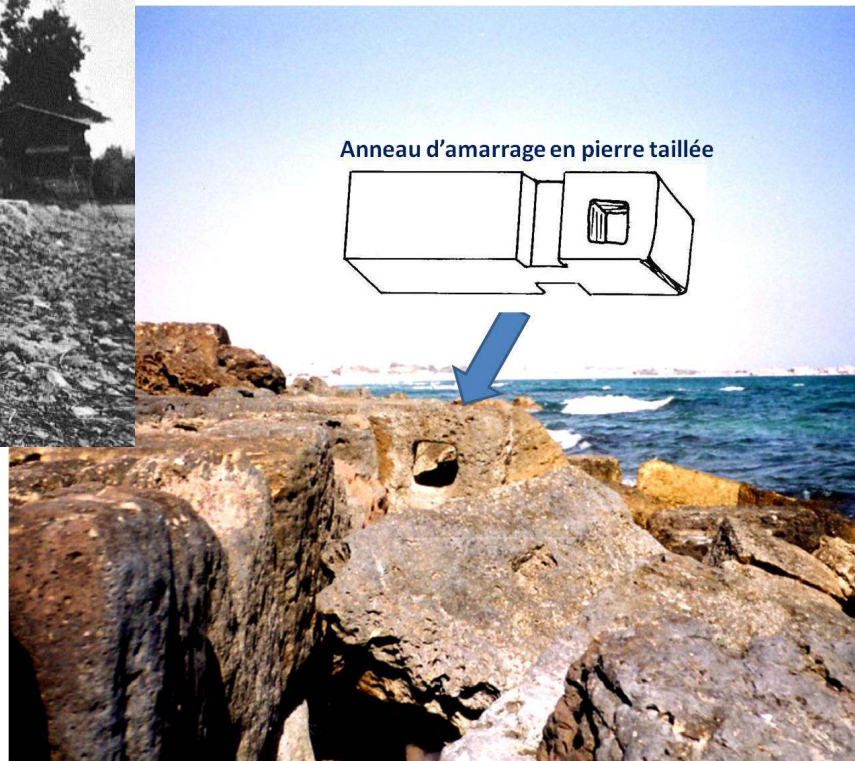
Molo del Lazzaretto at **Civitavecchia** (Photo A. de Graauw, 2022).

BRANDON, C., HOHLFELDER, R., JACKSON, M., OLESON, J., 2014, "Building for Eternity – The history and Technology of Roman Concrete Engineering in the Sea", Oxbow Books, (327 p).

MOORINGS



Mooring ring at **Portus Trajanus**,
(Testaguzza, 1970, p 170).



Leptis Magna (photos A. de Graauw, 2000).



Possible foot-hole of a derrick mast
at **Aquileia** (Photo A. de Graauw, 2010).



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Carthage (Hurst, 2010).



FLUSHING CANALS

El-Hanieh (Libya)



El-Hanieh (Libya) northern flushing channel
(Photo Misson, 5/10/2010)

(Google Earth 18/3/2009)

SLIPWAYS SHIPSHEDS

Carthage

(photo A. de Graauw, 2018).



Zea

(photo A. de Graauw, 2013).

BLACKMAN, D. & RANKOV, B. et al. (2013) "Ships of the Ancient Mediterranean", Cambridge University Press, (617 p).

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DUG-OUT BASINS

Cothon of Carthage



 ~~Kibotos of Mahdia~~



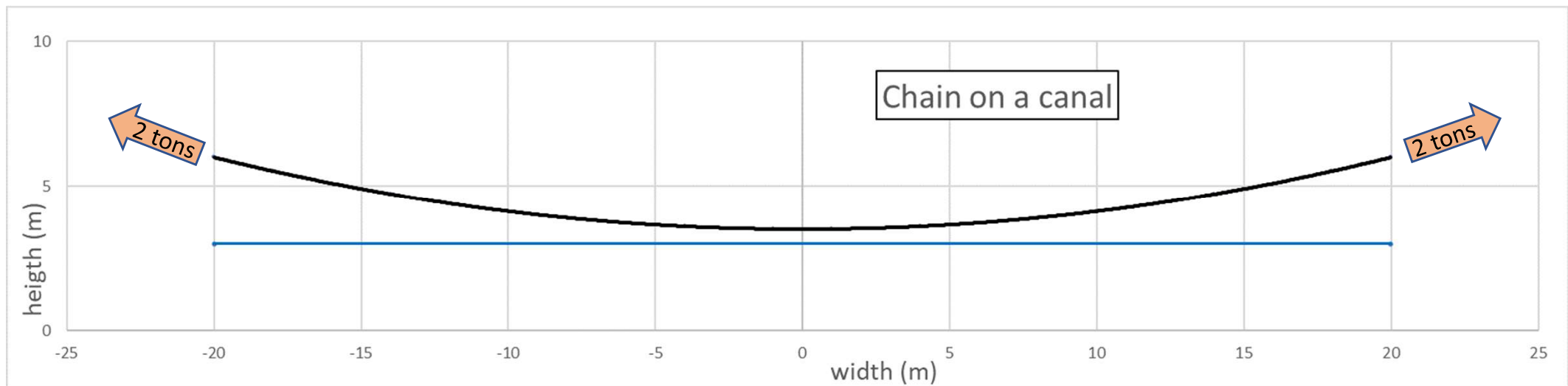
CARAYON, N., et al., 2017, "Kothon, cothon et ports creusés", MEFRA, 129/1, (p 255-266).

Around 88 Limenes Kleistoi can be listed
Ancient authors mention 9 places with chains:

- Syracuse
- Byzantion-Bosphorion
- Byzantion-Kynegoi
- Chalkedon
- Andriake
- Alexandria Portus Magnus
- Paretonium
- Carthage
- Hippo Diarrhytos

Définition:

- Intra-muros
- Narrow entrance
- Closable



Chain on a 40 m wide canal, fastened at 3 m above the water level and with a 2.5 m sag.

LEHMANN-HARTLEBEN, K., 1923, "Die Antiken Hafenanlagen des Mittelmeeres", (Klio, suppl. 14), Leipzig, (305 p).

MAURO, C., & GAMBASH, G., 2020, "The earliest "limenes kleistoi" a comparison between archaeological-geological data and the periplus of pseudo-skyllax", REA, T. 122, 2020, n°1, (p. 55-84).

LIGHTHOUSES & WAREHOUSES




Leptis Magna
(photo A. de Graauw, 2000).

Portus
(photo A. de Graauw, 2022).



TRETHEWEY, K. (2018) "Ancient Lighthouses, and other lighted aids to navigation", Jazz-Fusion Books, Cornwall, UK.
CHANKOWSKI, V., et al. (2018) "Entrepôts et circuits de distribution en Méditerranée antique", École française d'Athènes.

Harbours are natural or artificial shelters with variable nautical qualities:
nautical aspects are not the only harbour implementation criteria.

A majority of shelters (ca. 85%) have no port structures at all:
a sheltered sandy beach suffice. 

The oldest breakwaters and quays are made of:
ashlar on shallow waters ($h < 2$ à 3 m + exceptions)
rubble mounds on deeper waters

Roman quays and breakwaters use marine concrete poured into timber caissons.
None of these techniques are “obsolete”, even today.

Fish tanks and biological alignments are more accurate indicators of RSLR than port structures because of the uncertainty of the latter's "functional height".
However, the precise dating of these indicators is often a problem.

MSL is “horizontal” over a large area and its rise was ca. 0.5 m in 1500 years.
Local deviations of **RSL** from the 0.5 m/1500 years are due to local crustal movements.
RSL change was a discontinuous process and should NOT be expressed in mm/year.

Siltation is a frequent problem:
structural solutions are not efficient (arches, flushing canals),
dredging is the only way ... before leaving the place.

Each harbour archaeologist should spend some time on a sailing boat ...

Thank you for your attention

www.AncientPortsAntiques.com



DE GRAAUW, A., (2022), "Ancient Port Structures, Parallels between the ancient and the modern", <https://journals.openedition.org/mediterranee/12715>