# SEBASTOS, THE ROYAL HARBOUR OF HEROD AT CAESAREA MARITIMA: 20 YEARS OF UNDERWATER RESEARCH

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## FOREWORD

The name of Caesarea and its whereabouts never got lost amongst Christians, Jews and Muslims all through the ages. The texts of ancient scripts, such as Josephus´books, the New Testament, the Talmud, Arab and Crusader documents, include a wealth to that city, its monuments and its history. Yet, between the 14th and 18th centuries only a few Europeans would visit its ruins and none would depict the remains of its lost Royal harbour, the Sebastos. The fact is that all through the 19th century modern surveyors had mislocated it, as even more recent scholars did till 1960.

In fact, there was one exeption: on April 10th 1918, an airborne reconnaisance officer of the 303 flying squadron of the German air force wrote a report following his reconnaisance mission along the coast of Palestines, annotating an aerial photograph taken by his sergeant . In his report this officer pointed out the two parallel darker lines under the water as matching the description of Herod´s harbour as he just received from home a few weeks earlier.

In 1960, one of the true pioneers of UW research, the American engineer, Edwin Link, came to Caesarea with his research vessel, the "Sea Diver" and spent almost half a year at the site, of which his navy divers only managed to dive 12 days, producing a vey sketchy plan of the submerged remains and some data concerning their probe at the harbour channel. Yet, among their chance finds there was a tessera made of clay, silver and lead, depicting a harbour entrance with arched vaults and towers crowned by statues, much like Josephus´ description of Sebastos. This tessera, dated to the 2nd century AD, carries the letters KA that might be a regnal year (021), or the initials of the Greek form.

In 1975, the writer was asked by the Israeli Electric Company to carry out a thorough survey at the site in order to collect ample data for attesting the rate and character of subsidence of the harbour´s main moles, in order to decide whether or not the Isreal coastline is tectonically safe for locating a nuclear power plant. Since that year we have been studying the archaeological remains that harbour and those that were at its site before and after, both on land and underwater. Every year, for about two months, the proffesional staff of the Center for Maritime Studies at the University of Haifa would use dozens of diving volunteers from allover the world in order to advance the research.

The international collaboration enhance in 1979 when a group of American and Canadian scholars joined this project, creating CAHEP (Caesarea Ancient Harbours Excvacation Project ). Prof. R.L. Hohlfelder of the University of Colorado, Prof. J.P. Oleson, of the University of Victoria, Prof. R.L. Vann of the School of Architecture at the University of Maryland, and later on, Prof. R.R. Stieglitz of Rutgers University of New Jersey, joined S. Breitstein, Y. Tur-Kaspa, D. Syon, and other local experts for ten years of amphibious research.

In 1989 a new entity, the Caesarea Combined Expedition (CCE), replaced CAHEP. This time the aims were extended to include some additional terrestial issues concerning the city of Caesarea in the Byzantine era. CCE is co-directed by the CMS and the history Department at the University of Maryland, led by Prof. K.G. Holum, with a consortium of half a dozen other institutes in the U.S.A.

Since 1992 the Israeli government has sponsored a 5-year program for year-round field work, aiming to extend and modernized the tourist park at Caesarea, including the ambitious plan of reopening its land-locked inner harbour. The following presentation is an attempt to summarize the more important results of the study carried out by both CAHEP and CCE, including earlier ones by the Israel Undersea Exploration Society (1975-1978).

## MAIN AIMS OF THE RESEARCH

Five preliminary facts dictated the study of Sebastos and other ancient maritime installations at Caesarea.

1.The detailed text of Josephus describing how Herod built his harbour and how it looked, in two versions, in each of his two major compositions ( see the text in frame ), should be used as a guide for a study which would verify or prove every incorrect entry in it. Taking into consideration that Josephus lived and visited Caesarea three generations after Herod´s

time, one might take his testimony as a first-hand one only for those components of the harbour that were visible for the writer. One might question Josephus´ sources for the building process and techniques and his own understanding in marine engineering and proper Greek technical terms.

2.About the time Herod built Sebastos, a Roman engineer wrote "the" textbook on engineering, including one chapter on harbour technology. Chapter 12 of the fifth book in Vitruvius´ 10 books "DE ARCHITECTURA", is another type of guideline for field study: To what extent did the builders of Sebastos use the same techniques Vitruvius advocated? What did Josephus mean when he wrote that the harbour was built by materials that were brought from afar, imported at great expense? What other (local?) techniques were implemented in building Sebastos and of which tradition? Will it be possible to use the new data from the field study for better understanding Vitruvius´ text (see in the frame).

3.Josephus, Strabo and others mentioned a former port city at the site of Caesarea, that had an harbour, at least since the mid-third century BCE. Where was the harbour of this town, Straton´s Tower? What technology did it have? To what extent were its features incorporated, or renovated in Sebastos if at all?

4.Having the main part of Sebastos

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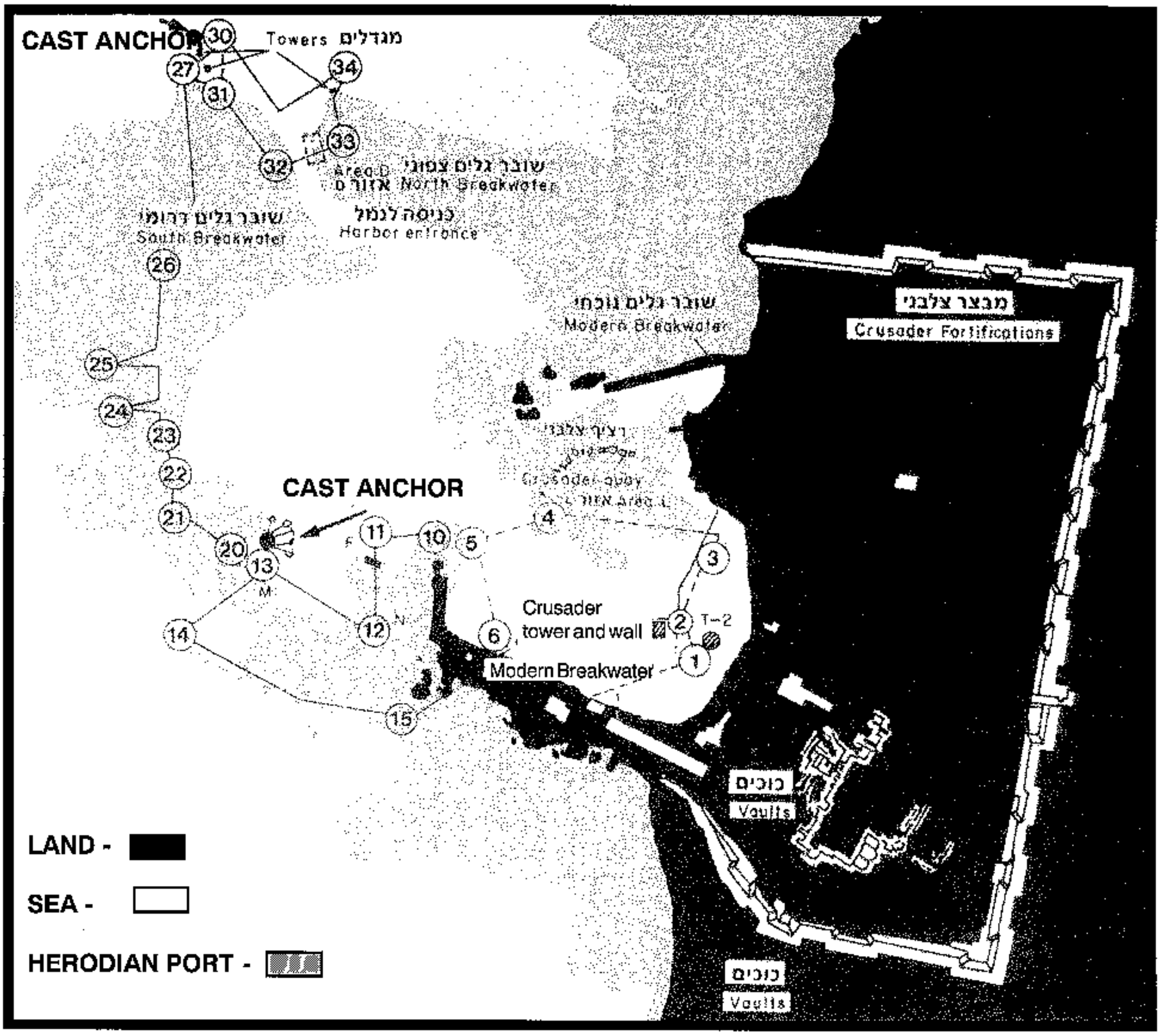
## SCHEMATIC MAP OF HERODIAN PORT IN CEACAREA




**Schematic map of the HERODIAN PORT, the numbered signsn and the general course of the guide cables.**
**——— Guide cable; — — — unmarked snorkeling course.**

*Plastic dive map for underwater use. On the back of the 4 maps available are discriptions of the findings at the numbered stations.*

vertically displaced by at least 5 metres since antiquity, makes it obligatory to study the cause and nature of that subsidence, as well as its limits. This issue becomes more crucial when reading the Eulogy written by one of the early Christian writers, Procopius Gazeus (of Gaza) around 500 AD, praising the Byzantine Emperor, Anastasius I, for his generous attempt to renovate the harbour of Caesarea that was already in a state that would cause merchantment to be wrecked over its sunken moles ( and see the text frame ).

Since the port of the city named after Caesarea had fallen into bad condition in the course or time and was open to very threat of the sea, and no longer in fact deserved to be classed as a port, but retained from its former fortune merely the name--you did not overlook her need and her constant laments over the ships which frequently, escaping the sea, were wrecked in the harbour. Those who awaited the cargoes suffered pitifully, seeing the destruction of those things of which they were in need, and seeing it without being able to help. But, thanks toyour good will, the city is rejuvenated and receives ships with good courage, and is full of the necessities.

### THE SUBSIDENCE OF SEBASTOS

As mentioned above, the first esue in our study was to find out whether the harbour works, or part of it had been subsided and at what scope. Careful examination of good aerial photographs have suggested the existence of at least one fault line, which runs parallel to the shore, not far to the west. This alleged line is clearly marked by the seawards visible edges of the rocky reefs and sea floor. Along the stem of the presently submerged moles this alleged lines is indicated by the transition from bedrock to tumbling mass of buildings stones. Series of geomorphological drills carried out for us by the Esraeli Geological Survey, indicated offsetted geological strata and proved that there are two relatively "Young" fault-lines at Caesarea, of vertical displacement of 5-6 m for the one closer to the shore, and an additional 2-3 m for the second, western one, which might be a little older.

The underwater surveys have verified these data in various sites. The easternmost one is the sunken "Floor", or a pavement of ashlar slabs, found at -5.2 m, in rather horizontal and intact state. Similar pavings were traced along the inner side of the western mole at similar depth, which suggest an even subsidence for most of the main harbour basin. Such a disposition can hardly been triggered by fluidation, or understrenching, as has been suggested by some scholars. It is more likely that some type of tectonic displacement was the cause. The fact that the sunken floor at area F, which is only a few meters away from the active fault line, subsided as an intact, even unit, may indicate that its subsidence was gradual, rather than a sudden event. Yet a recent discovery might indicate that the subsidence of the outer, main harbour basin occured rather early in history and probably quite suddenly. When studying the huge tumbling mass at the nothern tip of the main, western mole, we were surprised when the probes excavated below the tilted foundations of an artificial island that had been installed as a base for the "drusion" , or the lighthouse (and see below), we came upon typical remains of the wreckage site of a merchantman. The vessel ran aground over the already-inundated, tumbling structure, as a the piece of coiled lead sheathing stripped off its keel and the torn-off bolts clearly attest. Having only metal objects at the wreckage is typical for foundering in shallow, turbulent waters over a hard substrate.

The surprising items are a group of lead ingots, all of the same mold and undoubtedly from that wrecked vessel. Two of these ingots still retain their original form and all the imprinted markings, including the imperial imprint on their crest, which can easily be read as IMP. DOMIT.CAESARIS.AUG.GER. This would date these ingots sometime between 83 ( the year the Roman Emperor Domitianus was entitled "Germanicus", following his victory in Germany, and 96, his last year. other moulded letters on the sides of the ingots, MET.DARD. might indicate that the mines where they were cast were located at Cosovo, Dardania of the Roman era. The occurrence of wreckage over the lee side of the lighthouse already in the first century and about the time Josephus wrote his composition referring to Sebastos as an intact, properly operating complex, is the earliest datable evidence for the harbour´s subsidence, and too early to be considered as gradual. There are other indications of that sort, such as a composite, lead and wood anchor found in the harbour basin, laid over very coarse sand, mixed with shells and shingles, about one metre thick, which has been deposited by the surge, over the original harbour´s floor. The C dating of the anchor is mid-first century AD and the fact that it was dumped over sediments deposited by considerable waves might suggest that prior to that the harbour was nomore than an intact basin of still waters. Other supporting data of that sort involve our studies at the inner parts of the harbour, where wave-carried sediments were tracedunderneath 3rd century structures and in the inner harbour.

The suggested early date for the distruction of Sebastos has caused arguments between scholars of CAHEP and other historians as well. Yet, it is quite clear that the people of Caesarea preferred to use the open anchorage at the south bay already in the early 2nd century AD.

## HOW WAS THE HARBOUR BUILT?

At the present stage of our field work we can attempt to reconstruct the techniques and succession of working phases inthe construction of Sebastos. Though our study proved Josephus´figures to be accurate as far as the width and the overall outlines of the Herodian moles, his claim for the water depth was exaggerated by far. In order to fully appreciate the uniqueness of Herod´s moles, one has to consider taht they were a daring engineers feat, being laid in the open water, off the shore, with no topographic lee from the full might of the surge. Taking into account what Josephus tells us about the mal-nature of the place and what we know abour the local coastal process, we can estimate the scope of the problems that were to have proper engineering answers to the planning of the moles:

1.Establishing a rather massive and voluminous structure on a non-consolidated sea bed, over what was known to be ever shifting sand.

2.Buildinng structures that were to be strong enough to endure the constant pounding of the winter, with its components well ties and of overall coherence to avoid the familiar destructive of segmentation and hollowing at such structures, built in our times, due to the extensive suction of the retreating surge.

3.solving the inevitable phenomena of overtapping splash of sea water on the leeof the sea wall, in order to facilitate proper storage and shifting of goods on the inner part of the mole, as Josephus described it.

4.To maintain a proper water depth within the harbour basin and to keep it silt-free, in a place known notoriously for the constant shiftage of wave carried sand toward the shore, as Josephus indicated and as it is well known anywhere in protected basins along our Mediterranean. While today this inevitable problem is dealt with repeated dredging, the ancients did not have the heavy duty machines for such an operation, and for that reason preventive measures should have been applied as an imperative features in the overall planning of the harbour.

Sebastos was planned to be built at the site of the former town of Straton´s Tower, which had two small harbour: one at the northside of that town, at the lee of of a series off-shore reefs. There we have studied the Hellenistic quay, built in a typical Phoenician style of slim, long headers at the southern, protected side of the cove. Excavations next to that quay, in the water and on land, have revealed a score of 2nd century BC pottery, at stratigraphical context with the quay, and an early Roman vessel, of the Herodian Period - at a later context, when this relatively small basin might have been used as a fisherman´s anchorage for the Jewish suburb of Sebastos.

The other basin was originally a sandy bay, protected on its south side by a rocky promontory. That bay had been widened and deepened by the peole of Straton´s Tower, probably during the later part of the 2nd century BC and was incompassed by the city wall on its south and western sides. Of that "sea wall" only the round tower that crowned its tip, guarding the entrance, has survived to our day. This ashlar structure with a diameter of 13 m, which was laid in 2.5 m of water is an exact replica of the twin towers at the north city wall that also protected the other basin. Herod´s engineers incorporated this southern harbour as the inner basin of Sebastos and the city walls of Straton´s Tower as the dividing line betwwen the Royal Harbour and the adjacent city of Caesarea, which was a semi-autonomous municipal entity.

The first feature to be built in the sea was probably an artificial island, at the place where eventually the top of the main mole would be, some 500 m N-NW of the top of the southern promontory and about 350 m due west of the stem of the northern one.

During the 1990-1991 seasons of fields work we have discovered a series of wooden forms in which aggregated pozzolana had been packed, that served as the basis of that island. One of this forms, the lower part of which has survived almost intact, was about 17 x 7 m, with its original height just over 4 m, probably the depth of the sea floor at that site at that time of construction. The wooden form had been constructed on the shore in the regular shipbuilding technique of that period. That is to say a shell-first system,

in which side beams were laid, with composed boards of planks fastened by mortises and tenons attached to them as floor and side walls.

After completing that rectangular shell, upraght trimmed round and square section timbers were added over the floor and along the inner face of the side walls. Cross beams and diagonal ones enforced the structures that had in it inner compartments. A mixture of volcanic ash, filled it up to about one third of its height and was left to be dried and consolidated. Then the form was towed in the water to the site in the open sea and moored by iron chains at all four corners. Additional loads of rubbles and pozzolana was then added into the caisson, from barges, in measured quantities, so as to cause its gradual, even subsidence, till it rested on a rubble cushion that was made for it on the sandy sea floor. The neighboring form would have submerged next to the first one, as close as possible. The sides of the caissons were retained with piles of rubble and the gap between the forms were filled with pozzolana packed in sacks. The combined platform probably 21 x 42 m in size was covered with pavings slabs, on which the largest tower was built, probably the "Drusian", mentioned by Josephus, quite likely with a function of a lighthouse. Initial lab analysis suggests that both the wooden timbers for the caisson and the volcanic components of the pozzolana had been imported from Italy.

during the 1992-1993 seasons more forms were exposed and studied at area K. Some, after tedious efforts to float off some of the overlaid huge chunks of hydraulic cement, and others - due to the fact that the fill of the rectangular barges contained a lesser quality component -- the mass that was added when the form was due to be sunk at the building site. It seems that part of the building process was the most delicate one. Having a floating barge being moored at an accurate position in the open sea and deliberately and evenly sunk to nestle on the sea floor in a proper position, necessitated accurate, well-coordinated work of a large team, pouring components for hydraulic cement and rubble in a tight space. The ratio of the components and the coherence of the final product were trivial in that context. No wonder form K/3, tilted a bit when it was sunk, with its NE corner being damaged and one of the vessels dragged down with it. Other forms lost that lesser quality matrix by centuries of wave erosion, leaving hollows "tunnels" for us to clear off the sand fill to reach the barge´s floor. The overall setting of the wooden forms in area K is still under and will continue in coming seasons, but it is already obvious that this sophisticated technique of single mission barges of best ship right quality is far from what Vitruvius ang much more advanced than the secondary use of Caligula´s barge as the base for the Lighthouse of Portus.

Another artificial island of a similar type of construction was installedhalf way along curved line of the main mole at the turn of its course from west to a northerly direction.

When this skeletal composition had reached the stage of blocking off the surge, another artificial island was established at the designated tip of the northern mole. There, the wooden forms were made of somewhat "lighter" mode of construction. One such form we have studied in area G. The caisson with no planked floor had been composed of rectangular form of heavy square beams, on top of which double walls of mortised planks were inserted, fastened to a series of uprights, which were installed on top of the slipper 1.5 m apart. The hollow in between the uprights and within the double walls was filled, on land with fluid mixture of volcanic ash, fine grain tuffa and lime. When dried that cement had a specific gravity of 0.6 only. Then, the enforced form was towed to the site at the tip of the northern breakwater, moored in place with iron chains on sinkers and eventually subsided all the way to its nestle over the rubble cushioned sea bed, due to the additional burden of water soaked in the cement. At that stage the inner hollow within the frame was filled by aggregates of rubble, volcanic ash and lime, pozzolana, up to its rim, at water level. When hardened by absorbing the sea water the form was used as a platform on which the superstructures were laid. This process of building caissons on the shore and installing them as components for artificial islands seem to correspond with the eyewitness testimony of Pliny the Younger in one of his letters, written a half century lter from his vacation place at the Roman coastal town of centumcellae.

During the second phase, after the line of caissoned cement forms was laid at the designated course of the spinal wall, a second parallel was laid, within the first one along the designated line of the quay (or promenade, as Josephus named it).

This innermost wall was built of ashlar cut stones that were laid in tight courses of headers in typical Phoenician tradition of sea walls. When that had reached the height above the sea level, three confined hollow spaces were created: two parallel ones along the curved line of the main mole, and one within the confinement of the northern mole.

The work would have stopped at that stage, allowing the elements time to contribute their constructive share in the project. The incoming waves overrunning the Prokomia and the spinal line would break and deposit their load of sand within these hollows, which would eventually silt up.

Probes we made into these deposits have exposed the accumulated layers of well-sorted grain sizes sediments, demonstrating the altering wave energies over the time span of deposition. Five to seven layers of coarse sand, shingles and shells representing deposition during severe winter storms were counted in theseprobes, suggesting a duration of 2-3 years for the natural process of silt up of these hollows. Whem filled in with wave-carried sand the hollows were covered by a layer of rubble, sealing the captured sediments and used as a base for the paving slabs of the promenade and floors of the storage vaults. The ashlars of the quay can be traced along the lee side of the western mole for over 200 m. The courses were built of a standard side header 0.6 x 0.6 x 2.1-2.5 m, of the large dimension is the one retaining to the neighboring blocks in tight fitness, so as to have maximum drag between them. Such a structural mode would secure the endurance and integrity of the quay for long periods of repeated impact.

In the third phase the Prokomia, or Prokomatia was confined as a segmanted line of subsidiary breakwater, relative narrow and not much above the sea level, being some 20-30 m outside the spinal wall of the mole it would cause breakage of the surge, leaving an ample settling area on its lee, in which the wave energy would be absorbed. The main role of that structure would have been to prevent the splashing of sea water over the spinal wall, wetting the storage vaults that were on its lee. Breaking and settling the waves´energy away from the main mole would also ease the destructive impact of undertrenching current at the base of the main mole. Being a segmented line, with openings for rip currents, would keep the settling area on the lee of the Prokomia from the pilling up of the sea water and from being silted up in the course of time. It seems as if this unique subsidiary structure was added only to the main mole, which faces the open sea and the full impact of the surge. We did not find any remnants of it along the northern mole, which faces the wind of the fairest weather, as Josephus attested.

With the completion of the third phase of construction, the harbour basin was closed and well sheltered from the surge. This would make it a settling body of still water-a terminal for the shifting sand and for that reason - due to be gradually silted. In order to nullify such an inevitable natural process, a flushing current was initiated, flowing out through the harbour. Such a flushing current was conceived by letting extra water to be added to the harbour basin by inflow through a series of shallow channels diagonally crossing over the main mole along its souther side. Each channel had its openning facing the surge with a base somewhat above the sea level, so as to take only the incoming waves, with constant inflow of water. Incorporating with a wider settling basin along its course, such a channel would feed the harbour basin with additional quantities of silt-free water. Vertical grooves for insertion of sluice gateswould enable proper control over the rate of the inflow in various sea conditions. The additional quantities of water would find the way out through the harbour mouth, flushing it properly. Confirmations for the successful flushing of the harbour basin were found by us on the sea floor. Within the main basin, under layers of wave carried deposits there is a distinguished thin layer of fine mud with some first century sherds on it. Such a sediment is typical for still waters and represents the time Sebastos was intact and operating. The absence of sandy particles in the mud indicates that there was no siltation of the harbour from the open sea. Yet, when we started probing the sea bed just outside the harbour mouth (area D), we have exposed a deposit over two metres thick of mud, dirt and all kinds of garbage from the harbour - a dumping site for whatever was being carried away by that outflowing flushing current. Actually a full scale exhibition of artifacts which were found mostly at thatsite, including a score of clay vessels of fine Italian ware, wooden instruments, metal figurines, etc.

The final stage in the building of Sebastos included the upper structures, some of which Josephus saw and described. Among these features there was the spinal wall along the mole, the towers in it and the vaulted chambers within its confinement. Square slabs of cut stones were laid for the promenade. Subsidiary jetties were settled, dividing the harbour to three mooring basins, one within the other. One such jetty was studied at the south side of the harbour jutting off the southern mole, to the north, dividing between the main (outer) and the intermediate harbour basins, this pier was constructed by parallel side walls of ashlar headers and was topped with pavers of cut stones, carefully laid over a sand fill (Area F). East of that pier, at the part of the harbour that did not subside (on the lee of the fault line) one can see the edge of the quay along the inner face of the south mole, near its stem, retained to the rocky promontory. On the other side of the present day haven, under some later Roman buildings, at the water level, there is a quay and a pier, both subsidiary features within the intermediate basin of Sebastos. These structures were built in a typical Phoenician tradition of tightly laid long slim headers, as was recommended by Vitruvius in his last paragraph quoted above.

The inner basin that had been dug out artificially over a century earlier was incorporated as the iinermost harbour basin of Sebastos, with a series of large vaults along its eastern edge and the large temple which was dedicated to Augustus and Rome on top of the, overlooking the entire harbour.

Along the vertical face of this eastern edge of the inner basin we have exposed a line of marine fauna, vermetides and ostaea, marking the sea level at that time, much at its present elevation. About half a meter above that line there is a pierced mooring stone jutting from the quay.

At the tip of both moles of the main basins there are huge masses of tumbling block, from the elaborated superstructures that crowned the harbour mouth. We already mentioned above one of them the "Drusion", which was on the north-west side. This lighthuose which is an essential navigation aid, marking the way to the harbour for ships sailing in toward a rather low coastline, is reconstructed on the model and drawings not according to our archaeological data form the site, but based on the Roman lighthouse of Leptis Magna in Libya.

On the tip of the north mole, next to the eastern side of the harbour channel, there was a structure not much smaller than the "Drusion ". Its tumbling mass comprises huge rectangular cut stones, some of which are over seven metres long, Some of this blocks were fashioned at one end with a recessed scarf and hemispheric sockets for the wooden shafts for capstans on which were rolled up acroo the entrance. In order to withstand the drag of pulled chains the blocks had been fastend to each other with iron clamps fixed to their place in the cut grooves by molten lead. Frozen flows of lead were found at the foot of that tumbling mass under 10 m of water. This delicate work, as the accurate displacement of the blocks, would demand use of free divers, working under the water and probably using snorkels for breathing. such professional divers were known in the Roman world as member of the guild of "urinators".

As Josephus tells us there were statues, crowning columns, which had been set on top of upright rocks. Two bound together on the right side of those sailing into the harbour are clearly visible on aerial photographs and have been studied by us for several working seasons. They have been to be made of artificial conglomerate, and their position made them excellent navigational aids for defining the western edge of the sailing course into the harbour. The matching "Tower" on the eastern side was found by us, buried in the sand, just north of the tip of the northern mole, where it should have been according to Josephus (Area G). It is a cement block of 15 x 15 m, and some remnants of its wooden form survived along its sides. The towers on both sides of the entrance had been settled on sandy bars, shallower than the sea floor nearby. It seems as if the curved line of the main mole had altered the way the wave-carried sand was traveling along the near shore and the combining factors of the breakwater of Sebastos with the local wave climate deposited some of it just outside the entrance. The functioning flushing current kept the harbour channel silt-free and defined the accumulating sand bars on its both sides, in the open sea. The tower marked these bars, defining the navigational channel toward the entrance.

The in-sailing ships that were guided to Sebastos from afar, by the smoke and the fire at the top of the Drusion, and into it bybthe waters, were held at the tip of the northern mole, next to the controll building of the harbour master for inspection of their credentials, cargo, bill of lading and taxation. Then they would be tugged into their designated berth next to one of the harbour quays, for unloading, loading and even wintering when needed.

## THE INNER HARBOUR

As mentioned above, the main part of present field work in Caesarea is the year-round excavations in the "Inner Harbour". This party dug-out and artificially expanded bay was originally (or at least since Herod refurbished it) encircled by a moulded vertical wall, made of a mixture of pozollana, and rubble, on top of which ashlars were laid in places, for a quay. This basin was about 240 x 120 metres in size, with an even water depth of over two metres over most of it (except for its northeastern part). At present, the majority of the area is land-locked and topped by later, terrestrial structure that represent ten successive occupational phases, dating from about 500 AD to the Crusader period. The average elevation of the surface when we started our excavations was about four metres bove sea level, with about 2.5 metres of architectural remains before reaching the water table (of the fresh ground water) at 0.5-0.8 m above MSL. Only 1/7 of the former basin is still flooded by sea water with a sandy beach within it. The field research incorporates several issues:

1. A careful study of each building phase of the terrestrial structures, taking into consideration that these are due to be removed eventually. We were surprised by the high standard of the residential and commercial complexes found at the site, which illustrate the quality of urban life in Caesarea during the Early Islamic Era (750-1101). The complexity, quality and sophistication of the water supply and drainage systems and the reach corpus of imported fine wares are exceptional and in some contradiction to the meager historical references for Caesarea as a flourishing urban center during that period. In contrast to the character of the Arab levels, the Crusaders seem to have used the relatively low area within their fortified city only as a burial ground.
2. An interdisciplinary study is mandatory for tracing the various silting processes that had caused the inner harbour basin to go out of use. Layers of eolian sand, beach deposits, human deposits of garbage, deep pits that were dug for cisterns and wells, wave-eroded artifacts and marine encrusted building stones and sherds are all to be carefully documented, collected and studied in geomorphological, sedimentological, botanical and zoological labs, before one can reconstruct the complicated mutual response of man versus nature.
3. Of particular importance for our study is the alleged repetitive attempts made through the Roman and Byzantine eras (between 100-500 AD) to fight the intensive process and to renovate the maritime function of that inner basin. This study has just begun, but we are already baffled by all kinds of additional post-Herodian marine structure that were laid well below water level, manually, with extensive use of non-moulded "Terrestrial" cement that were found covered by marine encrustation. It is obvious that when these structures had been installed the sea and ground water had to be pumped off constantly and intensively at a pace which would exceed that of ours, working with heavy duty, modern pumps.
4. As we work, in this "archaeological hostile" environment of overbuilt, inundated and very non-consolidated area, we are still far comprehending the various building techniques of the ancients and still wonder which structures had been installed by the people of Sraton´s Tower, Herod´s engineers, or the later Roman inhabitants of Caesarea. An overall study of the texture, chemical components and mechanical characteristics of various types of cement and concrete might help us to solve these perplex issues.
5. The top elevation of marine fauna on structures, the level of well bottoms installed in various time periods, foundations and floors of buildings, etc. give us a uniquely reach corpus of well-dated evidence for reconstructingquite accurately the ever-changing sea level, or land/se relations, both on vertical and horizontal scales. These mostly eustatic changes are good indications for minor climatic changes and wider trends of historical and economical significance not only for the ancient people of Caesarea, but for the entire Near East.
6. Digging up waterlogged sediments and depositions that were for centuries in a non-aerobic environment and out of reach from human hands is a unique opportunity for our part of the world to retrieve small finds in the best state of preservation. So far, we have only begun to clear off these strata, but elegant pieces of statuary, a unique Byzantine amulet, hundreds of cubic metres of dumped food remains and even a 4000 year-old cylinder seal from Cilicia, probably a property of some Byzantine collector of antiquities, are just a few examples for that potential richness.

## LATER HARBOUR INSTALLATIONS

Sebastos, though probably one of the highest achievements of Roman engineering and obviously the first and only truely modern harbour of ancient times, was also the one with the shortest life span. Around 70 AD, 80 years after its inauguration as a royal entity, serving the ambitious economical and financial schemes of a great king as the main exporting center for the goods of Arabia Felix of the Nabatean cross-country trade routes of the voluminous shipments of salt and bitumen from the Dead Sea, as a stopping point on the route of the Egyptian grain carriers /the "supertankers" of the time) on their course from Alexandria to Rome and a favourable wintering port, it had been transferred to the hands of the minicipal authorities of Caesarea. Being far too big and its maintenance to costly for the needs of one city, the harbour soon fell to a state of disrepair. Laid over an active fault line, it started subsiding and soon gradually disappeared below the waves. Our studies have traced the only large-scale attempt to renovate that harbour, an effort financed and attempted around 500 AD by the Byzantine emperor Anastasius I. That attempt included a rampart made of the spilling of rubbles over the submerged northern Herodian mole, mostly over its inner half. This spill was further west, behind the tip of the sunken mole, the original harbour´s channel and on - to the site of the tumbled light house at the tip of the western mole. From there, the rampart was spilled toward the south-east, for about 150 metres, completing an overall shape of figures 1. Our excavations at areas H, D and R have exposed not only that rubble spill, but also a score of earlier Byzantine amphoras and many coins of the period.

At that time the eastern quay of the inner harbour was renovated, expanded and repaved with ashlar slabs, not as a maritime features but as an elevated platform next to a series of fresh water pools installed over the already silted basin. Elsewhere along the shoreline of what was then a densely populated city, there were all kinds of moulded sea walls, to protect the built-up area from the rising sea level and some alternative , additional achorages. One such anchorage, furnished with an ashlar landing stage was installed at the lee of the promontory at the south side of the bay south of Sebastos (Area P). That bay was used as the municipal anchorage, during the time Sebastos was operating as a Royal one and again - after its demise, when mooring within its submerged moles became too risky. That promontory was

furnished with a large piscina, known by its later, Arab name: "Kleopatra´s Baths", most probably - the municipal fish market. The landing stage next to it, to the south-east, may have served the local fishing boats.

Farther south along the new suburbs of the extended Byzantine city and at the lee of series of near shore reefs, we have studied additional fish tanks, and a line of pierced ashlar blocks, bridging the span between the shore and the lee of a rocky reef some 120 metres away (Area sc) - probably bases for wooden posts that once supported a jetty. So far we did not find any remnants of marine structures that can be dated to the Early Arab period. Yet, thousands of cubic metres of sandy depositions mixed with 6-8 centuries of sherds of mainly storage jars, covered by marine fauna had been dumped some time before 800 AD over the coastal area south of the Arab city after being dredged from the floor of the intermediate basin of Herod´s harbour, in what seems to be an attempt to refurnished Caesarea with relatively protected anchorage with an ample water depth for navigation.

During the Crusader Period, or maybe somewhat earlier, during the time of the Fatimid Dynasty of Egypt, Caesarea was made an important venue for exporting olive oil from the hills of Samari, a long jetty was laid, over the northern edge of the intermediate basin, enabling transshipment of bulky cargos to be loaded into the hold of sizable merchantment that would moor in water deep enough at its tip. A little further towards the east and closer to the present beach, at 1.5-2.0 metres of water, there are the submerged remains of the Crusader sea wall, with typical square tower at its tip. Next to that wall there was a quay, some 6 metres wide, which might have served boats of shallow draft and lighters that were sheltered within the fortifications.

## SUMMING-UP THE STORY OF THE HARBOUR

The long, complicated history of Caesarea and its harbours is not fully told yet. After twenty years of a large-scale research we are still shy of knowing all the answers to the question, some of which were phrased at the beginning of this paper. Every field season adds much to our knowledge, answers some questions and eventually, as is so often in archaeology, creates a whole series of new ones. At the stage of the on-going research, which is already the largest and longest one to be attempted underwater, we might summarize the history of marine facilities in Caesarea as follows:

**350-260 BCE** - a coastal town of Phoenician type, furnished with an ample harbour settled and called "Straton´s Tower," namedeither after the Sidonian king `Abdashtart, or an unknown Hellenistic commander of Ptolemy II Philadelphus.

**258 BCE** - the Egyptian official of Ptolemy II lands at the port of Straton´s Tower, his mission to collect taxes from Palestines.

**c.130-100 BCE** - a local Seleucid governor, named Zoilus, conceived his own tyranate, or petty kingdom, with Straton´s Tower as its capital. The town is fortified and withstands a siege by the Seleucids and Hasmonean King Alexander Jannaeus.

**c.100 BCE** - Ptolemy Lathyrus helps Jannaeus in adding Straton´s Tower to his Judean kingdom.

**63 BCE** - Pompey visits Palestines, distracts coastal pagan cities from the Judean kingdom, including Straton´s Tower.

**c.30 BCE** - Strabo describes Straton´s Tower as a small coastal settlement with an anchorage.

**21-10 BCE** - King Herod the Great built the harbour of Sebastos and the city of Caesarea next to it.

**15 BCE** - Herod hosts Marcus Vipsanius Agrippa and shows him his new harbour.

**10 BCE** - Herod inaugurates Sebastos and Caesarea, giving the harbour to the "Mariners" and the city "To its peoles".

**4 BCE** - Herod dies, succeeded by his son, Archelaus.

**6 AD** - Archelaus deposed by the Romans. Judea rules as a Roman province, with Caesarea as its capital.

**43 AD** - St. Paul the Apostle sails from Sebastos to Tarsos and later (58-60) is imprisoned in Caesarea.

**66 AD** - Severe disputes between the gentile majority in Caesarea and its Jewish populatin over the latter´s right for citizenship of the city triggers the outbreak of the Great Jewish revolt.

**70 AD** - Using Caesarea as their headquarters, the Roman crush the revolt. caesarea "re-founded" as a Roman colony with the harbour as partof it.

**c.200 AD** - St. Peter sails from Caesarea to Italy.

**253 AD** - The largest coins minted in Caesarea still depict Tyche, the city goddess followed by a genius holding an anchor - symbolizing its harbour.

**c.500 AD** - Anastasius I renovated the harbour of Caesarea.

**614-628 AD** - The Sassanians of Iran capture Caesarea and govern it for 15 years, maritime activity is documented.

**640 AD** - The Arabs conquer Caesarea after 7 years of years of intermittent siege.

**844 AD** - Ibn khurdadhbih lists Caesarea as one of the ports of Palestines.

**897-985 AD** -Al Ya´qubi, al-Muqadisi and other Arab geographers mention and describe Caesarea as a flourishing, fortified coastal city.

**1047 AD** - The Persian traveler Nasir-i-Khusrau visits Caesarea by the sea(?).

**11.5.1101 AD** - Franks and Genoeses capture Caesarea, slaughter most of its residents and sack the city.

**1166 AD** - Al Idrisi, describes Caesarea as a large a well fortified city with a small harbour that is capable of holding but one boat.

**1177 AD** - The byzantine John Phocas describes the "Truely wonderful harbour of Caesarea which was made by human skill.

**15.7.1187** AD - Caesarea is easily taken and sacked by two of Saladin´s officers.

**Dec. 1217 AD** - After 30 years of desolation, Caesarea is rebuilt by the Hospatallers.

**1225 AD** - The geographer Yaqut describes Caesarea as a mere village

**1228-1251 AD** - Caesarea is rebuilt and fortified by the Germans and the Franks (St.Louis).

**27.2.1265 AD** - Baybars, the Mamluk rules, conquers Caesarea and destroys it. The thorough ruining and deliberate filling in of the harbour is carried out by the Sultan al-Ashraf Khalil in 1291.

Today, one can see some of the remnants illustrating that long history of the harbour, either on land, by visiting the currently expanded tourist park, or by snorkeling over the shallow water of the present anchorage.

Since 1992 we have inaugurated an underwater archeological park for divers. Over 1500 metres of guiding cables were laid along four courses, around the perimeter of the submerged Herodian moles. These guiding lines are furnished with signs marked by numbers. Each indicates a special point of interest. Diving visitors may borrow from the local dive shops annotated palstics boards as underwater guides for their tour. There are over 30 marked signs along these underwater courses, each described in detail on the boards either in English or in Hebrew.

## JOSEPHUS´DESCRIPTION OF SEBASTOS

**Introduction:** The historian Josephus, who was born around AD 7/8, published a history of the Jewish War between 75 and 79 an a history of the Jewish people in 93/4. Both these works contain a detailed description of the city of Caesarea and its harbour, Sebastos. Despite certain inevitable inaccuracies, the data contained in these descriptions have been of the great value in assisting the reconstruction of the layout and appearance of the harbour in the Flavian period. The passages are quoted here in extenso to introduse the reader to the descriptions, and to avoid constant lengthy quotation of the passages in the text. The translation has been prepared by J.P. Oleson on the basis of the Greek text in the Loeb edition of Thackeray (1927:192-96: for the Jewish War (or Bellum Judaicum, as it is usually cited in scholarly literature; addv. BJ), and Marcus and Wikgren (1963:158-64) for the Jewish Antiquities ( or Antiquitates Judaicae, abbv. AJ). Transliterations of some of the important Greek vocabulary have been left in for those sections that deal with the design and construction of the harbour proper. Josephus´ Greek is very idiosyncratic, so it is not always possible to render the text literally into English. The Caesar mentioned in the text is the emperor Augustus.

Jewish War 1.408-414 (408) He (Herod) noticed a settlement on the coast - it was called Straton´s Tower (Stratonos pyrgos) - which, although much decayed, because of its favorable location was capable of benefitting from his generosity. He rebuilt the whole city in white marble (leuko litho), and decorated it with the most splendid palaces, revealing here in particular his natural magnificence. For the whole coastline between which the city lies, happened to lack a harbour, so that every ship coasting along Phoenicia towards Egypt had to ride out.