



The ship construction during Paul's time.

For a long time, skeleton construction was the standard. First, a solid framework, a skeleton, is constructed from the keel and frames, into which a smooth surface of planks is nailed. The so-called shell construction is mainly used in Africa and Asia. First, the outer paneling of the ship's hull is made by firmly connecting one plank to the other. After that, a system of strivings are drawn in for stability. In this construction, planks are placed on top of each other with an exact fit and connected to each other with nails. This method was also used on the ships of Paul's time and also on the ship of Pantano Longarini. Soft woods such as pine or cedar were the material for the planks and for the keel, while the underwater part was made of more durable wood such as oak or spruce. The cracks between the planks were stuffed with fibers made from flax or hemp. The stability of the ship was achieved with sand or stones. Often the ships were also painted, the paint was heated with wax. Large eye representations were used to portray them as living beings. The ships that were loaded with grain were usually larger and recognizable by a particularly terrible shape. They were also lighter and faster. The average length was 40 meters and about 10 meters wide. Ships for wine transport had a length of 19 to 33 meters and a width of 7 to 10 meters. Most of them also had a dinghy. As a rule, the dinghy was manned to be immediately available to help if a man fell overboard. The main mast consisted of a single piece. A cup-shaped wooden vessel was attached under the top of the mast, where the rollers and sheaves were located as well as the ropes needed to set the sails. Certainly one of the most interesting in Sicily from the point of view of underwater archeology in its depths and also under the mud of the Pantano Longarini there are certainly several other wrecks of ancient ships. But this wreck is only a part of the immense archaeological, historical and geographical treasure. Porto Ulisse, with its ancient city Odysseus, took its name from the mythical hero who in the eighth century landed there, and after him Aeneas, Saint Paul and Saint Ilarione.



The landscape like it looks today. The sea was at that time 500 m inland the country.
 (Photo above by LaSicilia, below by Antonio Randazzo)



**LA NAVE DI YASSI ADA (SIMILE A QUELLA DI PANTANO
LONGARINI -RICOSTRUZIONE)**

The Shipwreck in Pantano Longarini.

The leader of the excavations *Peter and Joan Throckmorton reports:*

The Pantano Longarini area was probably once the anchorage known to Greeks as Odissa, to Romans as Edissa, and to the Arabs and present day Sicilians as Marza. The wreck was discovered in the course of drainage operations which were part of a land reclamation project.

The workmen who first uncovered parts of the ship's structure took some of the cypress planking to a local shipyard and tried to sell it. At least the attention came to local archeological authorities and the further excavations was handed over to the University of Pennsylvania Museum.

Although the shipwreck was found in 1963/64, it was not until 40 years later that a scientific assessment was made. Several observations could be made immediately. The ship had an unusual kind of crossbeam stern. The planking and wales which had been worked into the stern were attached in an unfamiliar way. The ship was very heavily framed with grown timbers, roughly added to fit in place, so that there was little space between the timbers, which were massive half trees about half meter thick. This kind of construction were long before known from mosaics and sculptures, but which had never been studied in an actual shipwreck before. Now they were able to document only the surviving 9.1 meters of the stern out of an estimated initial find of 30 meters, which included the entire starboard side, width in the center 10 meter, keel 23 meter, tonnage 300. This also compares with Paul's ship. The wreck layed in a shallow pool which could be kept dry with electric salvage pumps. The exposed timbers were massive, some

weighing more than half a ton measuring 50 centimeters thick. Every kilo timber was saturated with 1.5 kilo water. The timber was still in good condition that workers were even able to stand on the wreck itself. It was sprayed with polyethylene glykol which sucked the water out of the timber. The timbers remained in an irrigation tank until 2001. Usually timber that has been soaked with water begins to shrink after just a few days in warmer or drier air and develops cracks. The ship was originally dated between fourth to seventh century after Christ. This type used under Byzantine time is still in the Roman tradition. The transition from shell to skeleton construction occurred sometime after the end of the Roman empire. The most interesting thing about the Pantano Longarini wreck is that it illustrates a previously unknown type of transitional ship construction. First they believed it was built somewhere in the Aegean or Eastern Mediterranean because of some figures in Greek. Later they changed their opinion it could also have been built in Sicily, since there was a shipbuilder near Catania, perhaps Naxos? Another reason was that the Greek colonies in Sicily were rich on forests, like cypress and oak. The Greek language in Sicily was spoken already for a long time. Camarina a town on the south coast was the first place of Greek colonization around 600 before Christ, and was the first Greek town in Sicily, still before the more known Syracuse.

The trade is no longer in the hands of authorities from the near east, but of large land-owners who can dispose of their own fleets. The navigation of the Mediterranean was limited to the spring and summer months, from early April to September. Seamen rarely and only out of necessity ventured into winter voyages. The duration of the journeys was irregular and the development was often fortunate. *Saint Ilarione* leaves from Paretonius, an important port of Egypt west of Alexandria in the year 363 on a ship which, with a direct route to the dangerous deep sea, reached Porto Ulisse, which at that time was the main route. Porto Ulisse was certainly not the only one in south-eastern Sicily on this side of Capo Pachino. Indeed, for the needs of the ancient ships whose immersion was not considerable and which were easily and always pulled ashore, Sicily was not poor in anchorages. Each beach a little sheltered and also several river mouths, such as the nearby river Irminio, could be considered ports - channels of ideal conditions. And Porto Ulisse can be considered, as well as a natural port, also a river port, due to the presence of waterways that in the past flowed into the sea and today, even with a very limited flow, flow into the marsh. At the mouth of the Irminio was the anchorage of the Byzantine village of Caucana near the port of Camarina, at the mouth of the river Ippari. The whole south-eastern coast, however, was very risky for ancient navigation and hides a large number of wrecks from various eras, mostly still to be discovered. As in all ages, the dimensions were very different in relation to the tasks to be performed. There were ships of a few meters for local or small coastal trade, and there were larger ships of 30 to 40 meters or more, intended for more demanding trades and qualified for long crossings. In the Byzantine age, most of the goods in the south-east of Sicily from minor ports on small ships were generally taken to Syracuse from where they left on large ships for various destinations. But the ship found in Pantano Longarini, with its 300 tons of tonnage, was certainly one of the largest of its time, the trend to build ships of greater capacity continues, thanks also to advances in construction techniques. We must not believe that in these centuries the ability to build ships, in the numerous large and small shipyards of the Mediterranean, including those in Sicily, was inferior to that of Roman times. In the Mediterranean still in the seventh century the ships carried about ten anchors, including large, medium and small, probably because they were secured to the bottom with ropes instead of iron chains. The ship of Paul probably had 4 anchors. Numerous iron or stone anchors have been found in our seabed. The anchors were mostly made of iron and were kept on deck. The first step in excavation was to tag every timber as it appeared. A plastic layer prevented a change of color. As timbers were photographed, measured, drawn, and their levels taken, they were removed in sequence. Once the cypress planking was exposed,



Photos by Johann Reinhard.

we saw that we would count on it very well and where the frames to the great longitudinal wales left round marks about 2 millimeter in diameter. Other timbers, lighter and less essential to the structural strength of the ship, had been nailed down by nails about 1 millimeter square, often driven in pairs. As each timber was removed from the wreck for storage in fresh water, we drew sections of it. Our policy during the excavation had been to record and measure everything, and especial care had been taken to locate with all accuracy such things as nail and bolt holes. The reconstruction was more difficult than we had expected. The ditchdiggers found a porcelain pot which shattered into small pieces. There were several sherds of late Roman pottery under frames. Many experts

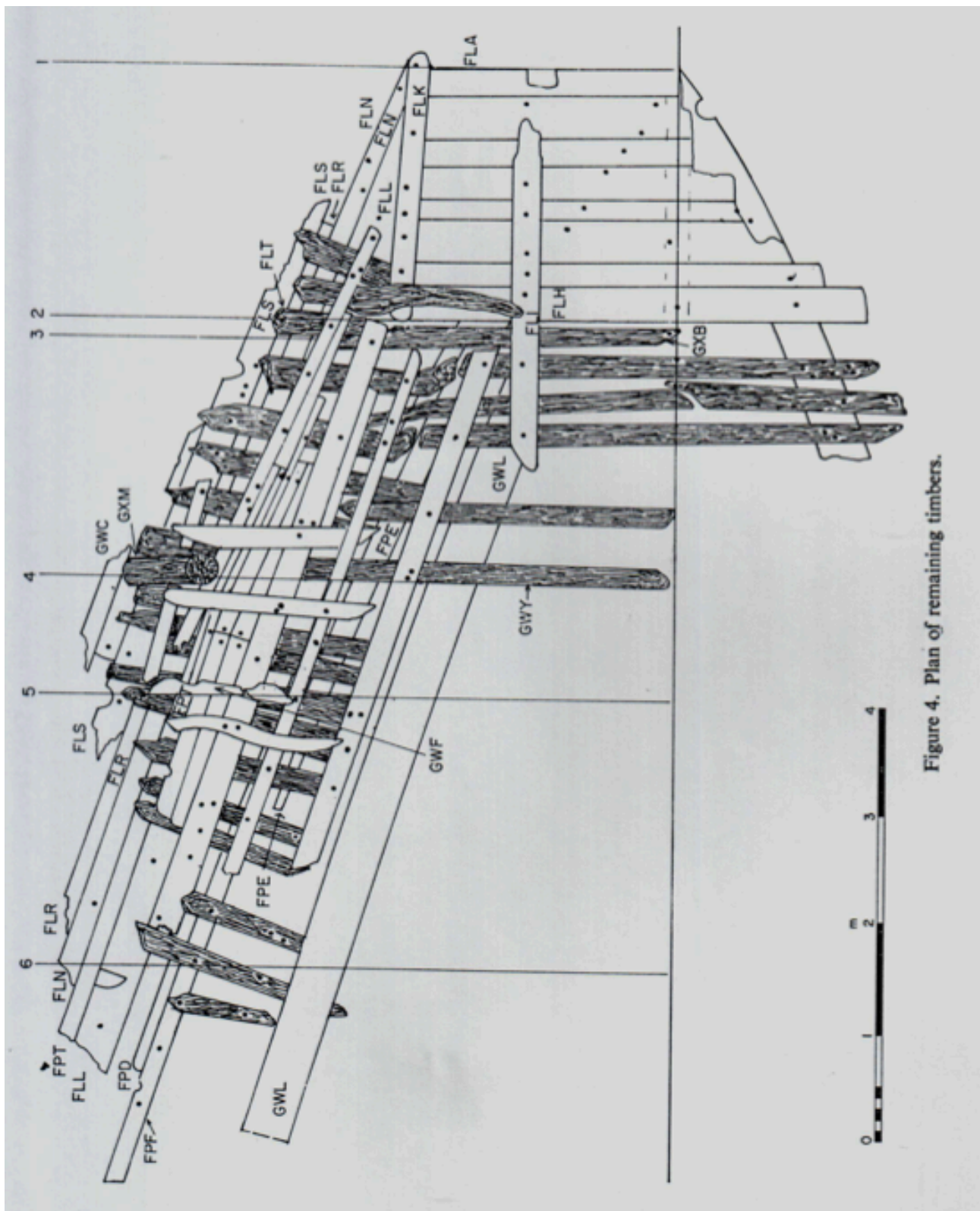


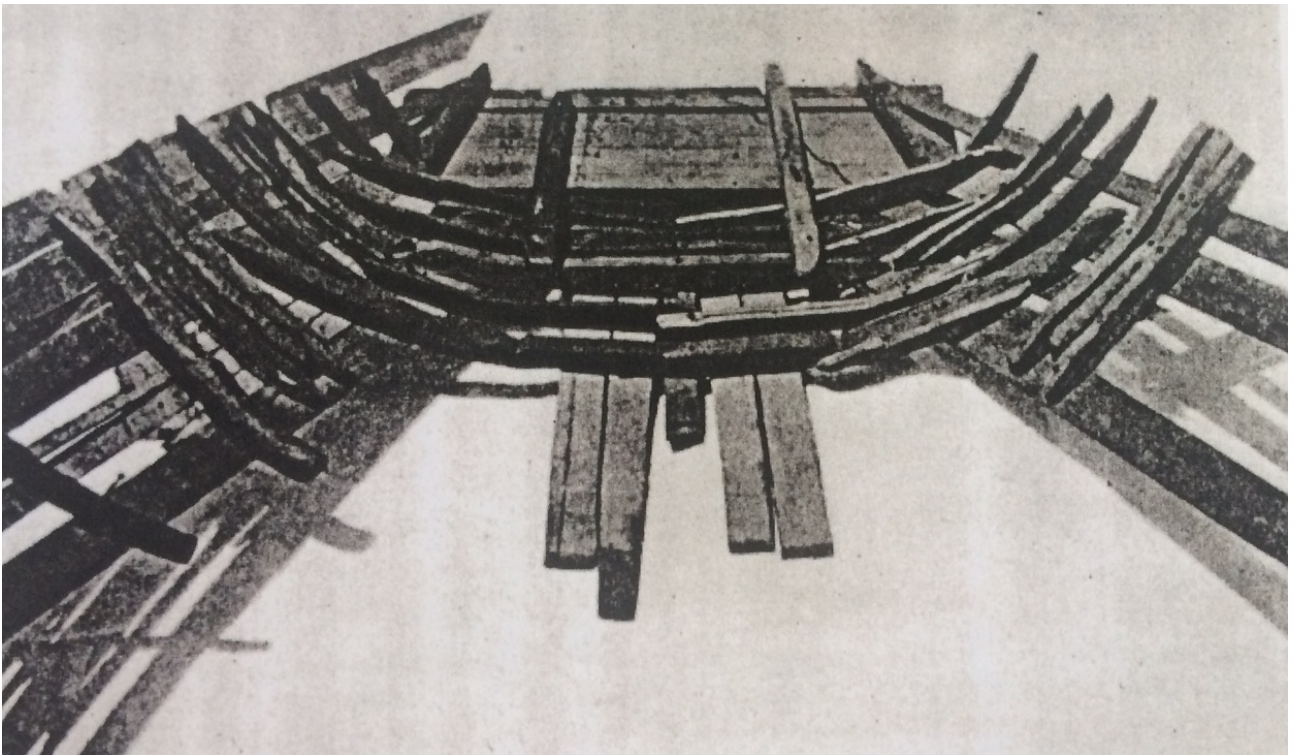
Figure 4. Plan of remaining timbers.

have seen these sherds and agree that they are typical late Roman-early Byzantine fragments.

The Pantano wreck is the first ship excavated which has a crossbeam stern. It seems likely that the heavy beams which sat on the waterline wale and extended behind from it were designed to support a large cabin. The ship seems to be broken longitudinally at the waterline wale. There are still many questions about the ship as we have reconstructed her. One can therefore be assumed that the ship was also in trouble due to bad weather conditions, like Paul's ship in Malta. It seems that many of the ancient ships that have

been carefully excavated were very old when they went down. A wooden hull is like an eggshell. It gains much of its strength from the compression of the sealing, keeping the whole structure in tension. In the case of the tenon-first Roman ship, the compression came from the swelling of the planks, which ensured a watertight fit when the ship was launched. The tenons, fastened securely in place by their treenails, held the planking tightly joined. The frame-first ship depends on her frames in order to hold the planking in place.





The main sail was square, and if the ship was 6 to 7 meters wide, you can count on a sail area of 100 to 110 square meters. Many ships had a headsail too, that was about a third of the size of the main sail. A big problem was that there was no compass and you couldn't calculate the course exactly. Observing the stars was only possible to a limited extent. There were also no detailed nautical charts, so one had to rely on so-called help books. They included distances in Stadium, that are around 185 meters, port facilities and whether they were protected and whether there was drinking water and about the nature of the coast. The running speed was measured after the waves. The maximum speed was 6 to 7.5 knots, without a sail not more than 1 to 2 knots.

The information about the crew differs. Except for the captain, the crew mostly consisted of slaves. It was usual for travelers to be allowed to go on board.

Many ships carried fore and behind decks, leaving the central hold open. Nevertheless the proposed reconstruction has a full deck resting on the through-beams for the Pantano Longarini barge. It is possible that the Pantano Longarini ship sailed when the winds were favorable, but for maneuvering in port it may have been rowed or towed. While several reconstructions and assembly methods have been proposed, it is clear that the Pantano Longarini ship was built using mixed construction, and the shipwright was experimenting with these new building techniques and designs. Although the Pantano Longarini ship is of a type not yet found elsewhere, major hull features are similar to those used on other ships. These wrecks can provide evidence as to what was available to the shipwright at the time of construction. First, that the ship was new or nearly so when it sunk. Second, that it must have been quickly covered by mud. Other excavated wrecks were newly constructed, possibly even on their maiden voyages when they sunk, such as **Ma'agan Mikhael**. It is possible that it sunk in a storm on its maiden voyage or shortly thereafter, leading to a catastrophic loss for the community that built it.

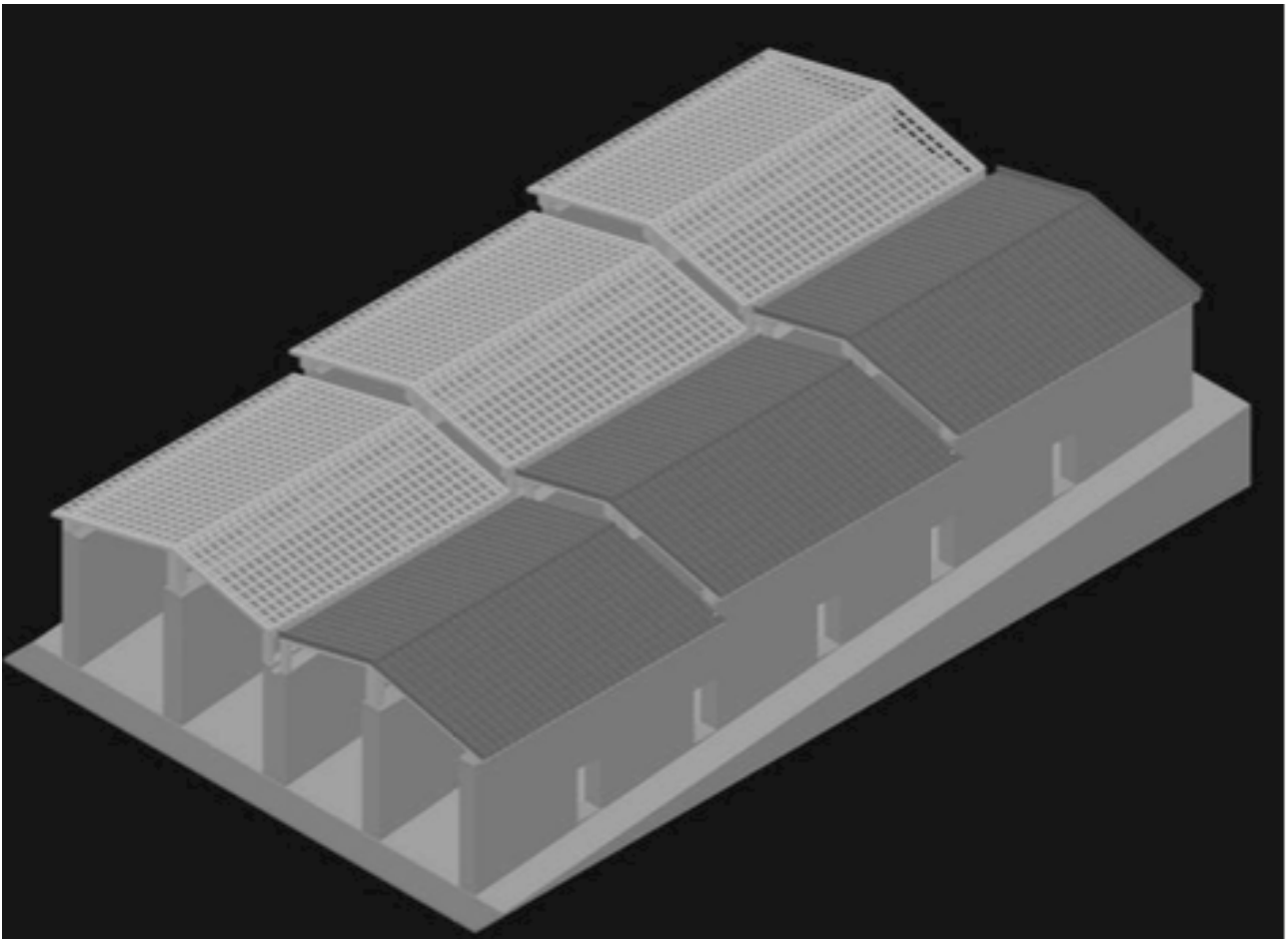


Excavations in Naxos (Sicily)



General view of shipsheds. Central ramp of sand in the upslope part of a slipway.

Black and white picture are taken by "The Shipsheds of Sicilian Naxos" by David Blackman and Maria Costanza Lentini.



Excavations became identified as the dockyard of the Greek city, the first Greek colony in Sicily an ally of Athens in the fifth century, it was therefore destroyed by Dionysios I of Syracuse in 403 before Christ. The surviving shipsheds are built on the exact orientation of the city grid plan of 470 before Christ. The dockyard clearly had only four covered slipways, but perhaps appropriate for the small fleet of a medium-sized city, which was never a maritime power. The facings of walls 1 to 4 are made of largish blocks. They are more or less irregular and the joints are not tight.

One rock-cut shipshed has been excavated for its surviving length (the lower end is lost under modern buildings); there is pottery evidence for the construction of its north wall in the mid-fifth century BC. Installations of an earlier phase are also starting to appear. A selection of pottery evidence and of the remains of roof components is published. The side walls of at least four shipsheds have been found just inside the city wall, and these respect the orientation of the fifth-century urban plan. The clear width of the shipshed excavated (5.45 m) confirms the evidence of other recent excavations: the previously held view that shipsheds had a clear width of 5.75 to 6 m will have to be revised. The back 5 to 6 m of the shipshed do not seem to have been part of the slipway proper; possible explanations are suggested. Some were clearly made to hold roughly squared vertical timbers to hold the ship steady when it was hauled along the slipway. We assume that timber groundways were laid on the bedrock, sand or cobbles.

The shipsheds had a tiled roof with a shallow slope, probably with a separate, horizontally ridged roof over slipways 1 to 2 and 3 to 4. Our initial reaction was to suppose that the whole complex related to remains, devoutly buried, of the roof of a building preceding the dockyard; but now we think it possible to attribute this evidence to an earlier phase of the dockyard, datable to the late sixth century. Clearly ships were being painted in these shipsheds: at the stern, and bow, there would have been more room to paint the sides of the hull because of the ship's 'cut-up'. The large number of transport amphorae is surprising in a dockyard. They were mostly for wine, and though many may have been reused (for water, above all), they provide good evidence for wine consumption in the dockyard, or in the ships that used it.

They were used in Greek times to preserve warships, drawing them out of the water when not in service. The Naxos slipways are perfectly aligned with the grid of the classic city, suggesting that they must have been part of the original plan. The shipsheds were found 200 to 230 m inland from the current coastline at the northern edge of the city on the east slope of the Larunchi hill. At that time the sea had a 2 meters higher level than today. Naxos was probably the natural landing-point in Sicily on the route west for the earlier voyagers coming from the Ionian Islands and Corfu, and those venturing to cross the Straits between Sicily and Italy. The port town in the classical period included the military harbour and the commercial harbour.

The data from the excavation are still under study; but they clearly show the existence of two roofing systems: the first, with antefixes, datable to the first years of the fifth century BC, at the latest; and the second, of mixed type without decoration, datable to the second half of the fifth century BC. There are several reasons why the shipshed complex at Naxos should have been built as expensive as possible: its site on the harbour lies just next to the most likely location of the Agorà, the market place, and due to the height of its roof it would have been clearly visible from there. It would have been among the first monuments anybody arriving from the sea would see; owing to its size it was already among the most expensive building projects, and so additional architectural decoration would not have made much of a difference to the overall costs; and even at times when the fleet was out at sea it would have been a constant reminder of the naval power.



Kyrenia II sailing 1987 near the Aegean Sea. Length 14 m, Speed 7 to 9 km/h.

