

## *The Ancient Harbors of Caesarea Maritima*

by AVNER RABAN and ROBERT L. HOHLFELDER



*The piscina or fish tank found at the southern end of the Byzantine harbor at Caesarea.*

The end of Rome's political turmoil and civil wars of the first century B.C. set the stage for a dramatic growth in her economy and financial resources. Once peace had been firmly established by Augustus (27 B.C.-A.D. 14), the vast and growing wealth of the empire encouraged appetites for the extraordinary among the rich and created markets for diverse luxury items from outside the Mediterranean world. Due to the ex-

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pense and limitations of land transport, however, this sudden rise in the demand for exotic imports increased the volume of maritime commerce. At the same time, it produced a need for new harbors to deal with rising demands and to ensure that these commodities would be transported as expeditiously and profitably as possible. Great harbors were planned, constructed or renovated to handle the shipping of bulk goods—such as those at Leptis Magna and Messina—and others with more specialized functions were being built as well. These facilities were intended to channel the exports of Arabia Felix, the Indian Ocean and regions beyond via the sea to Roman markets.

Eventually, Alexandria with its unique position in the eastern Mediterranean would become the premier example of such an international port. But

before Alexandria's dominance was secure, Herod, the semi-legitimate king of Judaea, attempted to gain control of the entry of luxury goods to the Mediterranean through his country. His plan to seize command of this trade was formulated very early in his reign (40-4 B.C.), and demonstrated his great political and business acumen as well as an ambition to revive the glory of the reign of King Solomon (ca. 965-928 B.C.).

The first step of his scheme involved the acquisition of the entire land bridge from the east to the Mediterranean littoral, first by an attempted marriage alliance with the daughter of the Nabataean king, and later by successful military actions against this state. Once in control of the overland trade routes, Herod needed a large port facility where a sizeable merchant fleet could winter, undergo repairs and fitting out, and



*Aerial view of the ancient harbors of Caesarea being investigated including the Herodian harbor (center) and possible Byzantine harbor and Hellenistic harbors/anchorage (left and right, respectively).*



*One of several hundred horrea or Roman warehouses that may have existed along the ancient coast of Caesarea Maritima to complement the harbors there.*

load cargo to guarantee immediate departure once the sailing season began in the spring. In this way, goods would reach western markets weeks before cargoes were shipped from smaller rival eastern ports, where ships would have arrived for loading only after wintering elsewhere, primarily at Kantharos at Piraeus.

The financial advantages in Herod's strategy are obvious and lie behind the most daring and sophisticated enterprise of marine engineering undertaken to that time. During Herod's reign and at his direction—about 50 years before the beginning of the building of the famous Claudian Portus at Ostia—Sebastos, as the harbor of Caesarea Maritima was called, arose on the eastern shore of the Mediterranean. It was the first man-made port built on the open seas without dependence on or





(Above) Diver Bill Murray of the University of Pennsylvania sketches a probe trench.  
 (Right) An airlift is used to vacuum away debris and sand from the massive harbor installations that once served the ancient harbors of Caesarea.



benefit of favorable topographic features such as a cape or bay. Fortunately, the construction of this engineering marvel is described at some length by the historian Josephus in two accounts: "Herod laid out a circular harbour enclosing enough space for large fleets to lie at anchor near shore, and (along this line) he sank enormous rocks to a depth of twenty fathoms. Most of these rocks were fifty feet in length, and no less than eighteen in breadth, and nine in height, some of them being larger, some smaller than that. The structure which he set in the sea as a barrier was two hundred feet (in width). Half of it was opposed to the surge of the waves and held off the flood of waters breaking there from all sides, and was therefore called a breakwater. The other half, supported on a stone wall, was divided at intervals by towers... Into it had been built a series of vaulted recesses as shelters for sailors. And before them there was a wide quay which encircled the harbour and was a very pleasant place to walk around for those who wished to do so..." (*Jewish Antiquity* XV, 334-38, Loeb translation).

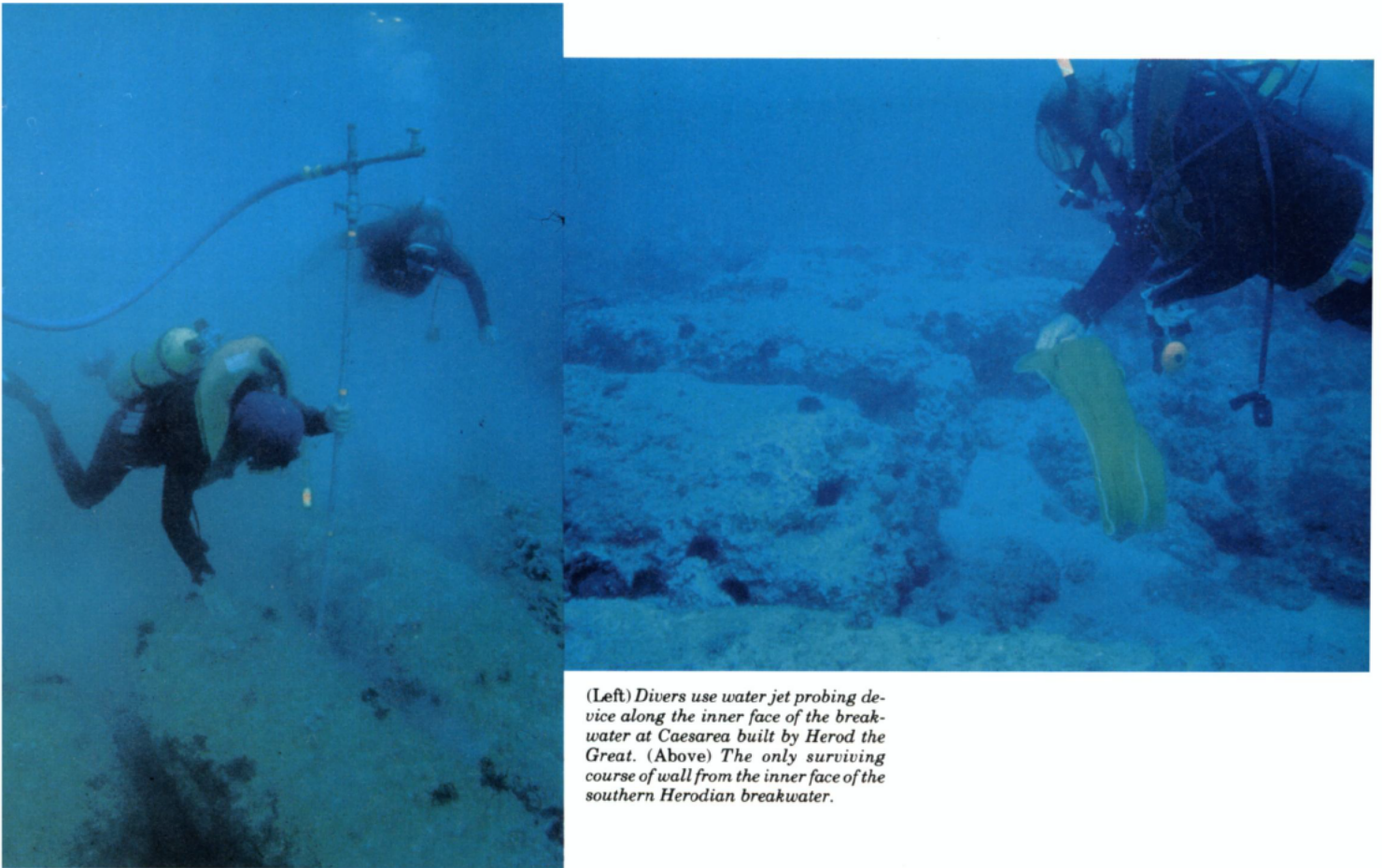
The remains of the harbor described by Josephus are visible today beneath the waters of the Mediterranean—a result of a vertical tectonic coastal sinking of five to seven meters. In the past two decades, Israeli, American and other groups have explored portions

of the massive complex of submerged structures. Last year, the Caesarea Ancient Harbour Excavation Project (C.A.H.E.P.) was formed by the Center for Maritime Studies, University of Haifa, to begin systematic excavations. During May and June of 1979 and 1980, the staff of C.A.H.E.P. and divers began investigations in the harbor complex, a project scheduled to continue for the foreseeable future. Volunteers from all over the world have participated in the last two seasons and the expedition welcomes underwear archaeologists to help in future campaigns. Although explorations are still in the initial stage, some basic facts have been uncovered about Sebastos, called the Port of Augustus according to Josephus.

The main Herodian harbor was built according to the plan of the Hellenistic *limen kleistos*—a well-enclosed harbor with a separate inner anchorage. Evidence of this inner basin, now completely silted in was uncovered during previous excavations conducted by the Center for Maritime Studies. It appears that the interior harbor area was linear, perhaps rectangular in shape, and may have incorporated the small mouth of a former river bed. Any coastal indentation would have been uncovered along the eastern side of anchorage. Above and behind the continuous quay stood large storage sheds or *horrea* dating from the Herodian city. The southern

limit of the anchorage was a natural rock promontory which had been modified in antiquity. This was done perhaps to incorporate a sluicing system to bring water from the open sea into the enclosed inner basin in order to allay silting. Traces of these sluices with cuts for wooden doors or hatches to control water flow are still visible. The inner face of the promontory was distinguished by a quay wall built of Phoenician-style headers—stones laid perpendicular to the face of the quay wall.

At the seaward limit of this natural promontory, a breakwater which served as the southern enclosing arm of the harbor was constructed for a distance of over 600 meters. It initially extended seaward or west of the shoreline and then curved to the north. But a base of rubble and pebbles, wider than the breakwater itself and over 50 meters in some places, was first laid on the sandy ocean floor to provide a firm foundation. On the seaward side of this foundation bed, huge dressed stones, some reaching 15 meters in length, were positioned to serve as its outer circumference. The inner face was formed by a quay built of headers with the distance between the outer and inner faces filled with enormous blocks of concrete which had been poured into wooden frames and permitted to harden. Even today some of the imprints of frames can be seen clearly



*(Left) Divers use water jet probing device along the inner face of the breakwater at Caesarea built by Herod the Great. (Above) The only surviving course of wall from the inner face of the southern Herodian breakwater.*

on numerous blocks. Similar methods of breakwater construction were used at Leptis Magna and the western harbor of Aegina, although the Caesarea construction anticipates both of these two projects.

The second or northern breakwater of Sebastos was built as an extension of facilities constructed on shore and was composed of much smaller stones than the southern arm. It extended from the ancient shoreline due west for a length of over 200 meters and averaged about 50 meters in width. Its inner face appears to have been distinguished by series of "finger-jetties" or interior loading platforms — one of which has been discovered in a reasonable state of preservation. The outer face seems to have been a simple stone and rubble breakwater. Since the northern breakwater was protected by the southern one from the severe southwestern storms, it was not made of massive dressed stones or huge concrete blocks, except at its seaward terminus adjacent to the harbor entrance. These colossal stones and blocks, some containing lead and/or iron clamps or connecting plugs, had not been positioned there to dissipate heavy seas, but were once components for some massive structure, perhaps the tower mentioned by Josephus. Divers also noted evidence in this section of the breakwater indicating that the entrance of the ancient harbor had been

closed by a chain, a common practice for many centuries.

Two other major structural features were discovered but have not yet been fully investigated. Parallel to the curving southern breakwater at a varying distance of between 15 and 40 meters from the main massif of the enclosing arm, the diving team found a stone wall of less than seven meters in width, poorly preserved and showing signs of haphazard building and frequent repair. It appears to have been a subsidiary "wave breaking" structure intended to cause storm waves to break some distance from the main breakwater, minimizing the potential of serious damage to its outer face particularly during the winter. The secondary breakwater has an additional and perhaps more significant function. It seems most likely that cargo was stored on the breakwater itself for loading onto merchant vessels during the winter months. Since the secondary breaker was located some distance from the main one, it would have reduced or eliminated the spray of crashing waves from reaching the storage facilities on the quay and would have protected the sheds and ships moored at the inner seawall.

At the head of the main southern breakwater divers discovered the ruins of a massive building. Although its exact nature is still unclear, it seems

likely that this marks the location of the port's lighthouse. The total harbor formed by the breakwaters and inner anchorage thus offered considerable working space, perhaps as much as 1,500 meters of berthing slips for ships, not including additional capacity afforded by the finger-jetties. The actual area contained within the harbor is about 200,000 square meters. In size, then, Caesarea was certainly one of the largest harbors of the Roman world, comparing favorably with Kantharos (ca. 750,000 square meters), Portus (ca. 325,000 square meters), Leptis Magna (ca. 102,000 square meters), Centumcellae (ca. 100,000 square meters), and while Josephus' claim that Sebastos equaled Piraeus in size is not precisely correct, Caesarea's Herodian harbor was larger than two of Piraeus' three ports, Zea and Munychia.

It is possible, however, that his Piraeus analogy was accurate. To the north and south of the Herodian installations, anchorages or perhaps even actual harbors appear to have existed. These facilities may have been in use in some fashion at the time of the construction of Sebastos. North of Herod's harbor, last season's survey revealed the remains of earlier port installations, perhaps belonging to the Phoenician town of Stratopyrgos or Strato's Tower, located on or near the site selected by Herod for the city of Caesarea. The early



Sluice gate used to help control silting within the harbor on the southern Herodian breakwater.

Hellenistic haven also was constructed in the tradition of *limen kleistos* — its seaward or western exposure was protected by a series of natural reefs. To the south and east, the mainland itself afforded protection. Its northern face appears to have been partially closed by the continuation of the so-called Herodian Wall, a fortification visible on land. The main quay of this harbor was surveyed along the southern coastline, although most of it is now obscured by debris from later periods suggesting that it may have served Caesarea as well as the earlier city. It was built of two rows of headers of slender carefully dressed blocks; the visible section of the quay has an east-west orientation and could be traced for over 35 meters.

The association of the early harbor with the Herodian Wall, which includes two large towers each with a diameter of 12 meters, strengthens the assumption that these fortifications probably antedate Herod's construction of Caesarea. Perhaps they and even the harbor itself may have been incorporated into the master plan of his city. Another tower of similar construction and diameter, now under a meter of water, was also uncovered within the Herodian harbor. Preliminary excavations around its base revealed lower courses of stones to an undetermined depth. So far, only a second-century B.C. cooking pot found crushed against the tower provides a tentative date for the structure. This tower seems to have been the southern limit of the Hellenistic city and marked

the entrance to the inner basin of Sebastos. Like the northern towers visible on land, it appears to have been incorporated into the planning of Herodian Caesarea.

Another feature of this ambitious harbor scheme lies to the south of Sebastos — a large bay formed by two promontories. The northern one is the rock headland used as the southern limit of the Herodian harbor. The promontory to the south was leveled and quarried and converted into a large pool connected to the sea by sluices, most probably a *piscina* or fish tank. The bay thus formed may well have been in use at least as an anchorage or mooring area. While this theory will have to be tested by future underwater explorations, it is important to note that land excavations on the shore adjacent to this bay have revealed a vast complex of warehouses in constant use from early in the first century through the seventh century after Christ. The later use of these commercial land facilities suggests that the southern bay probably served Caesarea into the succeeding Byzantine era as well. This proposition seems even more likely in light of explorations within the Herodian harbor that have revealed evidence of an advanced state of disrepair as early as the third century, probably due to earthquakes and neglect. Although some indications of rebuilding efforts have been uncovered, it may be that the entire enterprise proved to be too expensive and difficult to maintain. Once the justifica-

tion for a huge harbor complex had disappeared with the fall of Herod's kingdom and his dream of funneling eastern trade through Caesarea was abandoned, the harbor may have been too large for the city's needs and was probably allowed to decay gradually.

By the fourth century, however, Caesarea had entered a period of renewed prosperity and would have needed a working harbor. As excavations on land intimate, the coast fronting the southern bay grew in importance during the early Byzantine era. The bay itself probably shared in this change of fortune and eventually became the main harbor of Byzantine Caesarea. One of the major projects of the 1981 season will be to search for the Byzantine harbor. All of the ancient harbors of Caesarea were innovative not only in theory but in technology as well — some construction methods were used for the first time and mark Sebastos as a great forerunner of the other imperial ports of the early Roman empire. One advancement is the integrated use of dressed blocks laid in regular courses, including the joining of stones with lead castings, and the formation of blocks of concrete under water. The use of breakwaters strong enough for the construction of storage buildings and reloading quays on their inner side was also a technological feat. The construction of peripheral quays and finger-jetties within the main anchorage increased the transshipment area and allowed for the simultaneous loading of many ships. A new orderliness was born with the functional division of the various sections of the main quays according to size of ship, nature of cargo and destination. Important for defense was the effective incorporation of a large harbor in the overall city planning system and fortifications, with the possibility of closing the main entrance with a chain. Even the lighthouse became a necessary and permanent feature of the harbor at Caesarea and could allow entry and exit of ships during night hours as well as during the day.

Finally, and perhaps most reflective of Herod's influence, was the development of effective solutions to the engineering problems associated with strong waves, winter storms and silt-laden currents. Henceforth, harbor sites could be selected for economic or political considerations without regard to coastal topography. So far, the two seasons of underwater excavations in the ancient harbors of Caesarea have provided tantalizing glimpses of a surprisingly advanced technology for building harbors in the open sea equal in many respects to modern installations. Future campaigns will undoubtedly uncover considerable data about this facet and other aspects of ancient maritime life.