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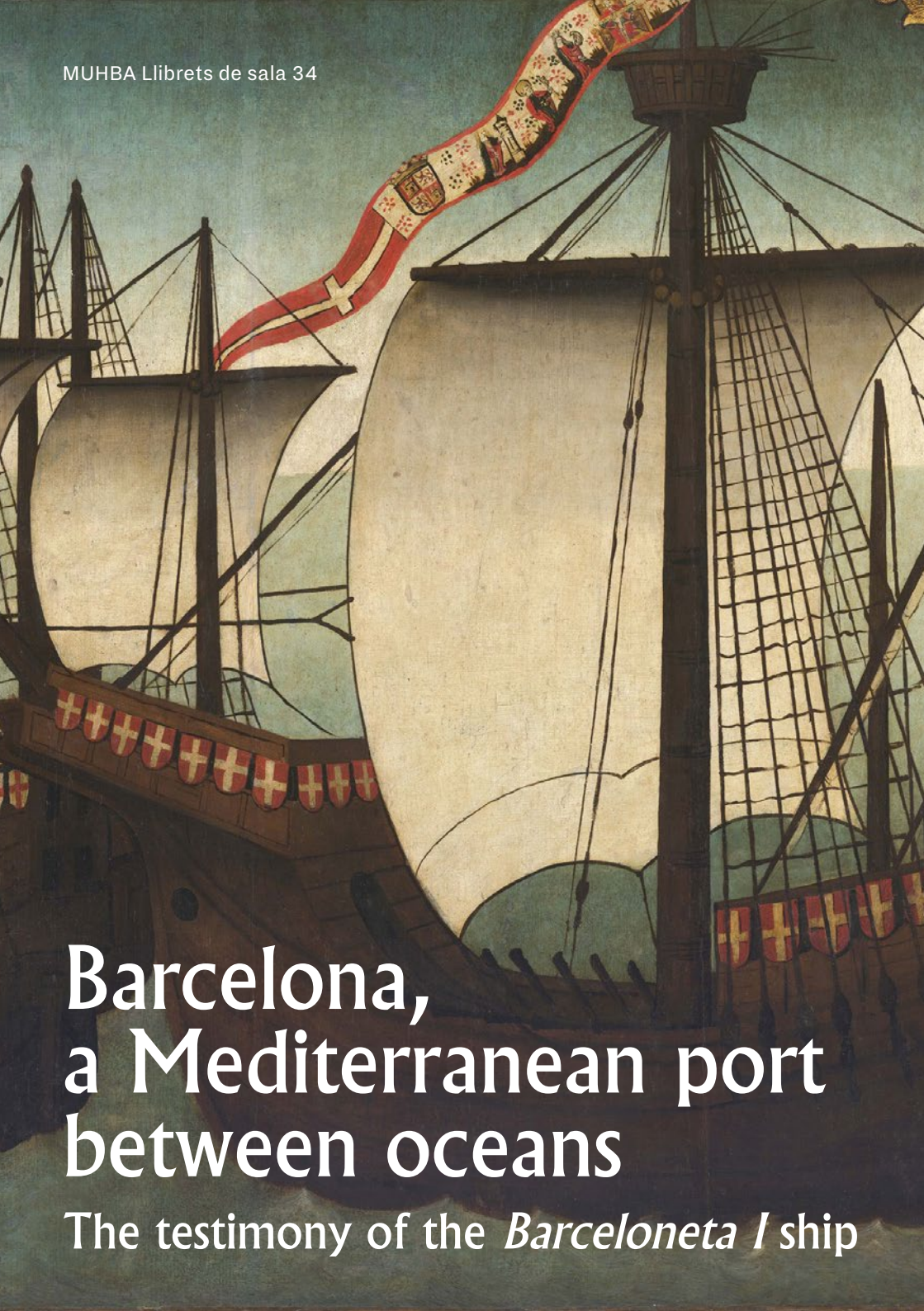

Barcelona, a Mediterranean port between oceans

The testimony of the *Barceloneta I* ship

MUHBA
MUSEU D'HISTÒRIA DE BARCELONA

Port de Barcelona

Barcelona, a Mediterranean port between oceans

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Virtual exhibition:

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Ajuntament de Barcelona

The *Barceloneta I* ship and the first wharf of Barcelona

The discovery of the *Barceloneta I* ship, a type of medieval sailing vessel the likes of which has not been found elsewhere in the Mediterranean, heightened the importance already enjoyed by Barcelona as a trading hub as early as the 13th century, when it became one of the dominant ports in sea trade and maritime law. Since then, the port of Barcelona has been the main infrastructure and most important economic driving force of Catalonia.

Throughout the first half of the 15th century, the efforts made to build the first wharf laid the foundations for the development of the port of Barcelona against a background of sea trade that had reached an all-time high. The initiative was resumed several decades later, and the late-medieval wharf became the original core of the modern port, further extended and upgraded by dint of the reform work performed towards the end of the 19th century, until the old port was replaced by the sprawling contemporary port of the Llobregat Delta.

Like all its historical forerunners, the new port of Barcelona continues to link the city to the rest of the world, although it now does so with the volume, intensity and diversity befitting our globalised 21st-century world.

The archaeological excavations performed between Marquesa and Doctor Aiguader streets and Pau Vila Square. SAB

The discovery

In August 2006, during the construction of a group of new houses on the land of the former local railway station next to what is now the França railway station, a long-term preventive stratigraphic intervention was initiated under the oversight of the Archaeology Service of Barcelona. The first results included the discovery of the remains of the port wharf (1477-1487), the South bastion (1527) with the moat and counter-wall (17th-18th centuries), as well as the underground areas of a storage deposit erected as of 1862 as part of Josep Rafo's port remodelling plan.

Since the property development work in question included three underground parking storeys, the excavation work had to be conducted below sea level with the help of a set of shafts that pumped out the salt water to keep the area dry, working at a depth of up to 7 metres.

This work eventually uncovered, in May 2008, the wreck of an abandoned vessel and its contents, which the archaeologists christened *Barceloneta I* after the place where it had been discovered.

Several days later, a second group of planks were discovered a few metres further east and were initially given the name of *Barceloneta II*. However, subsequent studies concluded that both sets of remains probably belonged to the same vessel.

Excavation and relocation

The *Barceloneta I* was found in a horizontal position at a depth of 5 metres with its outer shell exposed and the inner part hidden. The ship had therefore always been submerged in salt water. In this sub-aquatic environment, the chemical and biological alteration processes to which organic matter is subjected are slowed down. The lack of oxygen under the water keeps the wood and other organic material intact (pieces of rope, leather or even some plant remains...), as they would otherwise have been lost within a matter of years. Nevertheless, and albeit more slowly, the degradation processes had set in. Although the ship's appearance, volume and outer structure had been quite well preserved, its parts had lost a great deal of their original consistency.

Moving the ship from under the water to a dry atmosphere in such a short period of time therefore involved a major risk to its integrity. The rapid loss of humidity in the wood could lead to deformations and even cause it to disintegrate. This is why the remains of the vessel had to be wetted constantly throughout the excavation process. The problem was that one part of the *Barceloneta I* was resting on a stable bed of mud, while the rest was supported by sand that was gradually being eaten away by the constant flow of water, thus compromising the ship's stability. This meant that all the remains had to be documented as quickly and as correctly as possible, and sandbags were used to stabilise the ship provisionally.

Once all the parts had been logged, the vessel was disassembled piece by piece and the parts were placed on wooden boards for packaging and subsequent shipment to the Sub-Aquatic Archaeological Centre of Catalonia (CASC) in the city of Girona.

Stabilisation, wetting and packing work on the *Barceloneta I*. SAB

Unique remains in the Mediterranean

The number of medieval wrecks located and scientifically excavated in the Mediterranean area overall is hardly extensive in comparison to those of the classical period. Although this ratio is somewhat more balanced in Catalonia, we only know of another two wrecks dating from medieval times: the *Culip VI*, discovered in 1987 on the northern side of the head of cape Creus, and the *Sorres X*, unearthed in 1991 during the excavation work to build the Olympic Canal in Castelldefels.

The *Barceloneta I* is the last ship to have been found in Barcelona, although it is by no means the only one. The Cerdà city development plan had its maritime twin in the form of the aforementioned "*Proyecto para la mejora y ensanche del puerto de Barcelona*" [Project for the improvement and expansion of the port of Barcelona] by Josep Rafo, approved in 1860. Besides the building of new wharves, shipyards and docks, it also provided for the extensive dredging of the port bed. Work proceeded until the summer of 1874, when the dredger began to extract fragments of wood and subsequently encountered an obstacle the machine was unable to extricate.

The result was the discovery of the remains of a hull at a depth of about 8 metres. According to the report issued by the chief port engineer, Mauricio Garrán, numerous fragments of planks, a few pieces of rope, a substantial amount of artillery munition and a total of 11 cannons were found, some of which still contained pieces of their carriages. After a somewhat hasty investigation, the engineer concluded that the vessel had sunk during one of the sieges of the War of Spanish Succession (1701-1714). Two of the eleven cannons ended up in the Provincial Museum of Antiques of Barcelona, according to the catalogue of 1888; there is no trace of the others.

In view of the scarcity of similar specimens, it was only natural that the discovery be regarded as exceptional. Nevertheless, the *Barceloneta I* has certain features that make it even more unique. First of all, it is the result of a building technology based on the Atlantic tradition, which was widespread between the Cantabrian and Baltic Seas. This is what makes it a unique case among Mediterranean wrecks; only the *Cavalaire*, found in Provence, shares similar characteristics with the *Barceloneta I*. Moreover, the time-frame makes it one of the last representatives of the aforementioned building tradition, since as of the mid-15th century, the Mediterranean ship-building system gradually spread to the rest of Europe, yielding the first "European" vessels, destined to play an important role in the expansion of the Old World to America and Asia.

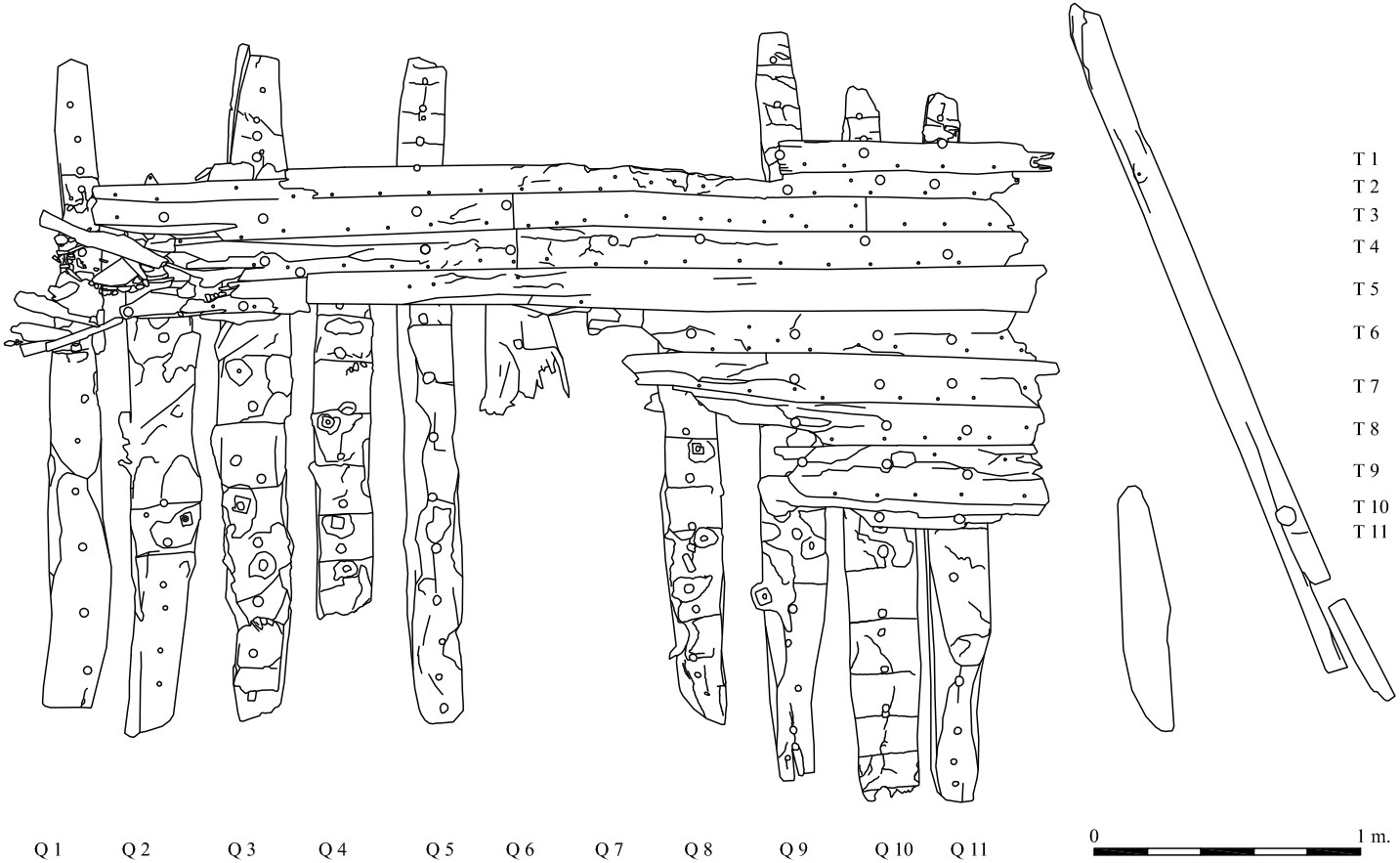
↑ Barcelona, capital of the Principality of Catalonia, located in the Mediterranean Sea, Daumont, 1767. ICGC

← Barcelona taken by the confederate fleet and army on 20 October, 1705, William Rayner, 1738. ICGC

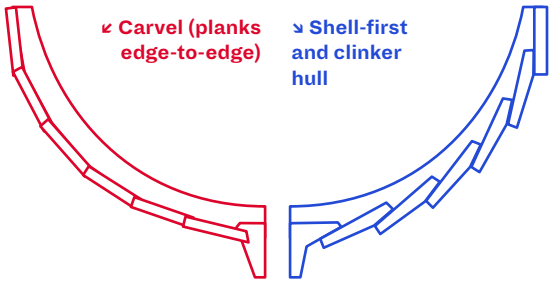
↓ Plan of the port reforms, showing the Barceloneta sector and the Industry and Trade docks with the East and West dikes. The location of the spot where the first ship was found is marked. AHCB

The preserved parts

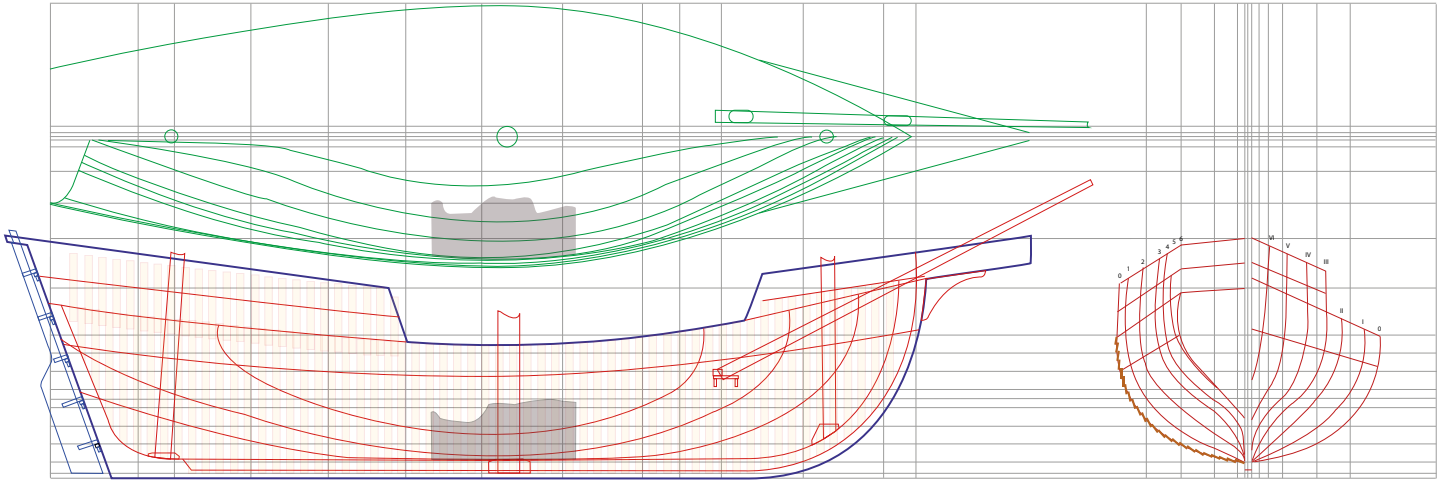
The *Barceloneta I* has been defined as the "fragment of a 15th-century ship or "barxa" built according to the shell-first and clinker principle". It is therefore only a small part of a vessel that had to be studied very thoroughly in order to discern the characteristics of the entire assembly and what type of vessel it actually was, as well as its geographic origin and the events that prompted its demise. The vessel's parts can be classified according to their orientation inside the boat. Therefore, we will call the parts that run from port to starboard the *transversal elements* and those that ran from bow to stern the *longitudinal elements*.



↑ The remains of the *Barceloneta I*, with the numbering of the different parts: frames (Q) and planks (T). Rafael Piera. SAB



As of the 7th century, ships in the Mediterranean were built according to the carvel principle **(planks edge-to-edge)**. In other words, the frames were fitted first and the planks were then nailed on, forming the shell. This resulted in a smooth hull. On the contrary, in the other system that was used between the north of Portugal and the North Sea, ships were built from the planks of the shell, which were overlapped to form the hull. The frames were fitted once the best part of the hull had been assembled, by way of reinforcement. This system, used to build the *Barceloneta I*, is known as **shell-first and clinker hull**.



↓ Approximate restoration of the shapes of the clinker vessel hailing from Biscay from the first half of the 15th century. Form plan, Lluís Rovira i Carbonell; digitisation, Marcel Pujol i Hamelink

Transversal elements: the frames

The frames are the curved parts above the keel, or the set of straight parts located in the lower part of a vessel running from bow to stern. In hulls of a certain size, each one of the frames is comprised of different parts: the lower part, which rests on the keel, is the *floor*, and the parts that rise upwards towards the gunwale are the *futtocks*. The *Barceloneta I* ship has 10 frames, one of which is now missing, lost centuries ago. As an exception, one fragment of the floor of Frame Q3 has been preserved, as has part of a second futtock on frame Q10. This, together with the frames' curvature, tells us that the surviving part belongs to the vessel's original futtocks.

In order to make sure that they fitted perfectly into the shell, the outside of the frames present the characteristic overlap of clinker construction. The ends of the futtocks were also adapted to ensure that they slotted properly into the upper ones, as well as into the floor on the bottom. The parts were secured to each other and to the shell using wooden pins or treenails.

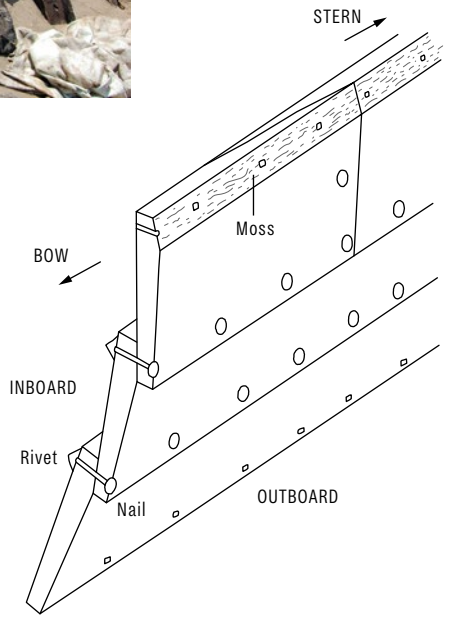
The frames of the *Barceloneta I*, with the characteristic overlap and treenails that secured them to the shell. SAB

Longitudinal elements: the planks

The different strakes of planks shape the vessel's hull. In the case of the *Barceloneta I*, as in all clinker vessels, the top plank is superimposed over the bottom one. To optimise hydrodynamics, the ends of the planks closest to the stern are also overlapped lengthwise by those closest to the bow. This detail shows that the remains of the *Barceloneta I* come from the port side. Unlike the frames, the planks were secured to each other by means of round-section nails and rivets: each iron nail was hammered into two planks and was fastened, on the inside, with a square or rectangular rivet that was also metal. The top of the nail was then bent to an angle of 90º by way of a butt.

← Planks of the shell of the *Barceloneta I*, caulked with pitch and secured with nails and rivets. SAB

↓ Diagram of the planks in a clinker-built shell according to Peter Marsden



There was one longitudinal part detached from the rest, the stringer. It appears to be an internal reinforcement to secure the join between the futtocks or between the floor and the futtocks.

Just like any other vessel, the *Barceloneta I* suffered the ravages of wear throughout its service life, sustaining damage caused by the progressive weakening of the wood, collisions in shallow areas or against wharves or other vessels. These ships were even more likely

to sustain such damage, as their owners, to recoup their major capital outlay, made every effort to ensure that they were never idle. One such minor mishap would be the diagonal cracks across the boat, originally repaired with two planks hammered over it like a patch.

The types of wood and how they were processed

The use of anthracology (the discipline that studies and identifies charcoal and wood remains) made it possible to ascertain that the wood used in the building of the *Barceloneta I* was oak for both the frames and the planks of the shell. On the other hand, the two planks that were nailed over it during the aforementioned repair were pine wood.

The analysis of the growth rings (dendrochronology) showed that the shell planks had been processed by splitting the trunk without using a saw, a technique that led to substantial timber wastage but yielded stronger planks because the wood was broken along the grain. It was also concluded that the trees came from an area with a certain degree of forestry management overseen by the shipbuilding industry, because the planks used for the shell came from oak trees about 120 years old, whereas the timber used for the frames had been selected from younger trees aged between 30 and 70 years.

Pollarded oak wood from the valley of Sakana in Navarre. The oak trees in the Basque country were pollarded to obtain timber for shipbuilding. Photo by Mendi Urruzuno © albaola.com

Desalination treatment through immersion in fresh water prior to gradual impregnation with a wax-like synthetic product (polyethylene glycol, PEG) at 60° C. CASC - ICUB

Restoration and conservation

Wood submerged in water maintains a misleading appearance of volume, shape and appearance that it gradually loses as the water evaporates. For this reason, the water that filled the wood's damaged cells had to be replaced by a dense and stable product that would consolidate and strengthen the wood. To facilitate the penetration of this product, the surface area of the parts of the *Barceloneta I* was cleaned and all the remains of iron nails which had been reduced to corroded shells on losing their metal core were removed.

Once they had been cleaned thoroughly, they were submerged in large containers of fresh water to remove the salt. This water was gradually replaced with polyethylene glycol (PEG), a material which at room temperature has the consistency of wax and when heated is more liquid and can be used to impregnate the wood. This laborious and costly treatment took four years. Once the parts had been removed from the containers, they were gradually dried and monitored until they were stable.

The conditioning at environmental humidity levels was performed by the Maritime Museum, after which the vessel was relocated to the MUHBA, where it was readied for exhibition. The remains of the ship must be stored permanently in a controlled environment to prevent the particles of rust and iron corrosion that impregnate the wood from forming acid

1:20 scale model of the *Barceloneta I* made by Lluís Rovira i Carbonell for the MUHBA

compounds that would cause the wood to disintegrate. For this reason, the glass display cabinet must also be properly conditioned. In this case, a positive pressure system blows air with the required humidity into it constantly and this air is then slowly released through slits in the glass to guarantee constant renewal. This prevents the entry of dust, whereas the circulation of air also prevents fungi from growing.

Inside the glass display, the fragment of the vessel has been arranged as it would have been in the vessel's hull, thanks to a customised stainless steel structure with new nails that replaced the original iron ones. This structure supports the 700 kg of wood, keeping each part exactly in the right place. It is also fitted with castors so that it can be moved easily. It was designed from a 3D model produced using photogrammetry. This model was indispensable in studying the degree of tilt and the original layout of the parts and, by extension, in being able to define the vessel's overall dimensions.

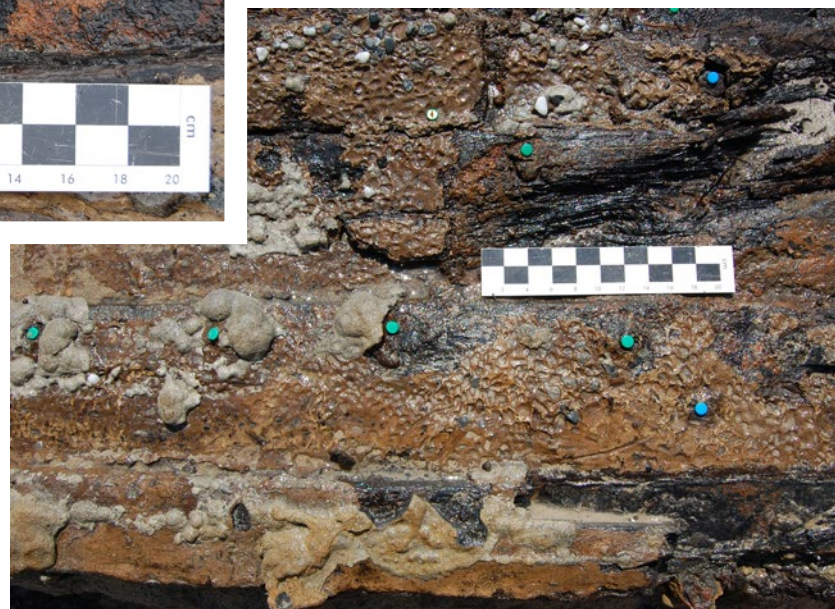
Geographic origin and dating of the materials

The aforementioned shell-first and clinker hull building technique showed that the *Barceloneta I* had not been built in the Mediterranean. Palynology, the science that identifies and studies the remains of pollen, was used to define its origin more precisely.

Before applying the pitch that waterproofed their vessels, caulkers placed moss between the joints of the shell planks to caulk and waterproof the joints. Evidently, the moss used had been exposed as it grew, meaning that it contained the airborne pollen from the area whence it originated. In this way, the analyses conducted identified pollen from plant species from the Cantabrian Sea and the Gulf of Biscay (oak, birch, fern). Moreover, the identification of the species of moss had already pointed to the same geographic location.

On the other hand, the pollen attached to the pitch that was used to coat and waterproof the hull came from several Mediterranean species (pine, olive, hemp, cistus). The overall data pointed to a Cantabrian vessel (at the time the moss was affixed), albeit used in the Mediterranean, at least in its final stage, since the vessel had been plugged in the Mediterranean on several occasions.

The date was determined from a carbon-14 analysis of the moss. Since the moss had been applied when the ship was built, it was more reliable than other parts of the wreck, which could have been repaired or replaced over time. The result dates the building of the vessel around 1410.



Detail of the pitch that coated the hull and remains of the moss used to seal the joints. SAB

↑ The boat of Urbieta (Gernika, Biscay), built in the mid-15th century following the same tradition as the *Barceloneta I*. Photo by Santiago Yaniz. AM

← Basque vessel sunk off Wales, with similar characteristics to the *Barceloneta I* and discovered at Newport. NMHS

→ Votive panel commissioned by Juan Martínez de Mendaro for the parish church of San Pedro de Zumaia (Gipuzkoa) in 1475. At the bottom of the panel there are several sailing vessels with the same constructive shape as the *Barceloneta I* vessel. GFA

From the Cantabrian to the Mediterranean

The presence of vessels from the Cantabrian area in Barcelona gradually increased throughout the 14th century. By the 15th century, these vessels were commonplace, although ships from the Atlantic area of France and the north of Europe continued to be something of a rarity. The shell-first and clinker vessels that visited the city hailed from Galicia and the Basque Country, particularly the latter. Their documentation identified them as “clinkers” or “Castilian”, these words being synonymous.

Although the building technique used does not allow us to distinguish the Galician vessels from their Basque counterparts, their dimensions do give us some pointers. According to medieval documentation, the vessels hailing from the Basque area were substantially larger than those from Galicia, which engaged mainly in the seasonal transportation of salted fish. Therefore, whereas the Galician vessels tended to have a maximum capacity of 90 “botes” (37.44 tonnes), the Basque vessels had an average cargo capacity of 165 “botes” (68.64 tons).

The comparison of the remains of the *Barceloneta I* with other more intact wrecks from the same period and of the same type, such as the *Aber Wrac’h 1* (wrecked in Brittany) or the *Newport Ship* (a Basque vessel that foundered off the cost of Wales), allows us to estimate their original

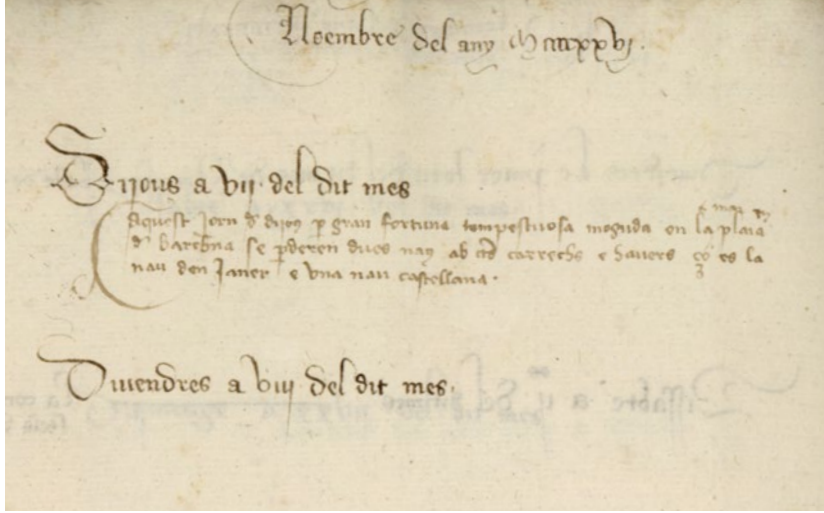
size based on the measurements of all of them. Thus, aspects such as the width of the frames, of the rooms (the separation between frames) and the spacing of the nails and treenails attest to the great similarity that undoubtedly existed between the *Barceloneta I* and the *Newport Ship*, which would also have been virtually identical in terms of the size of shell planks, nails and rivets. In summary, the remains of the *Barceloneta I* are perfectly consistent with a medium-sized or large merchant vessel with a considerable cargo capacity. In actual fact, everything would seem to point to it being a Basque "barxa" with a length of 25 metres, a beam (maximum width) of some 9 metres and a cargo capacity of between 150 and 300 "botes" (62 to 124 tons).

Steered by a single rudder, located astern, it was propelled by a single square-shaped sail on the mainmast. The vessel probably had another two masts, a foremast (closer to the bow), and a mizzen mast (further astern) with a lateen sail. This type of vessel was common among 15th-century Cantabrian shipowners, much more so than other types of boat such as balingers or caravels, which went on to enjoy greater popularity some years later. It is unlikely that the structural differences between "barxas" and ships were very substantial, albeit sufficient for someone knowledgeable to tell them.

The crew

Crew size varied greatly depending on vessel size, although other factors also played a part, such as manoeuvrability, the danger involved in the route or the length of the sea voyage. According to the freight rates (contracts pursuant to which sailing vessels were leased for a given voyage or period of time) drafted in Barcelona, the crews of the Basque "barxas" could range from 16 to 60 hands, although a crew of about 35 sailors tended to be the norm.

Viaje de santa Úrsula y las once mil vírgenes, Joan Reixach, 1468 (close up of retable). MNAC



Diary of the Consell de Cent (or Council of One Hundred). News item from 7 November, 1426, recounting how two vessels ran aground on the city beach, one of them "Castilian". AHCB

The final voyage of the *Barceloneta I*

By the time the *Barceloneta I* reached the port of Barcelona, it was already an old and relatively worn vessel, to which the aforementioned repairs attest. It should be remembered that it was probably built around 1410, and that this type of vessel had a service life of between 10 and 15 years. The last preserved part probably dates from before 1439, since as of that year, the building work on the first artificial wharf affected seaboard dynamics and also led the type of sediment that comprised the seabed to change, prompting the influx of sand that covered the ship, as we shall see presently in greater detail. The archaeological material recovered also suggests the same date.

Period documents shed some light on how the ship was formed, i.e. the process of how it was transformed from a functional vessel into an archaeological object. In 1420 and 1426, respectively, two relevant news items chronicling the heavy squalls that had hit the city's beach were entered in the diary of the Consell de Cent. Both items reported that the vessels involved were "Castilian" boats or clinkers that had "run aground".

We know not whether the *Barceloneta I* was one of these two vessels, although the events coincide with those of a beached vessel in the throes of being scrapped after the waves had dragged it to the site where it was eventually found. This is further borne out by the tell-tale signs denoting that the *Barceloneta I* had been taken apart and looted, such as the missing Q7 frame, which did not lead the vessel to be broken, as well as the notches on the ends of some of the frames and the fact that many of the treenails remained intact.

The historical context

Despite its somewhat modest size, the *Barceloneta I* ship directly attests to the trading links of the prosperous medieval Barcelona and the intense movement of vessels that berthed in its port. Beginning in the 11th century, the progressive growth of European cities meant that products that were in short supply had to be imported. At the same time, new markets also had to be found for the surplus of goods and commodities being produced.

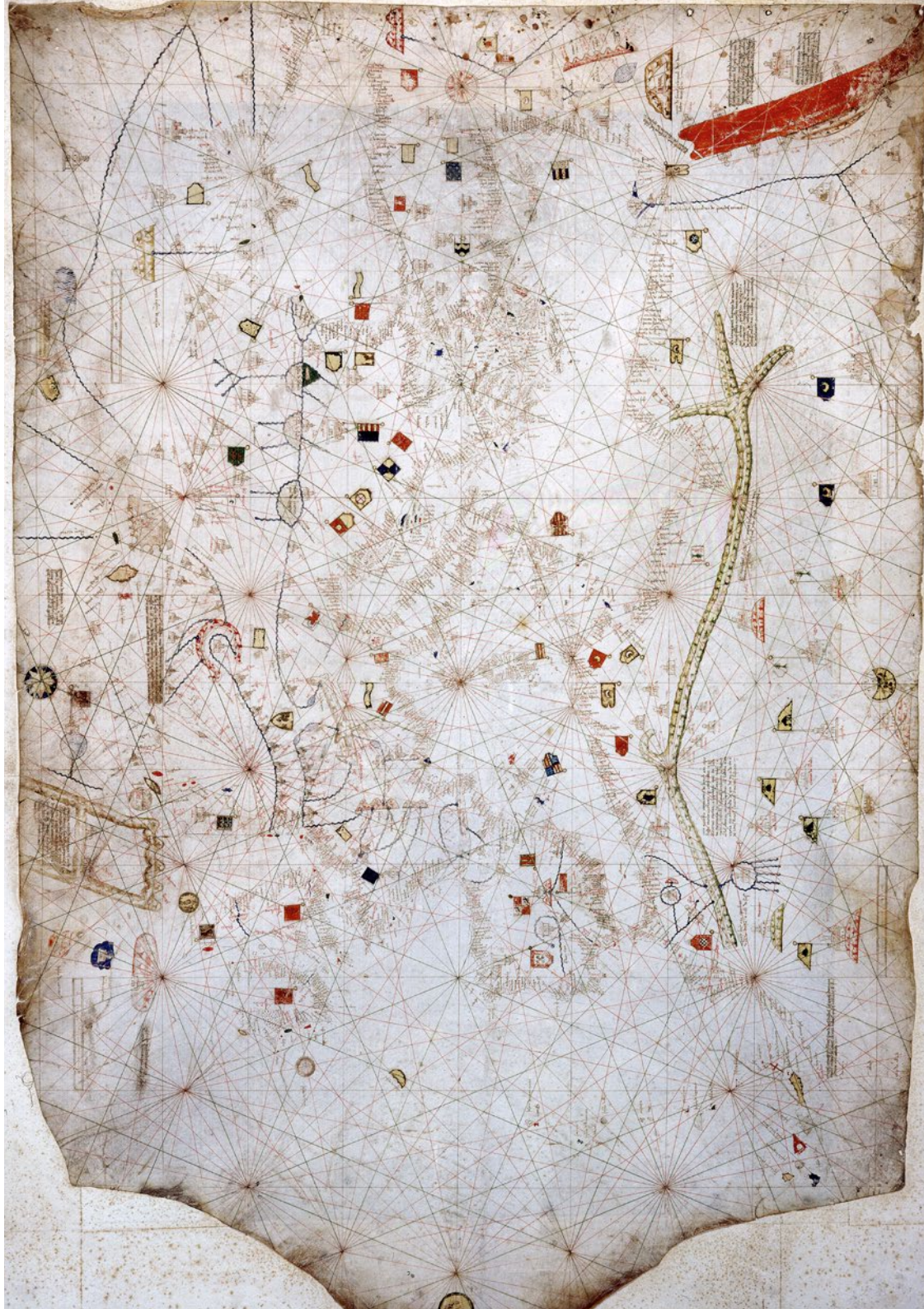
It is evident that the well-connected cities enjoyed a more advantageous commercial position, and the sea was a peerless magnet for the most important trading routes, since overland haulage using beasts of burden was ostensibly slower and more difficult, whereas navigating rivers was no easy task. For these reasons, the Mediterranean Christians became ensconced in a protracted struggle against the Muslim powers to control the Mediterranean waters to be able to forge stable trading routes with North Africa and the Eastern Mediterranean. Nevertheless, this trade was heavily focused on luxury goods, which weighed little but were of great value, such as spices and exotic products brought from the coasts of the Indian Ocean via the Red Sea.

The conquest of Seville (1248) and Cadiz (1262) by Castille led to the definitive incorporation of the routes towards the Atlantic cities. At the same time, cities' increasing demand for goods generated other forms of exchange, more related to bulk commodities of scant relative value. Other goods also began to be transported by sea, such as grain, salt, wine, wool, dried fruits and nuts, iron, alum...

The Basque vessels in the Mediterranean

The Cantabrian, Galician and more particularly Basque seafarers had begun to set their sights on the Mediterranean at the beginning of the 14th century. Nevertheless, their role in the Mediterranean trade dynamics and networks took on greater importance towards the end of the 14th century and throughout the 15th, not only in Barcelona, but also in other ports of the Crown of Aragon and other states. In fact, they also became the main auxiliary fleet of the great seafaring Republic of Genoa.

The Cantabrian seafarers were lured to Barcelona by the extensive and ever-growing market for freight rates or maritime transport contracts. The medium-sized Basque vessels were competitive because their dimensions made them suitable for carrying smaller batches of goods



→ Catalan medieval naval chart by the workshop of Abraham and Jafudà Cresques from the late 14th century. With the permission of the Ministero della Cultura © BNN

Ports of origin of the Cantabrian vessels that carried goods to Barcelona between 1439 and 1447 according to anchorage rights. Cartographic base: ICGC; data: Mikel Soberón

that could be loaded and transported quickly. For the same reason, they could also accept commissions to smaller nearby ports such as Sitges, Cadaqués or Blanes. Being Castilian, they also availed themselves of their neutrality in the long-running conflict between the Crown of Catalonia and Aragon and Genoa, allowing them to operate with relative immunity in areas and ports under Genovese influence, as was the case of the Tyrrhenian Sea and the area of Provence.

When tension peaked, as in the lead-up to the conquest of Naples in 1442, virtually all the trading vessels that anchored in Barcelona en route from Genoa, Pisa and Provence were under Basque patronage. Needless to say, piracy was rife in those waters. Basque shipowners such as Pedro de Larraondo, Pero Paya or Sancho de Butrón – whom we learnt of thanks to Maria Teresa Ferrer i Mallol – engaged in piracy, although many Castilian vessels also fell foul of these predators.

Besides the route to Flanders, which for obvious reasons was well known to seafarers from Biscay, in the first half of the 15th century Cantabrian vessels specialised in supplying food to Barcelona. They carried salted or dried fish, particularly in the months leading up to Lent. The lengthy fasting period generated a type of consumption that particularly attracted boats from Galicia, as well as Basque and Andalusian vessels, laden with sardines and hake. They also carried grain, either directly to ports such as Cagliari, Aigües Mortes and the cargo ports of Sicily, or ventured out on more complicated routes, combining several ports of call and a broader range of cargoes.

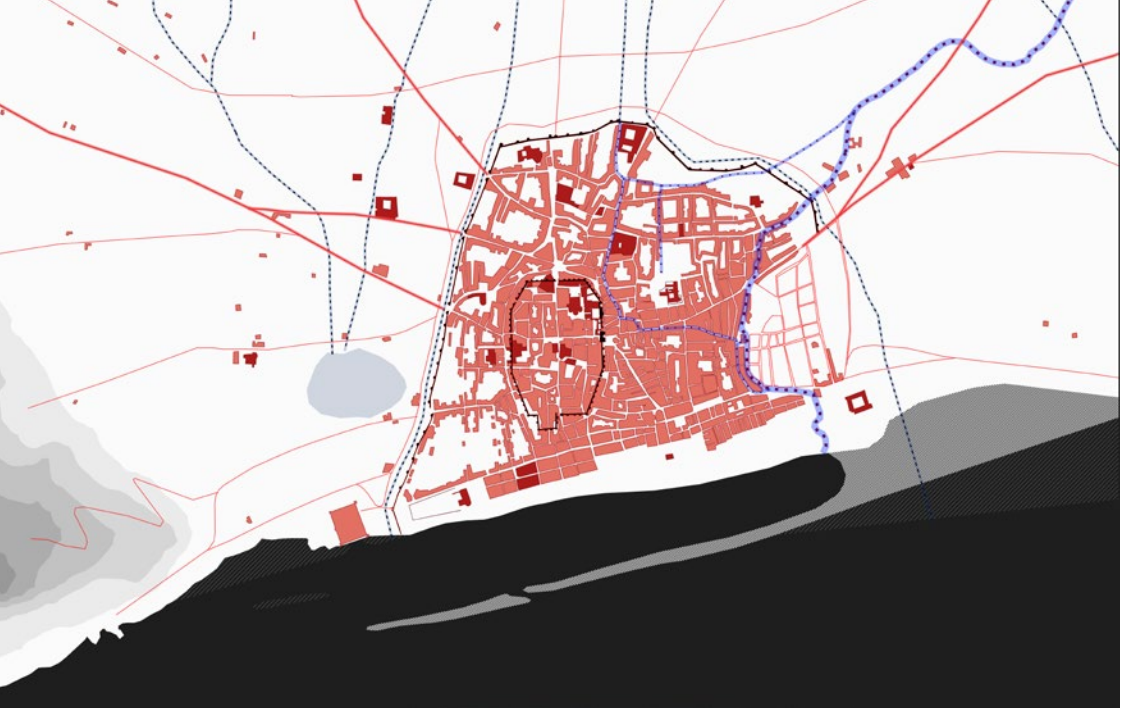
From *Les Tasques* to the Barcelona wharf

For the best part of the medieval period, the port of Barcelona had no artificial port structure, barring the occasional wooden pontoon bridges used as makeshift jetties. This shortcoming, and the fact that too much attention had been paid to certain shipwrecks, have created the idea that Barcelona had no port.

However, the city did have a natural defence: a long sandbar running parallel to the city about 200 metres from the shoreline, called *Les Tasques*. The protection offered by these sandbars created a calm and navigable seaboard lagoon, opening out seawards particularly through the main channel in front of the convent of Sant Francesc (now Duc de Medinaceli square). The carbon 14 analyses, archaeological materials and archival sources suggest that they originated towards the end of the 9th century and gradually disappeared following the attempt at building the first artificial wharf, undertaken in 1439.

In parallel, beginning in the 13th century, the port zone had gradually been configured along the city's coastline, stretching between Fusteria and Vidrieria streets (the latter now called Rera Palau street). The area was a hive of activity: loading and unloading activities, commercial dealings, ship repair and building, the launching of vessels and the distribution of products arriving from the sea, such as grain, wine, fresh fish and firewood, which were sold in that same sector.

View of the mud that comprised the seabed between *Les Tasques* and the shore (end of 9th Century - *c.* 1439). SAB



Close up of the coastline on the map from the year 1300 of the Historic Map of Barcelona (MUHBA), with the representation of *Les Tasques*

Calls for the need for an artificial wharf had gained impetus in the 1430s, leading Alfonso the Magnanimous to grant the city the licence it needed to build an artificial wharf wherever it deemed necessary, paid for through a new levy, the so-called anchorage right. The creation of the Taula de Canvi [Table of Change] in 1401 had helped to stabilise Barcelona's financial situation, and the Consell de Cent made the most of the circumstances to gradually transform the seafront into a space that symbolised municipal might. A large stone wharf was to be the icing on the cake, while also catering to the demands of a seagoing traffic that had reached historic heights.

The builders initially intended to convert the existing sand into stone, or in other words consolidate a large part of *Les Tasques* artificially. The system employed was based on two elements. The first one consisted of large wooden boxes carried by barges which, when they reached the convenient place, were filled with mortar and stones and sunk off the sandbar. The second system was complementary in nature and was intended to protect these blocks, with stone tipped alongside them to form a breakwater. The site was located next to the convent of Santa Clara, at the eastern end of the city. Unfortunately, in that very summer of 1439, an east wind squall destroyed all the progress that had been made until then. This was followed by years of indecision and the ensuing

inaction, and building work was not resumed until 1446, with a five-year time-frame envisioned. Three pontoons were assembled to transport stone to Montjuïc, where it was used to form a mole. After the funding for the scheduled five-year term had run out, the work continued in 1451 for a further year, in the course of which a single pontoon was used. The timber and the nails from the last pontoon were ultimately used to build the bridge of Sant Boi in 1454.

During that initial building stage it became clear that the wharf would ultimately be more expensive than had been envisaged. Moreover, since the flow of sediment carried by the coastal sea drift was being blocked, the breakwater gnawed away at the city's western beach, further compounded by the erosion of *Les Tasques*: that great sandbank that had protected the beach of Barcelona for centuries was beginning to fade.

The initiative was placed forcibly on hold on account of the conflict between the monarchy and the Catalan Institutions in the Civil War of 1462-1472 and was not resumed until the summer of 1477. Although the plans for a mole consisting of stone blocks were maintained, the site chosen was relocated from the Western side to the centre of the seafront, following the outline that the archaeological remains have duly documented. Project size and funding were also impacted, and ultimately only two pontoons were used.

Part of the wharf that was begun in 1477 and unearthed during the archaeological excavations. SAB

The work was overseen by the Sicilian master Stacio Alessandrino, who was purported to have participated in the building of the wharves of Palermo, Genoa and Candia. Despite such distinguished credentials, his work appears to have gone unappreciated, since he was replaced around 1482. His unofficial successor was one of the notaries public of the city's Mestre Racional [Treasury Oversight], Joan Maians, who completed the project in 1489, prolonging the wharf to what was left of *Les Tasques*. The sea had had gradually worn them down, transforming them into a cluster of scattered islets. The island where the wharf ended was named after this notary public of Barcelona.

One century later, the Consell de Cent decided to extend that initial late-medieval infrastructure, then about 240 metres long and 15 metres wide. Thus, a further two sections were added, each one measuring about 186 metres, between 1590 and 1623.

Disapte à XX de Setembre de lany M CCCCLXXVII fó
principiat lo Port de la Ciutat de Barcelona, restuant è
present lo molt alt è molt excellent Senyor Don Joan,
per la gracia de Deu, Rey d'Aragó.
Stants Concellers Mossen Luis Setantí; Belthesar de
Gualbes; Bernat Ponsgem; Joan Fogassot, notari;
é Francesch Cocó, hortolá.

↑ Transcription from the commemorative stone plaque (lost) of the ceremony of the beginning of work on the medieval wharf, 20 September 1477. Andrés Avelino Pi y Arimón, *Barcelona antigua y moderna*, 1854, vol. II, p. 32

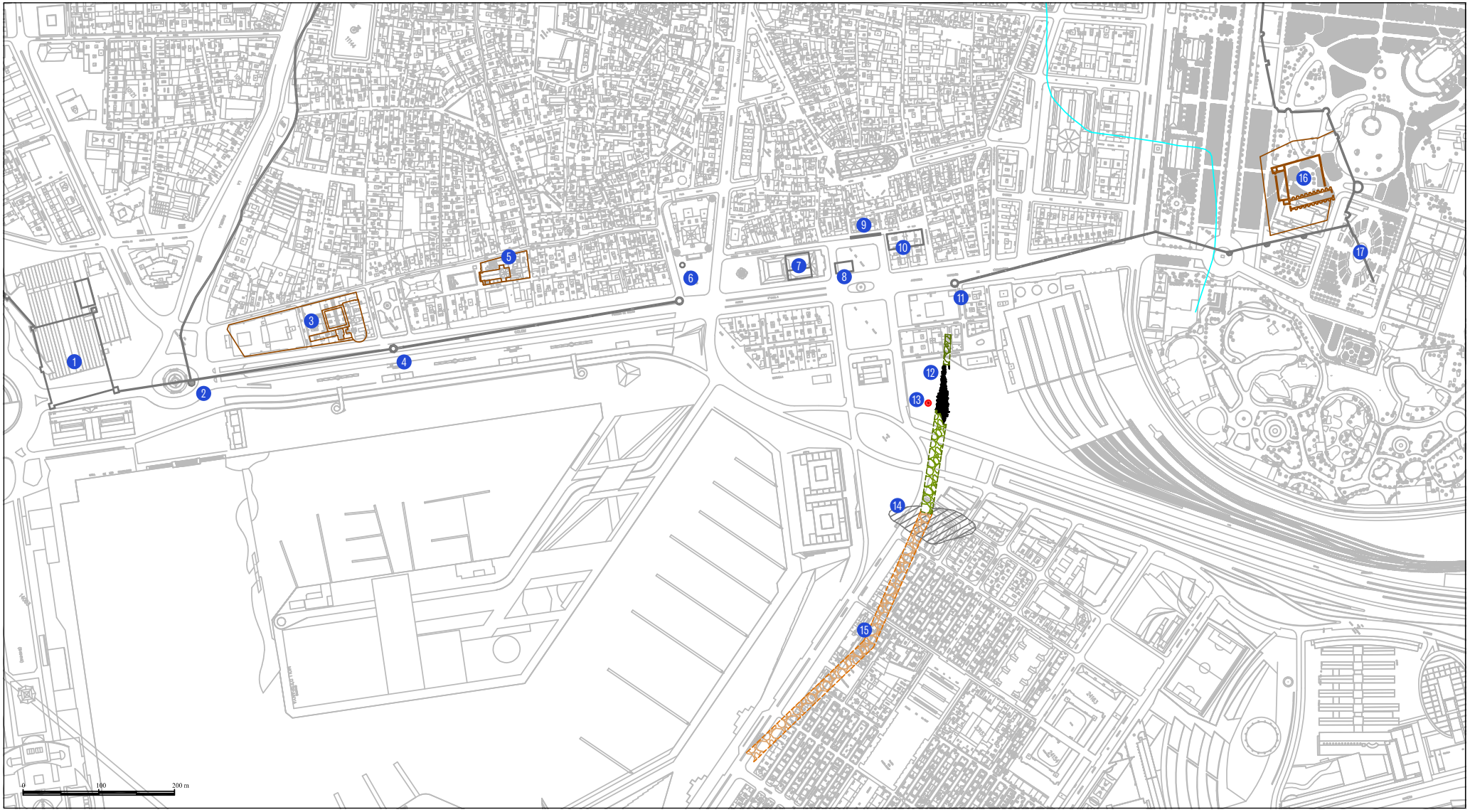
← Detail of the seafront of Barcelona in 1535. Version etched subsequently by Franz Hogenberg for the *Civitates Orbis Terrarum* of Georg Braun, 1572.

→ Picture of the wharf of Barcelona just before the expansion (only with the late-medieval mole), by the painter Rafaela Puig circa 1590. BC

Plan of Barcelona's seafront, with the medieval seawall, the 1477-1487 wharf (the part found by the diggers is bolded and the rest is green) and the initial extensions from the modern era (ochre), according to Mikel Soberón and Ramon J. Pujades i Bataller.

1 Royal Shipyards
2 Torre de les Puces [Flea Tower]
3 Convent of Sant Francesc
4 Tower of Sant Nicolau
5 Convent of la Mercè
6 Fountain of l'Àngel and Vi's square
7 La Llotja (Exchange)
8 Casa del General
9 Fishmonger's
10 Porxo del Forment (Corn exchange)
11 Torre Nova [New Tower]
12 Wharf of Santa Creu
13 *Barceloneta I* ship
14 Remains of *Les Tasques*, Maians' island
15 Extension of the wharf as of 1590
16 Convent of Sant Antoni i Sant Damià
17 Eastern sea wall

Following pages: A view of the Barcelona wharf during the final stage of the expansion work, *c*. 1616. Attributable to the painter Rafaela Puig. BNE




120
120
395
Barcelona
lo baluarte de ponente
las tarasanas

Barcelona with the castle of Montjuïc, the Ciutadella (Citadel) and the Barceloneta district, *c*. 1788. AHCB

The 18th century

Following the defeat in 1714 and the subsequent suppression of the Consell de Cent, the municipality of Barcelona's powers in port-related affairs began to wane. The army engineers, initially more preoccupied with maintaining military control of the site (with the building of the Citadel and Montjuïc Castle), devised numerous projects for the port in the course of that century, although few of them actually came to fruition. The project for the re-fortification of the city produced by Joris Prosper Van Verboom also envisaged extending the head of the wharf into an inverted L-shape, although the bulk of the work conducted on the port in the course of the mid-18th century was merely dedicated to alleviating the major depth problems caused by the accumulation of sediment.

The situation took a turn for the better in the second half of the century, when work began on building the port neighbourhood of Barceloneta (1753), and on extending the wharf and the dike. This work was culminated in 1772 with the construction of the stone tower of the new lighthouse, now one of the symbols of the port's historical heritage.

Furthermore, the decrees enacted between 1765 and 1778 deregulating trade with America facilitated sea traffic, although the calls to modernise the port, which still had to contend with serious problems of depth caused by the inflow of sand and mud, persisted.

In the last few decades of the 18th century, the enlightened Antoni de Capmany de Montpalau (Barcelona, 1741 - Cadiz, 1813) published several key contributions. His most important and best-known work, *Memorias históricas sobre la marina, comercio y artes de la antigua ciudad de Barcelona*, was published in Madrid in 1779 – and was expanded in subsequent years through to 1790. The major topics that he analysed and recounted in this lengthy and highly influential work are: sea warfare and naval power, the merchant navy and trade, as well as the "useful arts" or production sectors of the city. The *Memorias históricas* are a seminal contribution to Barcelona's economic history and a major source of knowledge about maritime and port activities in medieval and modern times.

The coat of arms of Barcelona, with the city, the port and the Royal Shipyards represented in the background. On both sides, the god of trade, Mercury, and the god of war, Mars, an allegory of the city's economic might. Drawing by José Camarón. Etched by Pasqual Pere Moles in 1779 for the cover of Antoni de Capmany's *Memorias históricas*.

The port before the great reform of the industrial era

The problems caused by the accumulation of sediments persisted into the early decades of the 19th century until, for the first time ever, a steam-powered dredger quickly managed to improve the situation and facilitate the reactivation of port traffic.

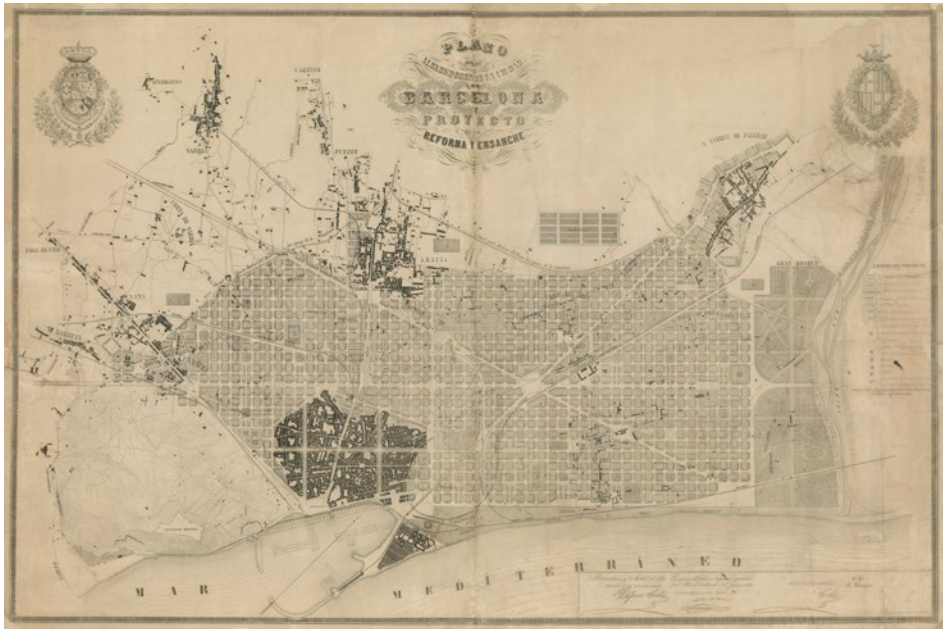
The images that best represent the port and seafront of Barcelona in the mid-19th century were produced by the Breton architect, draughtsman and lithographer Alfred Guesdon (1808-1876). The view here depicts the port in the foreground. The port's infrastructure, facilities and activity are clearly visible. Despite the city's ever-growing activity, the port was still a minor infrastructure work. The drawing dates from 1854 and was published in 1856 by François Delarue in the *L'Espagne à vol d'oiseau* collection.

1 The New wharf, built between 1816 and 1822
2 Lighthouse indicating the way into the port
3 Talleres Nuevo Vulcano warehouses and factory
4 The inner breakwater with the lighthouse from 1772
5 The Old wharf, subsequently named the Barceloneta wharf
6 Crane for hoisting heavy weights and fitting ship masts
7 Goods on the wharf
8 Small warehouses on the beach inside the port
9 Small passenger jetty, built in 1849
10 Steam-operated dredger
11 Steamer towing three barges
12 Two medium-sized vessels
13 Steamer unloading onto a barge
14 Sailing ship being towed by two rowing boats
15 Vessels moored by the bow in the new Wharf
16 Vessels anchored off the Old wharf
17 Adze master's workshop
18 Boats fishing
19 Portal de Mar
20 Barceloneta
21 Horta de Sant Bertran
22 Royal Shipyards
23 Sea Wall
24 Duc de Medinaceli square
25 Santa Maria del Mar
26 La Rambla
27 Textile factories in the Raval district
28 Church of Santa Maria del Pi
29 Cathedral
30 Royal Palace
31 Passeig de Gràcia and Camps Elisis
32 La Ciutadella
33 Barceloneta bullring

A view of Barcelona from the port, Alfred Guesdon, 1854. AHCB

The building of the first industrial port

In his Plan for the Expansion of Barcelona (1860), Ildefons Cerdà included the first project for the industrial port produced by the engineer Josep Rafo i Tolosa. Josep Rafo applied state-of-the-art knowledge and technical studies to this project, which was approved in 1860. The demolition of the Sea wall heralded the beginning of the port's growth and transformation into the infrastructure the industrial city was calling for.



Plan for the Expansion of Barcelona, with Josep Rafo's reform project included, 1860.AHCB

The Board of Works of Barcelona, founded on 5 February, 1869, was the first modern organisation tasked with the administration and management of the facility. The Board began to operate the very next day in order to extend and improve the infrastructure, loading and unloading technical installations and the storage buildings.

In 1873, the project designed by the first director of the Board, the engineer Mauricio Garrán, was approved, modifying the inner layout of the wharves and the docks proposed by Josep Rafo. The work performed on providing the outside of the Wall wharf with greater protection between 1869 and 1875 went a long way towards beginning to overcome the port's historic problems of lack of protection and infill.

↑ The new industrial port during the Universal Expo of 1888, with different squadrons sent by the participating countries. AHCB

← The Wall wharf with the scaffolding of the monument to Columbus (1888). Photo by Pau Audouard. MMB

↓ The Barceloneta wharf in full swing (1888). Photo by Pau Audouard. MMB

The port in the early decades of the 20th century and the struggle to achieve the free port

At the end of the 19th century, increased goods traffic and greater vessel cargo capacity brought the shortcomings of the work carried out according to the projects by Rafo and Garran to light yet again. Wider and deeper wharves were called for, as were more powerful installations for the loading and unloading of goods, and larger warehouses and sheds. At the same time, the loss of the American colonial markets in the wake of the rout of 1898 heightened demands for a “free port or neutral zone”, i.e. a facility outside the state customs area for the handling, industrial transformation and exportation of goods in transit, mirroring the measures being implemented by other major cities. A proposal submitted in 1901 envisaged the building of an extensive port and free zone covering a broad strip of the coast between Montjuïc and Castelldefels. The State government refused to entertain the petition for a free port and neutral area for many years, and when it eventually did its scope fell substantially short.

The reform of the port began with the expansion planned by the Board director, Carlos de Angulo, in 1900. Building work on the wharves began that year and continued through to 1914, whereas the more complex work on the East dike – damaged on several occasions by heavy squalls – was not fully completed until 1925. However, the outbreak of the First World War eventually obliged the State to cave to the petitions of the Barcelona City Council, which were seconded by a broad-ranging movement of institutions and agencies and by a further 499 Catalan towns and cities, as is certified by the Economic Assembly that met in the Saló de Cent (Room of Hundred) in 1915. Thus, the authorisation to create a free warehouse was granted in 1916 and was acknowledged as a free port warehouse in 1917 after the Cadiz model. The provisional installations were located on the Bosch i Alsina wharf and in different premises inside and outside the port area. It was governed by a consortium chaired by the mayor and was comprised of representatives from the economic world.

Finally, the plan designed by Josep Cabestany eventually permitted the inclusion of 900 hectares of land belonging to the municipality of l’Hospitalet and a stretch of land of el Prat de Llobregat within the municipal district of Barcelona in 1920. Seven years later, an international call for tenders was issued for the design of the new port on this land, which was also leveraged to kick-start a campaign to promote Barcelona abroad. Bids were submitted by engineers from all over the world, although there was no outright winner. The project submitted by the Dane Bjørn Petersen received the first honourable mention and was used to build a spectacular model exhibited to great success in the

First electrically-operated cranes in the Barceloneta warehouses (1905). APB

The jetty in the Portal de la Pau (1913). APB

Strolling along the wharf on a holiday (1930). APB

Inside of a warehouse on the Barceloneta wharf (1906). APB

A block being launched into the water from a special pontoon on wheels (1915). APB

Aerial view of the port (1935). APB

Project of the port by the engineer Blas Sorribas for the Barcelona Free Zone, 1930. AHCB

course of the International Expo of 1929. However, the free zone law enacted that same year imposed an alternative dual space model with a free warehouse on the one side and a free zone on the other, authorising the installation of industries that did not exist in the Spanish State or which required assistance to be able to export.

Unfortunately, between 1936 and 1939, the Spanish Civil War led all these operations to be placed on hold: the port was heavily targeted by air strikes, particularly by the Italian Legionary Air Force operating out of Majorca, which wreaked serious damage and destruction upon buildings, technical facilities and infrastructures. Franco's post-war autarky initially led trade volume to taper off. The goods haulage figures notched up in 1929 were not recovered until 1960.

The new port of *developmentalism*

The opening of the huge SEAT automotive complex in 1953 signified the reactivation of a large manufacturing area on the land occupied by the Free Zone. This ushered in a progressive change in the economic policy of Franco's dictatorship, prompting brisk growth and the diversification of port traffic throughout the 1960s. Coal made way for cement, petroleum by-products and natural gas as main commodities, and container movement also began to expand. A new extension and adaptation of the port was therefore called for, and the 1965 expansion project laid the foundations. The port acquired 222 hectares from the Consorci de la Zona Franca to implement the extension, using the land lying more inland for the industrial estate, which included some special customs areas.

Shortly after the 1965 project, work began on the extension of the dike, counter-dike and the inner docks to the west of Montjuïc, followed by the work on the South wharf. With great foresight, and mostly with the support of private initiative, the container terminal, the inflammable products wharf, automotive terminal, overland haulage hub and other specialised installations were all constructed.

SEAT-make cars being shipped to Yugoslavia (1969). Photo by Pérez de Rozas. AFB

The 21st-century port

The port that was designed in 1965 and built in the following years quickly proved to be insufficient to cope with the new conditions posed by traffic and more particularly by vessel growth. The new master plan, initially produced in 1989, and revised and definitively approved in 1998, envisaged a new and ambitious expansion. The work proposed was executed between 2001 and 2011. The resulting extensions led the port to double its operating surface area. This allowed traffic to grow substantially. The volume of goods handled rocketed from 24.7 to 67.7 million tons between 1998 and 2018. The creation of the new docks inside the South dike will also make it possible to create even more wharves and facilitate the expansion of traffic and activities in the coming years.

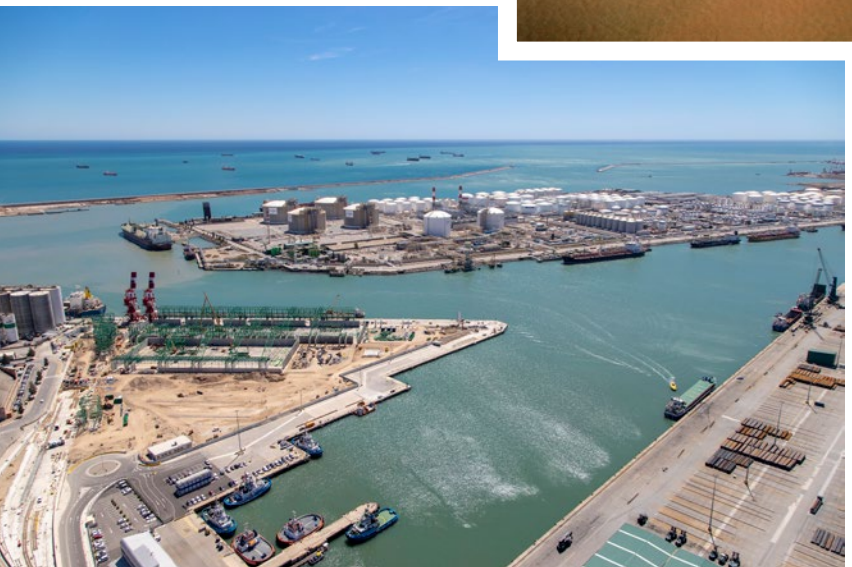
← Auto-terminal, the Logistical Activities Zone and the BEST container terminal in the background (2019). Photo by Ramon Vilalta. APB

↓ The Logistical Activities Zone and the BEST terminal on the new land in el Llobregat (2019). Photo by Ramon Vilalta. APB

→ Work on the South dike and the Prat wharf after the river Llobregat estuary was diverted two kilometres south. Photo by Nacho Vaquero. APB

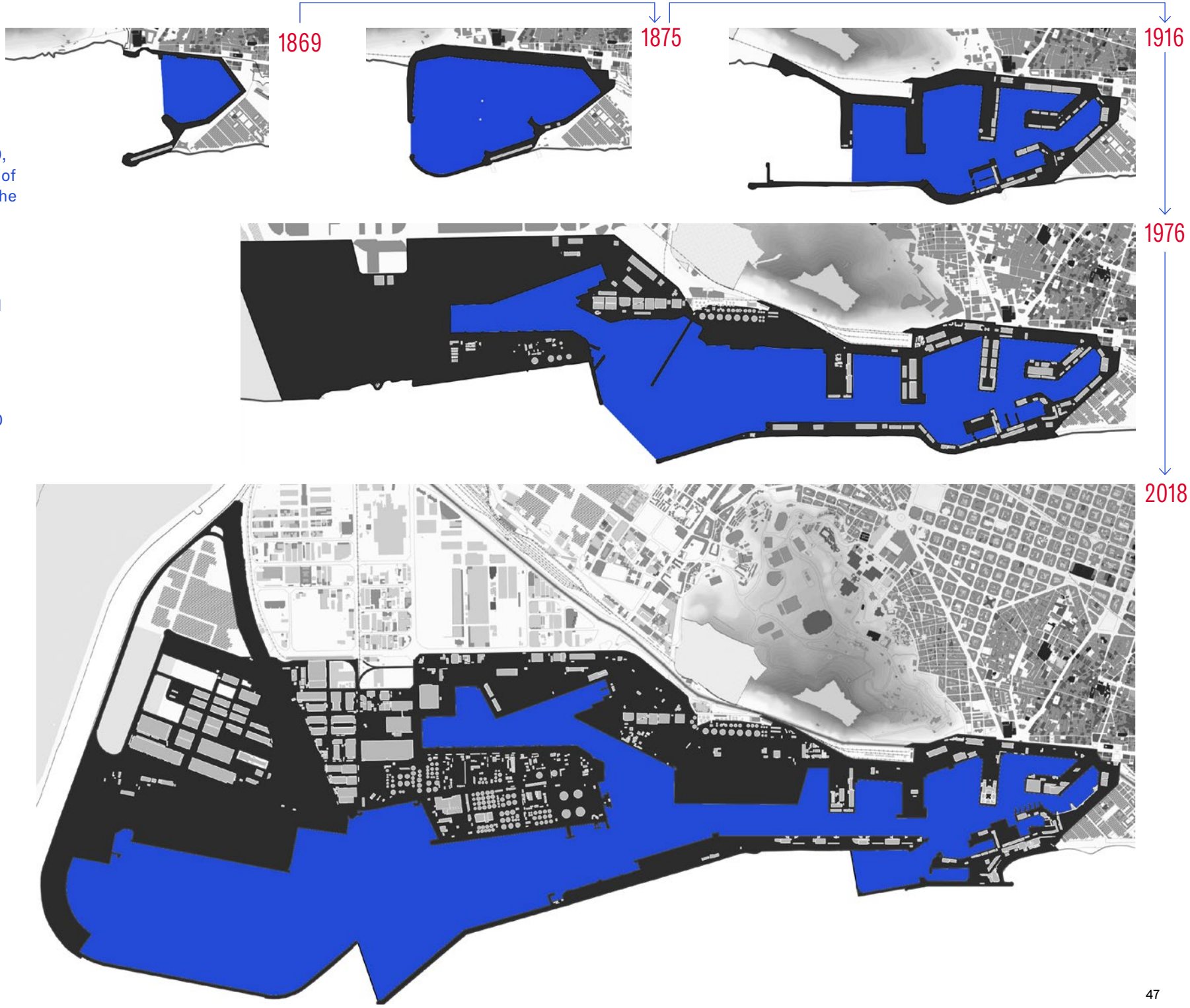
↓ The new ICL terminal, in the building stage, in the foreground, with the Energy wharf in the background (2019). Photo by Ramon Vilalta. APB

↓ Aerial view of the port (2019). Photo by Ramon Vilalta. APB



Ever since the Board of Works was created in 1869, the port has grown by dint of **four major projects** and the corresponding projects:

1 **1859 Project**, executed between 1869 and 1875
2 **1900 Project**, executed between 1901 and 1925
3 **1965 Project**, executed between 1966 and 1975
4 **1998 Master Plan**, executed between 2000 and 2011



The port of Barcelona is an indispensable infrastructure to the operation of the city's economy and of an extensive hinterland. It receives imports, and allows goods coming from a large territorial area, even from beyond Catalonia, to be exported all over the world. It also attracts the major shipping companies and logistical operators. The port is five ports in one: urban, commercial, logistical, energy and ocean liners.

Satellite picture of the port and the city, 2018. ICGC

The **logistical port** is the area used for the provision of logistics services related to the port's activities. It is an intermodal hub that provides different services through the leasing of industrial premises.

The **energy port** is the area for petroleum by-products, gas and chemical products. It plays a key role in the receipt, storage and distribution of the energy resources of an extensive territory.

The **commercial port** is used for loading and unloading goods. It boasts specialised multi-purpose terminals and facilities for cabotage with the Balearic Islands and other nearby ports.

The **passenger port** is the area for ferries and ocean liners. It has maritime terminals that specialise according to the type of traffic.

The **port Vell** (Old port) is the urban port open to the city's inhabitants and is world-renowned as a paradigm of integration between port and city. Its 70-hectare surface area concentrates port and fishing, nautical services, sports, culture and training, business, commerce and leisure activities.

The spot between the Sea Gate and the former South bastion, now next to the França railway station, is where the remains of the **first artificial wharf** of Barcelona, built as of 1477, were discovered in 2008, and which provided the foundations for the reform work conducted on the port until today. The *Barceloneta I* ship was found next to the medieval breakwater.

GLOSSARY

***Bota*:** the unit of measure used in the Middle Ages to calculate a vessel's capacity. In Barcelona, this was equivalent to 10 *quintars*, or 416 kg.

Bow: the front of a vessel.

Clinker-built: the layout of shell planking so that each one overlaps the one below it. The planks were joined with nails normally secured on the inside with rivets.

Draft: part of the hull of a vessel that is permanently below the water line.

Frame: transverse rib which in medieval Mediterranean ship-building gave the ship its shape and was its main structural element. In Atlantic medieval shipbuilding, its function was to reinforce the main structure, the shell. It normally comprised several parts: the lower part, the *floor*, and those that gradually rise upwards to the gunwale, called the *futtocks*.

Freeboard: part of the hull of a vessel that is above the water line.

Gunwale: the upper edge or planking of the sides of a ship.

Keel: set of straight parts located on the bottom of a ship or boat running from bow to stern. The frames are deployed on top of it.

Pitch: a viscous substance obtained by distilling the tar of certain coniferous trees. It was used by shipwrights to waterproof sailing vessels.

Plank: a piece of timber arranged in different ways depending on the period and geography that formed the hull of a vessel.

Port: facing the bow, the left side of a vessel.

Room: the empty space between the frames.

Shell: set of planks arranged in strakes that cover a ship's hull. To guarantee waterproofing, shipwrights caulked its surface with pitch and sealed the joints with oakum steeped in pitch. In Atlantic Europe, animal hide, wool or moss were also used for this same purpose.

Starboard: facing the bow, the right side of a vessel.

Stern: the rear of a vessel.

Stringer: a longitudinal course of planking which runs inside the boat, normally located at the height of the joins between the different parts of the frame. In vessels with a deck, it also supported the weight of the deck girders or beams which supported the floor of the deck transversally.

Treenail: cylindrical wooden bolt.

THE *BARCELONETA I* SHIP

Excavation team: CODEX, Arqueologia i Patrimoni: Rubén Sánchez, Tanveer Ahmed, Patricia Aznar, Andrew Rance, Javier Morales, Isabel Pereira, Daniel Vázquez, Sergio Arroyo, Rafael Piera and Mikel Soberón Rodríguez; Centre d'Arqueologia Subaquàtica de Catalunya (CASC): Gustau Vivar, Rut Geli and Marcel Pujol; Àbac Conservació-Restauració: Maria Molinas, Lluïsa Matas and Irene Garcia; Servei d'Arqueologia de Barcelona: Montserrat Pugès and Ferran Puig

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Anthracology analysis: Raquel Piqué (UAB)

Dendrochronology analysis: Marta Domínguez (Universiteit van Amsterdam)

Photogrammetry and 3D model: Bruno Parès

Photography and archaeological planimetry: Rafael Piera and Mikel Soberón (CODEX, Arqueologia i Patrimoni)

EXHIBITION

Antechamber of the Palau Reial
Plaça del Rei, s/n
Standing exhibition since May 2021

Organisation and production: Ajuntament de Barcelona, Institut de Cultura, MUHBA (Museu d'Història de Barcelona); Port de Barcelona

Project direction: Joan Roca i Albert and Mònica Blasco i Arasanz

Coordination: Aina Mercader and Quaderna

Curators: Mikel Soberón Rodríguez and Ramon J. Pujades i Bataller

Audiovisuals: Tururut Art Infogràfic

1:20 scale model of the *Barceloneta I*: built by: Lluís Rovira i Carbonell; assessment: Marcel Pujol Hamelink and Mikel Soberón Rodríguez

Design of the exhibition: Udeu – Adelina Casanova

Production and assembly: Croquis and Grop

Graphic design: Andrea Manenti

Preventive preservation and reassembly of the *Barceloneta I*: MUHBA: Lídia Font, Anna Làzaro and Carla Puerto; with the assistance of Julieta Cash and Àbac Conservació-Restauració SL: Maria Molinas, Mar Valiente, Irene Garcia Alonso and Núria Deu

Physicochemical analyses: Arte-Lab SL

Display cabinet conditioning: Arte & Memoria, Manteniment d'Obra Civil ICUB and COPISA

Design of the stand: Equiro Equipament SL

Management of the excavation materials: Núria Miró and Emili Revilla

Transport and handling: Aliance Brother SL and Tti

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Barcelona, a Mediterranean port between oceans. The testimony of the* Barceloneta I *ship

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Cover picture: Votive panel commissioned by Juan Martínez de Mendaro for the parish church of San Pedro de Zumaia in 1475. Picture with CC license: Gipuzkoako Foru Aldundia / Diputación Foral de Gipuzkoa

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Port de Barcelona

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