



DOR MARITIME ARCHAEOLOGY PROJECT

The Ancient Harbour and Anchorage at Dor, Israel

Results of the underwater surveys 1976 - 1991

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with various contributions



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during swell periods (mainly early July to the end of September, but to a lesser degree throughout the rest of the year other than the months December-April).

Although the link between the exposure of maritime deposits and the erosion of sand accumulations during the winter months is fully appreciated, the complex reasons dictating the location and duration of the exposures are more arbitrary, depending on and effected by the interplay between several factors:

1. Firstly, the mass of sand transported to the study region is far less considerable than in the south of the country. While the annual northerly directed transport of sediment approaches 400,000 m³ at Gaza and 215,000 m³ at Ashdod, only 80,000 m³ is conveyed to Atlit, 9 km north of Dor (Carmel *et al.*, 1984: 1287). Situated toward the northern termination of the classical littoral cell stretching between Damietta in Egypt and Akko in Israel, Dor is one of the country's minimal recipient's of sediment. This is one of the contributing factors why little maritime material has been detected in the south of Israel and an abundance between Tel Aviv and Akko (cf. Wachsmann, 1984-5; Wachsmann and Raveh, 1980; Galili *et al.*, 1993). As mentioned previously, human intervention in the form of modern quarrying and coastal construction (Nir, 1990) has also enhanced the fragility of the sand equilibrium along this shore.

2. The actual deposition and erosion of sediments along the coast of Israel is immediately related to the direction and rate of longshore transport, in turn conditioned by the interaction between the changing shoreline orientation and direction of the incoming waves. Within the sediment transport model recognized in the south-eastern Mediterranean coast, the gently curving shoreline orientation causes sediment transport to be northward between El Arish and Netanya, but southward between Netanya and Haifa Bay. Due to the transformation in the coastal contour, changing from east-west to north-south, the net transport naturally becomes smaller with distance from the Egyptian sediment source. At Dor, and indeed between Netanya and Haifa as a whole, sediments are susceptible to 'smearing' as a result of the lack of clear trends in

transport direction and the constant change, as often as daily, in incoming wave direction (Goldsmith and Golik, 1980). Thus, in the study region the currents are frequently moving in opposition, so that the sands swept to the beaches by offshore currents are transported back south by the wave-induced current (Emery and Neev, 1960: 11).

3. The majority of productive surveys yielding positive results are concentrated between December and April when winter storm fronts pass across the coast of Israel every 6-10 days. Throughout this period storm waves average 2-3.5 m, 4-5 m in extreme cases, and are generated by westerly winds associated with low-pressure systems over Europe ('northern' storms) or Africa ('southern' storms) (Carmel *et al.*, 1985: 1 and 18-19). Once every 5-10 year interval waves lasting 13 seconds and achieving 8 m in height are expected in Israel (Goldsmith and Golik, 1980: 155-6). The magnitude of an exposure and point of erosion depends on the combination of incoming wave direction, ferocity of the storm waves, and wind velocity which may reach 80 km/hr or more (Nir in Bird and Schwartz, 1985: 505).

4. As Eitam, Hecht and Sass have ascertained, the mass of sand encountered up to depths of 7 m in the environs of Ma'agan Michael - and hence Dor - manifests as a series of oblique, parallel or crescentic short-crested bars constantly changing in both size and shape which disappear during swell periods (1978: 7). During the episodes of stormy conditions waves attempt to turn full vertical circles, possible only at depths of 2-2.5 m or greater (Orni and Efrat, 1964: 36). At shallower locations the lower part of a wave brushes the bottom of the sea and is forced backward. Consequently, the upper part of the wave drops vertically with its full weight causing the breakers to carve out a trough in the sand, displacing the sediment to form crests elsewhere. Such an exposure may endure for anything between two hours and two weeks, varying in size from less than one metre to 15 m in diameter, or more.

Chapter 3 Historical and Archaeological Background

Introduction

According to traditional perception, the city of Dor is credited with possession of the southernmost harbour facility within the Biblical territory of Asher. A few kilometres to the south the Crocodile River, often equated with Shihor-Libnath, separates Asher from the Sharon Plain.¹ Even if this correlation is considered implausible by some scholars, the same river designated the boundary of the Dor region when it was the centre of Solomon's fourth district (Kallai, 1986: 61).

Evidently far from coincidental, the distinct geographical circumstances also induced the city to be situated at a political cross-roads: in the Roman period the city was just beyond the realm of Herod the Great (Schurer, 1979: 120), Herod Agrippa and the Procurators, and at a later date was included with the northern district of the Ptolemais (Baly, 1974: 131; Avi-Yonah, 1979: 116). During the Byzantine period Dor retained its position as a border city, dividing the provinces of Phoenicia and Palestina Prima (Dauphin, 1982-3: 26).

Settlement Patterns

Setting aside the specific social stimuli prompting settlement establishment, expansion and contraction over time, the linear sandstone outcrops elevated above the flat soil horizons at Dor were continuously exploited as ideal foundations from the inception of human occupation in the vicinity. Throughout prehistory and vast tracts of the periods described in Biblical narratives, swampy wastelands, naturally poor in drainage capability, permeated the lowlands of Dor. The availability of raised sandstone platforms, therefore, ought to be accentuated as the dominant criteria influencing the location of settlement.

Accordingly, the earliest regional occupants chose the low undulating rocky hillocks south-east of Hopami islet to commence habitation. Early Bronze Age I and Chalcolithic flints, shards, spindle whorls/fishing-net

weights, and traces of structures surveyed and partially excavated at this site reflect at least semi-permanent residence over an area of some 2.5 km by 4,100 BC. Raban's coastal fieldwork exposed Chalcolithic sequences in the vicinity of the Early Iron Age quay on the northern flank of the Main Bay and also beneath the sand tombola separating the Main and South Bays (Raban and Galili, 1985: 332), confirming the existence of pockets of settlement in this period. Raban presents a case for the appearance of occupation at south Dor in the 5th millennium BC which, as elsewhere along the coastal fringe, "spread onto the top of the coastal sandstone range and into the low ground on its west side" following an original preference for newly formed riverine estuaries (1983a: 226-7).

The major phases of sedenterization, however, are distributed within a 1,100 x 1,000 m expanse of land, roughly rectangular in contour, which both adjoins the Mediterranean Sea and juts seaward to the south-west to form a promontory. Continuous excavations upon the 15 m high artificial mound of Tel Dor verify that occupation commenced at least as early as 2,000 BC and endured into the first third of the 3rd century AD (Stern *et al.*, 1992: 36) when the high Tel was abandoned.

The depth of the Middle/Late Bronze and Early Iron Age strata has complicated appreciation of the morphology of the cities relating to these periods. During the 14 years in which the Hebrew University and affiliated groups have excavated the site, the Persian, Hellenistic and Roman levels have been scrutinized with greatest detail. Though the entire eastern segment of the Tel comprised a carefully planned residential quarter during the 6th century BC, only for the beginning of the Hellenistic period (332 BC) have soundings clarified how the mound was divided into specific sectors: religious sanctuaries were positioned to the west, workshops and warehouses above the Main Bay, and public sports/recreational facilities in the north (Stern, 1994: 219). At this time, the eastern and southern perimeter of the site was occupied by a residential quarter constructed according to formal Hippodamic principles, most closely resembling Olynthus in Greece (Stern, 1982a: 111).

¹ However, according to Kallai's detailed examination "there is no doubt that Asher's allotment does not extend beyond the Carmel but only touches it". Instead, he places the southern limit of Asher at the Kishon river outlet in Haifa and ascribes Dor to Manasseh (1986: 61 and 176).

However, according to Stern Dor was mostly inhabited by Phoenicians, but with a strong Greek core resident (1989: 120-1).

Limited soundings 150 m east of the perimeter of Tel Dor in 1991 exposed an agricultural/industrial zone in the form of two wine press's and the sub-structure of a pottery kiln. Amphora shards compressed within the latter confirm the spread of human occupation beyond the Tel by the second half of the 2nd century BC (Kingsley and Raveh, 1994b: 250-3). As London has carefully asserted, occupational expansion of this form is hardly surprising given that "over emphasis on the excavated large tells distorts our perception of the Bronze and Iron Age societies...Nothing in the archaeological remains implies that the tells were the permanent residences for large parts of the population" (1992: 77). Indeed, a small Middle Bronze IIA settlement surveyed on the second kurkar ridge, immediately south of Dor (Gophna and Beck, 1981: 46), confirms the existence of satellite regional occupation from an early date.

As an autonomous city of Syria, Dor was directly answerable to Roman authorities from 57-55 BC. Between 64/3 BC and AD 210/1 sets of coins were struck depicting Doros, the son of Poseidon and legendary founder of Dor, the goddess Tyche-Astarte, ears of corn and the vine (Meshorer, 1986-7: 63-4). Structures from this period are heavily robbed but include two temples to the west and south-east of the mound, a bath-house, roads, sophisticated sewers, a possible basilica, and part of the incoming aqueduct (Stern, 1980: 211; Stern *et al.*, 1989: 37; Stern *et al.*, 1991: 50). However, the excavators conclude that during the Roman period stagnation and decay had already set in at Dor, "a direct result of nearby Caesarea's development and the construction of a new sophisticated port there...Two port's could not flourish in such close proximity and Dor's population began to dwindle soon after the building of Caesarea..." (Stern, 1994: 319).

Contrary to such a scenario, an ever mounting body of evidence portrays this point of view as biased by one-sided documentary comment from Josephus Flavius and St. Jerome. The former 1st century AD source discounts both Dor and Jaffa as reliable havens, noting their tendency to be "poor harbours because the south-west wind beats on them and always dredges up sand from the sea upon the shore, and thus does not permit a smooth landing..." (Marcus, 1980: 15.333). St. Jerome's translation of Eusebius's *Onomastikon* in

AD 390 defines Dor as deserted (Dahl, 1915: 99).

Dauphin's exposure of a Byzantine basilica at the south-eastern foot of the Tel resoundly confirms a major human presence between AD 337-361 and beyond AD 649 when Bishop Stephen of Dora was introduced to Pope Martin as vicar of the see of Jerusalem (Dauphin, 1982-83: 31). Previously published elements of the underwater work at Dor have also stressed the changing, but continuous role of trade in the Late Roman and Byzantine eras (Raveh and Kingsley, 1991). More recently, the Hebrew University team sampling the Tel have acquiesced after uncovering a Byzantine horizon on the east of the site (Stern and Sharon, 1993: 128).

Silence within 9th-12th century references denotes settlement stagnation in the vicinity of ancient Dor, with the exception of the Crusader outpost of Merle which was perched upon the old acropolis (Archer, 1880: 141). By the time the Chevalier d'Arvieux visited in 1664 (Labat, 1735: 87-91), the town of Tartoura had emerged. Over the following centuries various travelers recorded glimpses of rural life here, usually incorrectly naming the town Tuthera or Mantura (cf. Macaulay, 1984: 67). Tantura, the most common appellation, receives prominent coverage in the description of Napoleon Bonaparte's retreat from Akko. After his navy failed to arrive to assist the retreat to Egypt, Bonaparte ordered much of his artillery to be jettisoned into the waters of Dor (Wachsmann and Raveh, 1984b; Fig. 14, Pl. 6).

Fortifications

Backed against the sea, the local geography was not merely beneficial from a maritime perspective, but was also defensively advantageous. The Carmel Mountains east of Dor constitute a natural barrier and a first line of defence. The kurkar ridge supporting the line of the modern Haifa to Tel Aviv highway would prove a second obstacle, particularly since access through the ridge was very limited with low points almost certainly well-guarded. Arriving in the immediate vicinity of Dor, swampy ground and a barrier of water apparently enclosing the Tel on three sides into the Early Iron Age also combined to complicate attack. Subtle offensives against the city were clearly futile and for this reason Josephus Flavius defines Dor "a fortress hard to be taken" (Marcus, 1966: *Antiquities* XIII, 223:2).

Amongst the list of aborted attempts to besiege the city, historical records describe Antiochus III's

unsuccessful mission in 219 BC, followed by Antiochus VII Sidetes's attempt to shake Tryphon out of the city in 139-8 BC after a military confrontation in Upper Syria. Encamped with what is surely an exaggerated estimate of 120,000 warriors and 8,000 horses, Tryphon still managed to elude his pursuers by sea although Antiochus "surrounded the city, and the ships joined in the attack from the sea; and he worried the city by land and sea, and allowed no one to go out or in". Four sling bullets inscribed with a dedication willing the victory of Tryphon discovered just beyond the walls of Dor (Gera, 1985), confirm the veracity of this encounter.

Throughout extensive periods of the site's lifespan, daunting artificial fortifications contributed to the dilemma of forcing an entry. Four superimposed sequences of defences uncovered on the eastern edge of the mound include a four-chambered gate with a 20.5 m long facade entered by a 4 m wide passage (Stern, 1990: 17). Constructed during the 9th century BC, the system was destroyed in the reign of the Assyrian Tiglath-Pileser in 734/3 BC (Stern, 1988: 8). At the beginning of Assyrian rule, a two-chambered gate was subsequently erected over the old defence, fronted by a flagstone courtyard. Toward the middle of the 4th century BC this gate was also dismantled, according to the excavator, possibly in the course of the Sidonian rebellion against the Persians in 348 BC (Stern, 1988: 8).

The Hellenistic city wall exposed again on the eastern flank of the Tel (to a height exceeding 2 m in some stretches) exemplifies the most substantial fortification system from this period recorded in Israel (Stern, 1985: 175). A line of square towers positioned 30 m apart (Stern, 1982: 109) projected beyond this wall which was established in the last years of Ptolemy II (285-246 BC) and continued to function perhaps as late as the beginning of the 3rd century AD (Stern, 1988: 13). A concentration of over 200 stone catapult balls stashed close to the line of the Hellenistic wall (Stern *et al.*, 1991: 51; Stern *et al.*, 1992: 42) imply heavy artillery would also have protected the city.

The Artificial Harbour Installations

Toward the turn of the century Dahl examined the archaeological and historical sources thematically pertinent to maritime activity at Dor in his pioneering scholarly work *The Materials for the History of Dor* which retains much relevance for modern fieldwork in the area. North of the ancient promontory he identified

numerous coastal structures including a wharf, small jetty, and a large building which "was probably for the accommodation of sailors and traders, used doubtless as a storehouse and a market" (1915: 11). Since these features are laid upon a rocky abrasion platform, not even a small boat could expect to leap up to the shore at this point.² Rather, these neatly arranged ashlar foundations of two temples (Pl. 8), two-thirds of which have been obliterated by the sea and harsh coastal climate (cf. Stern and Sharon, 1993: 131).

The maritime appraisal of this coastal stretch closely echoes Guérin's earlier description (1875: 306-308) which we may assume served as Dahl's raw material. In the light of contemporary fieldwork, Guérin's report emerges as largely accurate and, in sections instructive, even though the functional interpretation of some structures is improbable. Strolling from the south to the north of Dor, the following caught the eye:

"A shallow cove curves in front of the village; a small vessel lies at anchor at the moment. Three or four small islands shelter it from the open sea, against the westerly winds, subduing the violence of the waves. It is, moreover, defended from the north by a rocky point which sticks out into the sea in the form of a promontory. Here and there, this small headland was formerly exploited as a quarry. In the midst of the sand which partly covers the surface, a number of lilies have taken root and emit a delicious fragrance.

To the north and an insubstantial distance from this cove, one perceives the ancient port of Dora, defined by two promontories, which used to jut further out into the sea by means of two artificial moles. The southern mole is almost completely destroyed. As for the northern mole, several large fragments still remain there. The promontory which it has exploited was previously fortified. Towards its end and at its highest point, the remains of a high tower are observed, constructed out of very regularly arranged medium size stones, which do not appear to date beyond the Crusades. To the west, and at the foot of the promontory, the rocks were excavated so as to form two sorts of small pools which, from this side, served at the same time as moats for the tower which I mentioned. The gigantic sea-wall, only remains of this

² Contrary to the opinion expressed in Kingsley and Raveh, 1994a, the coastal structure discussed by Dahl (1915: 11) is not identifiable with the large rectangular foundations on the southern edge of the North Bay.

tower it is true, testifies along with the nature of its construction and the lancet arch that can be observed there that it probably dates to the time of the Crusades, as I have just said; but the substructures which cover the sides of the same promontory are much more ancient and prove that it must have been fortified since antiquity.

To the east of the debris from this tower, upon the upper platform of this headland, several column drums are still driven into the sand. Then, more to the east, the remains of a three-quarter filled in moat is distinguishable, and beyond a dozen large stone column drums are deposited in the sand.

At the foot of this same tower, toward the north, a rather awesome construction seems to have served as a maritime warehouse. It is a rectangular enclosure, still partly standing; it was built with magnificent blocks, perfectly quarried, covered with a thick layer of small stones bonded together by means of excellent cement.

A second construction was connected with this construction, of lesser dimension, but built in the same manner; today it is three-quarters fallen down. Some huge blocks arranged in stairs lead, near there, to a quay paved with immense slabs.

Further north, a small headland sticks out into the sea. Several well-cut, wide stones are still in position. Yet further north, around another small bay, one encounters foundations of warehouses built with beautiful sizable stones. To the west, this cove is protected by an islet against the winds which blow from this direction.

Continuing to walk along the beach in a northern direction, one arrives at a long wall extending up to the sea, like a kind of dyke, and a quay paved with large slabs. Then a third cove follows, shaped like a semi-circle, which an islet similarly shelters against the winds. Some fifteen columns bearing squared bases lie around in the sand. A line of dunes dominates the west, parallel to the shore. All the expanse which we have just covered can, perhaps, be estimated at 1,200 m" (Guérin, 1875: 306-308).³

With the exception of the invalid assumption that the temple foundations at the foot of the Crusader tower were ancient maritime warehouses, Guérin's careful record compares strikingly faithfully with present topographic appraisals. The 'dyke' in the North Bay still dominates the landscape (Pl. 9) and the columns

with squared bases, surely associated with the North Bay quay (see below), still temporarily rise above the sand profile. What Guérin observed, therefore, to impel him to define the Main Bay the ancient port, complete with artificial moles, is perplexing.

At the present stage of investigation, we may merely note that geographically this poorly sheltered zone is ill-suited for harbour construction. Nevertheless, at least six column bases, large grey-veined and blue marble blocks over one metre long have been noted in the north-eastern corner of this bay. Similarly, kurkar columns are strewn close to shore in the southernmost corner of the bay, along with spreads of ashlar masonry and a square-cut feature, at least 2.5 m wide. On one occasion in 1989 when the sand accumulation retreated at this point, the man-made square feature descended over 2 m beneath msl and was fronted to the west by a floor. Since the sea-level never fluctuated by 2 m in the Roman era, this either signifies the subsidence of a quarried surface or a limited attempt at breakwater construction.

The most substantial traces of harbour-works, however, are concentrated in Zone C. Between 1983-4, the Center for Maritime Studies at Haifa University surveyed and partially excavated the enigmatic variety of installations strewn along the southern corner of the North Bay under the direction of Raban. A large rectangular structure was dated to the 2nd-3rd century AD and interpreted as a probable public storage place and the side of a 30 x 40 m inner harbour which served small freighters and fishing boats from at least the 5th century BC until the Byzantine era (1 in Fig. 15). The intrusion of sand into the heart of the bay was combated by three de-silt channels (each of which corresponds to sea-level changes), which served the harbour between the Hellenistic period and Late Antiquity (Raban and Galili, 1985: 339-341).

In 1988 two mooring stones (2 in Fig. 15, Pl. 10) were discovered 38.8 m north-east of the north-eastern corner of the Late Roman storage building amongst a mass of masonry (Kingsley and Raveh, 1994a). They measure 101 x 93 cm and 107 x 98 cm and lie 25.6 m apart on a north-south axis. Unparalleled in the Mediterranean, the moorings are associated with a quay believed to be concealed beneath the sand and a jetty and tower extending at right angles to the quay into the middle of the bay (Raveh, 1988-9: 50). The moorings are assumed to be related to the large Late Roman rectangular structure and should pre-date the early 3rd century AD when the sea reached + 0.7-0.8 m above

msl, flooding both the quay and rectangular structure.

Juxtaposed immediately south of the de-silt channels in the North Bay are an intricate series of shallow rock-cut basins and structures served by a low-level aqueduct which conveyed fresh water to the harbour quarter from sources about 4 km away (Peleg, 1984: 13-15). Raban interprets the facility as a purple dye factory (1981: 20-1) operational between the 2nd-3rd century AD and also during the 6th century AD (Raban and Galili, 1985: 343). Although the reasons for the construction of the formal harbour at North Dor are almost certainly multi-dimensional, the likelihood that development was determined by the success and profitability of the purple dye industry is a logical suspicion.

Trade Importation

As a primary maritime contact zone and the first link in the diffusion of prestige goods and common merchandise, a cosmopolitan material culture has been revealed within Dor. The earliest deposits excavated date to the Middle Bronze IIA (2,000-1,750 BC), and less than one metre above bedrock a Middle Bronze IIC/Late Bronze IA horizon has been penetrated in the vicinity of the dry-docks. The material culture from this phase includes large quantities of fragments of imported vessels such as Monochrome bowls, Red-on-Black shards, White Painted wares, faience tiles and fragments of a faience bowl (Stern and Sharon, 1987: 203-5). White painted and bichrome Cypro-Geometric fragments from at least eight imported pottery vessels from Phase 9 within Area B1 from the 2nd half of the 11th century and first decades of the 10th century BC compare in quantity to contexts from Tyre (Gilboa, 1989; Yellin, 1989).

Several hundred decorated wares from Euboea, Corinth and the Greek islands recovered from 6th century BC Persian levels form the largest and most varied of such assemblages within the Eastern Mediterranean (Stern, 1994: 183). Hellenistic strata within the residential quarter yielded quantities of imported ceramic braziers (Rahmani, 1984: 230), apparently originating in the Aegean (Gunneweg and Perlman, 1984: 235). Practically every house of this period contained Greek amphorae from Rhodes, Chios, Cnidos, Thasos and Samos (Stern, 1994: 183 and 237). In the later periods Megarian bowls, Terra Sigillata, and oil lamps are very common (Stern, 1994: 229-31).

Trade Exportation

Long before Dor was approached as a possible excavation site, the city was recognized as an eminent producer of lavish purple dye. Writing in the 1st century AD, Claudius Iolaus's historical narrative suggests Dor had gained a reputation as a traditional purveyor: "Next to Caesarea lies Dor, a very small town inhabited by Phoenicians. These settled here because of the somewhat rocky nature of the beaches and the abundance of the purple-fish. At first they built themselves cabins, about which they placed stakes. When their business prospered, however, they split the rocks, and with the stones thus set free they built city-walls, and made a harbour with good and safe anchorage. They called the place in their native tongue Dor. But the Greeks, for the sake of its more pleasing sound, agreed to call the city Dora. And some make the statement that Doros, the son of Poseidon, was its founder" (Dahl, 1915: 94).

A rare city coin of AD 66/7 features a murex shell on the reverse side (Meshorer, 1986-7: 64), acknowledging the role of purple dye production within the Roman city's economy. Following soundings adjacent to the North Bay at Dor, Raban identified the series of rock-cut pools scattered close to shore as the physical vestiges of this industry. Further progress in clarifying the scale and chronology of regional production has been revealed on the Tel in Area D2 in the form of pits filled with amphorae, slag, crucible fragments and industrial dye waste (Stern *et al.*, 1991: 53). A thick deposit of dump material including shells and complete storage jars from the centre of the town and an intact manufacturing installation in Area D1 on the south-western edge of the Tel (Stern and Sharon, 1987: 208) confirms purple-dye production was already well-established by the Persian period. The large quantities of spindle whorls uncovered throughout the city by the Hebrew University team may also suggest that the wool and cloth required for dyeing was also prepared locally.

Although pottery production is attested at Dor (Ariel *et al.*, 1985; Kingsley and Raveh, 1994b), the diffusion of the amphora form beyond the mother city is sufficiently thin to conclude fabrication was aimed at a purely regional market. Safrai's treatise on the Roman economy argues that between the Roman and Byzantine period stone quarrying was also a major industry at Dor (1994: 212 and 422).

³ Translation from the French original by Sean Kingsley.

Historical Summary of Dor⁴

13th c. BC	Earliest reference to Dor, in a topographic list in reign of Ramesses II.
Late 13th BC	King of Dor overcome by Joshua (Joshua:12: 23).
1076 BC	Egyptian priest Wenamun sails into the Sikuli Sea People harbour at Dor.
Mid 11th BC	Sikuli city destroyed
1000-925 BC	In reigns of David and Solomon Dor functioned as the Israelite United Monarchy's main port. Under Ben-abinadab the city is developed as the capital of Solomon's 4th district (1 Kings 4:11).
733 BC	Assyrian conquest of Dor by Tiglath-Pileser III.
676 BC	In a treaty between King Esarhaddon of Assyria and King Baal of Tyre, Dor is granted to Tyre.
Late 6th BC	Eshmunezer inscription describes Dor as handed to the Sidonians.
219 BC	Antiochus III unsuccessfully besieges the city.
205 BC	First coin struck at Dor under Ptolemy V.
138-7 BC	Dor serves as a stronghold for Diodotus-Tryphon in a war against Antiochus VII.
Late 2nd BC	The tyrant Zoilus rules Dor and Straton's Tower.
64-3 BC	Year 1 of quasi-autonomous coin mint production at Dor.
63 BC	Pompey removes Dor from Hasmonaean realm and restores its autonomy.
57 BC	City becomes an autonomous city of Syria, under direct Roman rule.
34 BC	Dor is handed to Cleopatra by Antony as a gift, before defeat at Actium in 31 BC.
AD 41-44	In reign of Agrippa I Dor's pagans erect an imperial statue in the synagogue. Governor of Syria intercedes in favour of the Jewish population.
AD 210/11	Final year of coin mintage.
AD 390	St. Jerome describes Dor as deserted.
Late 12th AD	Crusader's build the castle of Merle on the summit of Dor. King Richard I spent a night here in 1191.
1664	The Chevalier d'Arvieux witnesses the wreckage of a Greek ship at Tantura.
1799	On May 20th Napoleon Bonaparte camped at Tantura after defeat at Akko. Rifles, cannons and artillery dumped in the bay.
1923-4	First excavations at Dor, under John Garstang.
March 1938	Jewish clandestine immigrants from Greece safely landed at Tantura.

⁴ The majority of these citations are derived from Dahl, 1915, Schurer, 1979 and Stern, 1994. Otherwise see Egberts, 1991 for the voyage of Wenamun, Meshorer, 1986-87 for the coins of Dor, and Naor, 1987 for lists of clandestine immigration.

CHAPTER 4 MILLSTONES AND MISCELLANEOUS STONE OBJECTS

Millstones

Millstones of assorted shape, size and form, spanning wide chronological parameters, are a prominent class of artefact deposited offshore at Dor. Several (MT 11, MT 12 and MT 15) appear to have been unceremoniously rolled off the summit of the principal city, a crude method of disposal. Although the specific context can neither corroborate nor negate the prospect, others (MT 09 and MT 10) conceivably originated from a ship's galley where they were employed in on-board food processing. Thirdly, certainly the collection of archaic saddle-querns (MT 01 - MT 08), and perhaps the large circular millstones (MT 16 and MT 17), represent the durable remnants of a compound cargo.

Unintentionally, Gordon Childe predicted the plausibility of discerning millstones in association with shipwrecks and other maritime contexts several decades ago through an understanding of the nature of millstone use and circulation in the Mediterranean. During the Phoenicians circumnavigation of Africa, Childe proposed the voyagers would have "carried mills for grinding the grain, and on shipboard hand-mills would be more appropriate than the heavy stationary mills...An enterprising merchant-captain would be likely to secure the most efficient hand-mill as a general rule" (1943: 25).

Childe's opinion that the Roman army functioned as agents in the diffusion of rotary querns may be outdated, but his depth of vision has been expanded upon in recent years to concur that at the height of the Roman Empire millstones were indeed circulated over great distances. Petrological analysis of rock formations around the Mediterranean basin confirm that with the international expansion of Roman culture, the highest quality millstones composed of Mulgarian red rhyolite rock from Sardinia and Orvieto leucite rock from Italy (Peacock, 1980) might be exported as far as 1,500 km from the source (Williams-Thorpe, 1988: 285; Williams-Thorpe and Thorpe, 1989). Rather than concluding the army acted as a catalyst for millstone dissemination, Williams-Thorpe has suggested that the general pattern of exports trend toward a view that these stones travelled outward on ships collecting the grain tax vital for Rome's sustained wealth (1988: 286).

Scale and management of production and export, plus technological improvements in the finished product, are the three main criteria which distinguish the approach to bulk trade in millstones during the Roman period from the preceding centuries. Curiously, although the tangible archaeological manifestations of large-scale intensive Roman millstone exportations have not yet been subjected to underwater confirmation, 4th century BC wreck sites off Kyrenia in Cyprus and El Sec in Majorca underline the intensity and frequency of pre-Roman trade. At the moment she demised around 310-300 BC (Parker, 1992: 231)¹ the former ship carried an assortment of twenty-nine hopper-rubbers positioned on one side of the hull in three rows to compensate the ballast displacement and possibly to be sold-on at a later date (Katsev, 1969: 57; Katsev, 1970: 8). About forty-two upper and lower parts of hopper-rubber millstones from the Greek wreck El Sec dated to 375-350 BC were also accompanied by two large rotary mills (Williams-Thorpe and Thorpe, 1990: 115-7).² To these wreck concentrations the archaic saddle-querns lost opposite the southern, shore-side tip of Tafat islet at Dor (MT 01 - MT 08) may be presented as an example of classic pre-Roman millstone trade.

Millstone Chronology

The recognized tendency for amphora forms to remain unaltered for decades and occasionally centuries is compounded in the case of millstones, even more inferior indicators of chronology: following invention, limited trial and error, adoption was widespread and generally continuous throughout much of the Mediterranean. The archaic saddle-quern type (MT 01-MT 08) is present in contexts of the mid-6th century BC on the acropolis at Morgantina in Sicily, and continues in abundance to the end of the 5th century BC. By the early 4th century BC the form was no longer dominant (Type 1B in White, 1963). Fourteen of the querns from Olynthus are associated with a

¹ Radiocarbon analysis of almonds stored within the wreck provide a date of 288 ± 62 BC for the act of wreckage. The latest coin from the site dates to 306 BC (Katsev, 1970: 14).

² Parker favours a date range of 360-340 BC for the shipwreck (1992: 392).

Conclusion

Trade and Trepidation at Dor

Even during the initial pioneering years of exploration within the Mediterranean Sea, marine archaeologists tagged their pursuit "the recovery and interpretation of human remains and cultural materials of the past from underwater by archaeologists" (Goggin, 1960: 350).¹ Preceding pages of the present volume described, catalogued and partially assessed the artefactual material from the waters of Dor. Although, as ever, the inquisitive archaeologist retains far more questions than supplies answers, an attempt to synthesize the results will follow with a number of models constructed to deliberate on the exploitation of the harbour under scrutiny. Since the translation of the past figuratively resembles the interpretation of a theatrical stage play, open to numerous personal, artistic and intellectual adaptations (Tilley, 1989: 278), the issues discussed below will stimulate various degrees of agreement and opposition. Such debate, in an open forum, is wholeheartedly welcomed.

Dor: Harbour, Anchorage or Ship's Graveyard?

Fifteen years of underwater exploration, in combination with the availability of historical texts ancient and modern, resoundly establish that the pendulum of fortune did not maintain a consistent beat throughout the harbour's history. Although levels of trade ebbed and flowed with the surges of civilization, a general maritime presence seems to have prevailed into the first half of the 20th century. Despite Thompson's dismissal of Tantura as "a sad and sickly hamlet of wretched huts, on a bare seabeach, with a marshy flat between it and the eastern hills" (1880: 67), large quantities of the locally cultivated produce, including corn, barley and cotton were still transhipped from Tantura during the early 19th century (Robinson, 1837: 192), with local charcoal exported in 1883 (Wachsmann and Raveh, 1984a: 236). Estimates of the town's population in this period range from about 1,200 people (Guérin, 1875: 306), to Buckingham's consensus that about 500 Mohammedans occupied 40-50 dwellings (1821: 125).

¹ Our italic emphasis.

As Oliphant observed in the course of a storm at Tantura, when native craft sought shelter behind the islets, boats at anchor defied any gale (1887: 16). Consequently, the local population seems to have guarded this asset, enforcing a tax of nine shillings per head on passengers and mariners compelled into the anchorage by adverse climatic conditions (Pococke, 1745: 57-8). More than a century later Tantura employed a custom-house official called Abu Habib (Wilson, 1881: 119), and as late as 1937 the Hydrographic Department of the English Admiralty recognized Tantura as "an approved landing place situated on the sandy beach inside some black rocky islets" (1937: 180).

If a definition of a port emphasizes the necessary proximity of man-made installations such as wharves, quays or lighthouses, then from a technical perspective Dor only achieved eligibility in several periods. During the Early Iron Age a quay and well straddled the southernmost flank of the Sikuli town (Raban, 1987). The Hellenistic dry-dock (Raban, 1981b: 17-18), now isolated on the north-western spur of the city, was probably a segment of a more substantial design in its day. Though restricted in efficiency by size and lack of protective breakwaters, the North Bay is studded with the most impressive vestiges of a man-made port (Kingsley and Raveh, 1994a) and apparently served the mother city between the Hellenistic period and into Late Antiquity (Raban and Galili, 1985: 341). Amongst the phases when the city boasted artificial maritime installations extend vast stretches of time when the available archaeological sources denote a total absence of such amenities.

Just as recent approaches toward socio-economic interpretations of ancient harbours stress the abnormality of large ports, emphasizing that most trade of the Roman Empire transpired in very simple ports of the coastal cities with no maritime facilities at all or coastal cities with no maritime facilities at all (Houston, 1988: 560), so the notion that Dor may have been restricted by a lack of advanced loading and unloading services is simplistic. A cursory glance at the history of three of the Mediterranean's most celebrated ports accentuates the point.

Even though the task of completing the Claudian harbour at Ostia is deemed a more extensive and complex undertaking than cutting an outlet to Fucine Lake, a venture which occupied a massive labour force of 30,000 people for eleven years according to Suetonius, the final product still failed to prevent the wreckage of 200 ships within the Claudian moles in AD 62 (Meiggs, 1973: 55 and 58). The quays and mooring facilities of Severan Leptis Magna (Bartoccini, 1960: 18), virtually unused and landlocked today, also serve as an illustration on how the decision to erect a monumental port is not purely decided on economic matters: born and bred at Leptis, Severus exempted the city from the land tax and provided funding for the improvements of the city's institutions after revisiting in AD 202 (Lennox Manton, 1988: 71). Closer to Dor, the history of Caesarea, established partially to flatter Caesar Augustus (Beebe, 1983), again displays the political element often embedded in the equation dictating port establishment.

Graced with wide, sandy beaches shadowed by an almost uninterrupted chain of offshore islets, whichever culture possessed Dor was saved the arduous task of worrying about harbour installation maintenance and, to a large extent, the avoidance of siltation. The geomorphology sculpted a natural anchorage, and nature sustained its perpetual service. Possibly motivated by the shallow depth on the lee side of the southern islet chain which facilitated direct anchoring onto the seabed, no attempts to adapt the rock platforms into a proto-harbour (Frost, 1972a: 97; Frost, 1991b) were apparently warranted in antiquity. In relative terms, the open-ended islets and half-sheltered coves at Dor may contrast feebly with the geographical configuration of Greece. But along a shore dubbed merely "a shelf for the casting of wreckage and the roosting of seabirds" (Smith, 1966: 101), Dor was exceptional. As Garstang accurately noticed early in the present century while sampling Tel Dor for the very first time, "compared with the inhospitality of Ascalon and Gaza the port of Dora is a paradise for small vessels, and it was to this fact that it largely owed its ancient greatness" (1924: 45).

Rather than the embodiment of order, with regimented entry and loading/unloading at numbered berths, Dor would have appeared visibly provincial in antiquity to the modern eye. Improvised slipways, cut into the sand and possibly supplemented with wooden rollers, probably supported careening vessels and cluttered the shoreline from the southern edge of the

Tel to the end of Hopami islet. Such a system prevailed on the sandy Isthmus of S. Angelo d'Ischia in the Greek archipelago into the present century, facilitating the beaching of coasters of 80-120 tons using moveable capstans (Ericsson, 1984: 100). At Dor, under similar circumstances, boat and ship repairs could be attended to, fishing nets mended, tales of the open sea exchanged, and anchors stolen. Incoming merchandise simply would be maneuvered to shore in small lighters and then transported by cart into the city store-rooms or market. At the same time water reserves could be replenished from the local sources, abundant in the springs within the Cenomanian strata of the Carmel (Blake and Goldschmidt, 1947: 87).²

Simultaneously, the natural harbour's reputation as a glowing beacon in a tumultuous sea was tinged with cautious respect. Vessels comfortably sheltered from a ferocious storm behind the islet chain anticipated little trouble. However, any ship inadvertently caught in the midst of the same storm, after risking a short-haul voyage along the coast as the sky darkened, might confront the paradox of Dor: approaching the islets with the wind tearing at a sail, uncontrolled entry without respect for the ever-shifting sand-banks and eddying currents swirling around the islets was frequently penalized by wreckage or structural damage to the hull as she grounded on the sands, or shattered against the ominous rocks. Requisite caution accompanying passage into the harbour from the south is epitomized by the concentration of all the sounding leads (for which the context is known) between Hopami and Tafat islets.

The concentration of thirteen shipwrecks in the South Bay, dating between the 13th century BC and 18th century AD, vividly portray how trade at Dor could be accompanied by trepidation. Throughout the site's history, therefore, Dor was perceived as both a harbour, anchorage and ship's graveyard, depending on the set of circumstances under which a vessel arrived in the locality.

² Fresh ground water in the Pleistocene aquifer of the coastal plain flows from the foothills in the east toward the drainage basin of the Mediterranean Sea (Nir and Eldar, 1987: 4; Nir and Eldar-Nir, 1988). Eleven ancient water-wells have been excavated along the Mediterranean shore of Israel, dating between c. 1,300 BC to AD 1,300 (Carmi *et al.*, 1994). Examples at Dor include an Early Iron Age facility of the 12th century BC (Raban, 1983b: 232-4), and numerous other unpublished wells of Byzantine and Arabic date.

Harbour Contamination

Before focusing on aspects of regional trade, the reliability of the data accumulated from the survey programme - pivotal in developing interpretation of the inventory - demands comment. Specifically, are the surface artefact collections representative of the site's total inventory and is the variability in artefact density a valid reflection of the character and frequency of exploitation?

As expected, the chronological spread of maritime deposits examined underwater broadly correspond with the phases attested on Tel Dor. However, several outstanding chronological and spacial anomalies have also been extrapolated, including the virtual absence of sequences dating between the 11th and 7th centuries BC. Does such a lull confirm Dor temporarily reverted to a backwater in these centuries, or can this pattern be explained in relation to sampling deficiencies?

The question is both compounded by uncertainty concerning the typology of anchors relied upon in this transitional period³ and by the possibility of interpreting harbour contamination diametrically: the presence of any maritime archaeological deposits from a specific culture does not unequivocally establish proof of trade transactions within that period. And *vice versa*, absence of anchors and pottery from a given culture need not be categorical confirmation of maritime abstention. The case is influenced by the identity and character of the individual harbour and the essential matter of whether the submerged deposits derived from shipwrecks, deliberate jettison, or carelessness during loading and unloading.

Does the retrieval of 168 pieces of pottery of Punic, Greek and Roman date from the harbour of Lilybaeum, modern Marsala, (Bound and Falsone, 1983: 6-7) mean that port authorities widely established a *laissez faire* attitude toward harbour contamination in antiquity? Or was deliberate jettison confronted by a fine, in the good modern tradition of environmental protection? Could a bare harbour floor simply be the result of a strict code on illicit dumping or habitual dredging? Until these concerns are addressed and a quantitative approach introduced into harbour archaeology, tracing harbour and seasonal anchorage exploitation will remain an issue strewn with ambiguity.

³ The appearance of the composite anchor combining a stone stock with wooden arm/s and shank in the 7th century BC (Bound, 1991: 35-7; Gianfrotta, 1977) overlaps with the demise of the all-stone anchor (Frost, 1982: 269). How the latter changed in shape between the 12th and 7th centuries BC is unclear.

Recently, however, the results of CAHEP operations at Caesarea Maritima between 1980 and 1985 have furnished the first statistical set of data underlining harbour utilisation fluctuations in Israel. The 33.3 % of deposits examined underwater spanning the 1st century BC and 1st century AD coincide with the Herodian port's commercial peak (Oleson *et al.* 1994: 153), verifying that an escalation in the quantity of lost deposits with a rise in trade traffic is not an anomalous trend. By admitting that an intensification of submerged deposits (other than those derived from shipwrecks) seems to denote trade expansion, the I and II periods at Dor seems to have been accompanied by a maritime slump which is curious given the appearance of Cypro-Geometric white painted and bichrome wares on Tel Dor at this time (Gilboa, 1988; Yellin, 1989). On the other hand, the sudden upsurge of contamination during the Late Roman and Byzantine periods forces the case of Dor to be redressed for Late Antiquity, an issue discussed at some length in the following pages.

Quite clearly, the survey programme at Dor confirms that the cultural boundaries, as defined by artefactual criteria, closely corresponds with the natural boundaries, defined by the geographical configuration of the islets. Coverage between the south and north of all three zones is notably patchy, particularly within the large rectangular bounded by E8-E16 and G8-G16 in the South Bay (Figs. 3-4, 7, 9, 11), where the shelter of Tafat and Shehafit islets have allowed the sediment of to stabilize. Similarly, within the screened segment of the Main Bay, the sand level between Grids E1-2 and F1-2 is fairly steady. A glance at the distribution maps plotting anchor and pottery locations within this Bay (Figs. 5-6, 8, 10, 12) depicts heavy concentrations to the north, the area most exposed to the open sea and incoming waves. A short spur protruding into the bay from the southern flank assists merchant vessels anchored within these sub-zones deposited anchors and domestic assemblages with the same frequencies as elsewhere within the harbour, or were subjected to the survey remains insoluble. However, the intensity of the total assemblage extending over sixteen years has minimized bias enabling a sample representative of the total assemblage population within the entire harbour to be gathered. While Middle/Late Bronze Age, Roman and Byzantine anchors, and Persian and Byzantine amphorae may be encountered in both the South and Main Bays, other assemblages seem more restricted in spacial

distribution. The confinement of all trapezoidal lead stocks from composite anchors of the 5th-3rd centuries BC to the Main Bay is notable in this respect.

The comparative sterility of maritime material culture within Dor's North Bay is also instructive when discussing harbour contamination. The low figure of 7.3 % of survey time invested in this zone over the years reflects the paucity of artefacts exposed within the bay. Although this may be partially biased by the elongated ridge protruding just above the water-line enabling a high sand relief to prevail through most of the bay, when sediments have shifted the quality and quantity of contamination confronted in the Main and South Bays is simply absent. Thus, while a few Crusader plates, Persian and Byzantine amphora shards and three stone anchors of indeterminate form and date have been recorded in Zone 3, not one lead or iron anchor element, nor any shipwreck, has been recovered. Minimal deposition, in this case, is probably related to the availability of secure mooring facilities here, the shelter afforded by the bay, and perhaps the circulation of cargo other than amphorae and their contents: if the North Bay harbour was indeed conditioned by the city's flourishing purple-dye industry, the movement of precious Murex shells from ship to shore would be accompanied by the utmost care.

Ship Dimensions

Unlike large tracts of the Mediterranean basin where precipitous cliffs slope steeply downward from the shore, the continental shelf of Israel has a very shallow gradient of less than one degree (Nir, 1965: 4). This factor, compounded by the coastal linearity and associated scarcity of reliable harbour facilities, conditioned the magnitude of merchant vessels operating within the territorial waters of ancient Palestine throughout antiquity. Even though ships of at least 240 tons, with a 10 m beam and 30 m length, required depths of little more than 3 m (Rickman, 1985: 108), the shallow near-shore belt had a limited ship size accommodation capacity, irrespective of the forces of the economy and market fluctuations. For this reason large Roman vessels approaching Dor and Joppa were forced to anchor unsteadily offshore, amongst the elements (Marcus, 1980: 15.333), and rely on small coastal lighters for ship-to-shore merchandise transference. And as the Dor material exemplifies, ship magnitudes therefore tended toward the conservative.

Safrai's assessment, derived from Talmudic sources, that regular-sized ships in Roman Palestine had a

capacity of 180 *seahs* (1,728 kg) and large-sized ships 540 *seahs* (5,184 kg) sounds a reasonable estimate (1994: 289). However, other Talmudic interpretations of a sizeable boat as "large enough so that one would not wobble in it while standing up" and according to water tank capacities, can hardly be accepted as scientifically reliable. Hence, Safrai concludes that generally to "all intents and purposes...it is impossible to determine exact measurements or size regarding the ships which frequented the ports and harbours of the Land of Israel" (Safrai, 1994: 397).⁴

If marine archaeology in Israel cannot yet precisely rectify this situation after only some four decades of fieldwork, comparisons of the sizes and weights of the plethora of anchors lifted from sites like Dor with examples directly associated with Mediterranean shipwrecks will undeniably provide an essential guide to the scale of vessels exploiting a given sea-lane or harbour.

Matching the Dor anchor collection alongside other Mediterranean assemblages verifies near-continuous local maritime exploitation from the Middle Bronze Age to the Crusader period. At the one extreme, the triangular one-hole stone anchor AN 08 weighing 114.2 kg with a length of 77.9 cm may be dated to c. 1900 BC through reference to the Temple of the Obelisks collection in Byblos (Frost, 1969a) and the New-Yam group (Galili, 1985; Galili, 1987). While no comparable form accompanied the Ulu Burun ship to the seabed in the last three decades of the 14th century BC (Pulak, 1994: 15), the wreck yielded twenty-eight stone anchors weighing between 121-207.9 kg, according to most recent publications (Pulak, 1992: 8). Since the densest stone anchor from Dor approaches 170 kg (AN 16) with nine others exceeding 100 kg and six surpassing 120 kg, the material comfortably overlaps with the lightest Ulu Burun examples. Thus, with an estimated length of 15 m (Pulak, 1991: 8) the Ulu Burun ship would have experienced little difficulty navigating the sea-lanes at Dor.

⁴ Concentrating on the Sea of Galilee, Nun has postulated that a fishing boat averaging 4-6 m in length with a capacity of 3-6 people would require an anchor weighing 20-30 kg. Larger boats of 10-12 m with at least four sailors could transport 10-20 passengers, or a cargo of similar magnitude, and needed an anchor weighing at least 50-80 kg (1975: 137). Elsewhere, Nun specifies that small boats up to 5 m long required an anchor of 5-10 kg, medium sized boats 15-25 kg, and larger boats 25-45 kg (1993: 17). Whether Nun refers to a single example or multiples of anchors is uncertain.

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The question of whether merchant vessels anchored within these sub-zones deposited anchors and domestic assemblages with the same frequencies as elsewhere within the harbour, or were subjected to wreckage, remains insoluble. However, the intensity of the survey extending over sixteen years has minimized bias, enabling a sample representative of the total artefact population within the entire harbour to be gathered. While Middle/Late Bronze Age, Roman and Byzantine anchors, and Persian and Byzantine amphorae may be encountered in both the South and Main Bays, other assemblages seem more restricted in spacial

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The comparative sterility of maritime material culture within Dor's North Bay is also instructive when discussing harbour contamination. The low figure of 7.3 % of survey time invested in this zone over the years reflects the paucity of artefacts exposed within the bay. Although this may be partially biased by the elongated ridge protruding just above the water-line enabling a high sand relief to prevail through most of the bay, when sediments have shifted the quality and quantity of contamination confronted in the Main and South Bays is simply absent. Thus, while a few Crusader plates, Persian and Byzantine amphora shards and three stone anchors of indeterminate form and date have been recorded in Zone 3, not one lead or iron anchor element, nor any shipwreck, has been recovered. Minimal deposition, in this case, is probably related to the availability of secure mooring facilities here, the shelter afforded by the bay, and perhaps the circulation of cargo other than amphorae and their contents: if the North Bay harbour was indeed conditioned by the city's flourishing purple-dye industry, the movement of precious Murex shells from ship to shore would be accompanied by the utmost care.

Ship Dimensions

Unlike large tracts of the Mediterranean basin where precipitous cliffs slope steeply downward from the shore, the continental shelf of Israel has a very shallow gradient of less than one degree (Nir, 1965: 4). This factor, compounded by the coastal linearity and associated scarcity of reliable harbour facilities, conditioned the magnitude of merchant vessels operating within the territorial waters of ancient Palestine throughout antiquity. Even though ships of at least 240 tons, with a 10 m beam and 30 m length, required depths of little more than 3 m (Rickman, 1985: 108), the shallow near-shore belt had a limited ship size accommodation capacity, irrespective of the forces of the economy and market fluctuations. For this reason large Roman vessels approaching Dor and Joppa were forced to anchor unsteadily offshore, amongst the elements (Marcus, 1980: 15.333), and rely on small coastal lighters for ship-to-shore merchandise transference. And as the Dor material exemplifies, ship magnitudes therefore tended toward the conservative.

Safrai's assessment, derived from Talmudic sources, that regular-sized ships in Roman Palestine had a

capacity of 180 *seahs* (1,728 kg) and large-sized ships 540 *seahs* (5,184 kg) sounds a reasonable estimate (1994: 289). However, other Talmudic interpretations of a sizeable boat as "large enough so that one would not wobble in it while standing up" and according to water tank capacities, can hardly be accepted as scientifically reliable. Hence, Safrai concludes that generally to "all intents and purposes...it is impossible to determine exact measurements or size regarding the ships which frequented the ports and harbours of the Land of Israel" (Safrai, 1994: 397).⁴

If marine archaeology in Israel cannot yet precisely rectify this situation after only some four decades of fieldwork, comparisons of the sizes and weights of the plethora of anchors lifted from sites like Dor with examples directly associated with Mediterranean shipwrecks will undeniably provide an essential guide to the scale of vessels exploiting a given sea-lane or harbour.

Matching the Dor anchor collection alongside other Mediterranean assemblages verifies near-continuous local maritime exploitation from the Middle Bronze Age to the Crusader period. At the one extreme, the triangular one-hole stone anchor AN 08 weighing 114.2 kg with a length of 77.9 cm may be dated to c. 1900 BC through reference to the Temple of the Obelisks collection in Byblos (Frost, 1969a) and the Newe-Yam group (Galili, 1985; Galili, 1987). While no comparable form accompanied the Ulu Burun ship to the seabed in the last three decades of the 14th century BC (Pulak, 1994: 15), the wreck yielded twenty-eight stone anchors weighing between 121-207.9 kg, according to most recent publications (Pulak, 1992: 8). Since the densest stone anchor from Dor approaches 170 kg (AN 16) with nine others exceeding 100 kg and six surpassing 120 kg, the material comfortably overlaps with the lightest Ulu Burun examples. Thus, with an estimated length of 15 m (Pulak, 1991: 8) the Ulu Burun ship would have experienced little difficulty navigating the sea-lanes at Dor.

⁴ Concentrating on the Sea of Galilee, Nun has postulated that a fishing boat averaging 4-6 m in length with a capacity of 3-6 people would require an anchor weighing 20-30 kg. Larger boats of 10-12 m with at least four sailors could transport 10-20 passengers, or a cargo of similar magnitude, and needed an anchor weighing at least 50-80 kg (1975: 137). Elsewhere, Nun specifies that small boats up to 5 m long required an anchor of 5-10 kg, medium sized boats 15-25 kg, and larger boats 25-45 kg (1993: 17). Whether Nun refers to a single example or multiples of anchors is uncertain.

In the course of the later Roman, Byzantine and early Arabic periods, iron anchors deposited offshore range between 0.77-150.4 cm and 7.6-30.8 kg. A Y-shaped example lifted from Dor prior to the present survey programme is now stored at the National Maritime Museum in Haifa and is published as 2 m in length.⁵ Viewing the iron anchors alongside well-dated assemblages, the Dor repertoire once again overlaps with the lightest and smallest examples (see Tables 5-6).⁶

Wrecked off France c. AD 40-50, the 18 m long Dramont D vessel carried three iron anchors measuring 1.85-2.17 m (Joncheray, 1975a: 13). With an estimated length of 12-15 m, one of the anchors on the deep water Isis wreck, which probably foundered in the last quarter of the 4th century AD, is estimated at c. 1.7 m (McCann and Freed, 1994: 49 and 51). The range of four anchors within the 10-12 m long Dramont F vessel dated c. AD 400 spans 1.36-1.70 m (Joncheray, 1977: 6). Two centuries later, when a 20 m long merchant vessel foundered off Yassi Ada in or very soon after AD 626, the eleven T-shaped iron anchors measured between 2-2.565 m with weights of 78.75-141.75 kg (van Doorninck, 1982a: 131 and 134). The eight iron anchors with Y-shaped arms associated with the 15 m long Serçe Limani vessel, wrecked in 1025/6 (Steffy, 1982: 30; van Doorninck, 1988a), at 1.2 and 1.4 m again overlap with the size of iron examples in the Dor collection.⁷ In combination, therefore, irrespective of the small size of the sample for each anchor type, the available evidence blends to suggest that 16-18 m represents the maximum length of Dor. The numerous smaller examples of stone and iron enable a vivid image of a vibrant fishing community to be assembled, with

the shoreline and shallows dotted with numerous colourful fishing craft and lighters.

The Nature of Trade

Whether the product be bronze, lead or stone, natural raw materials were highly valued and safeguarded in the Eastern Mediterranean and continuously subjected to re-cycling.⁸ One naturally occurring resource, however, was copiously abundant on a local basis. Focusing on the rocky shore extending between Dor and Atlit, Safrai argues that while stone quarrying was of minor economic significance throughout most of the country in the Roman era, the extraction of stone was a major industrial pursuit throughout this particular province. Perhaps in the region of 40% of the local population was involved in quarrying during the Roman and Byzantine periods, with 38,400m³ quarried between 100 BC and AD 600 by about 1,828 individuals toiling at any one time (Safrai, 1994: 212-3 and 422).

Although the compilation of such figures can be twisted simply depending on how one arrives at basic assumptions including whether quarrying was purely seasonal, a full-time activity, conducted by the army or the secular sector, the scale of stone extraction was clearly massive throughout these periods. As mentioned in Chapter Two, even the offshore islets were systematically stripped using heavy machinery.

The transportation of roughly-hewn stone to Dor harbour, and diffusion from this point, epitomizes a classic example of local inter-regional trade. Given the large expenditure involved in carting rock over land, we would expect consignments to be shuffled between the coastal cities, arriving at the closest harbour or shoreline to the final destination. Movement by ship is confirmed by the documentation of four wreck sites within Dor: a large spread was exposed in 1991 opposite the Roman temple immediately north of the Main Bay (Grid No. C9.1), and the northern flank of the Main Bay itself is studded with well over thirty

Table 5. Summary of the Dimensions of Anchors from Dor Harbour

Anchor Type	Weight Range kg	Length Range m	Date
stone	25-170	0.31-1.08	c. 2300-700 BC*
stone stocks	—	1.36-1.92	c. 600-340 BC
lead cores	3.2-8.2 each	0.29-0.38	c. 415-280 BC
iron bow-shape	40.9**	0.66-1.11	c. 50 BC-AD 125
iron bow/T-shape	12.75	1.50	c. 2nd-3rd AD
iron T-shape	7.6-30.8	0.75-1.43	c. 5th-7th AD
iron Y-shape	—	1.15-2.0	c. AD 950-1025

* Some examples of the stone anchor assemblage probably date as late as the early 20th century of the present era. The principal period of exploitation is given here.

** Encrusted weight of MA 08. Based on the weight of encrustations covering anchors from the wreck Dor J, the actual iron is probably about half this figure.

Table 6. Anchor Dimensions in Relation to Ancient Mediterranean Ship Lengths*

WreckNo.	Anchors	Type	Date	Weight kg	Length m	Ship Length m
Ulu Burun	28	stone	late 14th/early 13th BC	121-207.9	—	15
Porticello	4	cores lead/wood	415-385 BC	74-123.5	0.8-0.96	17
Ma'agan Michael	1	lead/wood	c. 400 BC	2 x 22	—	13
Comacchio	1	iron bow-shape	25-1 BC	—	2.35	c. 25
Chrétienne H	2	iron bow-shape	AD 15-20	—	2.5	15
Sud-Lavezzi B	3	iron bow-shape	AD 10-30	—	3.5	23.8
Nemi	1	iron bow-shape	AD 35-50	414	3.6	73
Dramont D	3	iron bow/T-shape intermediate	c. AD 40-50	—	1.85-2.17	18
Grand Rouveau	1	iron bow-shape	c. AD 50	—	2.98	c. 15
Isis	4-5	iron T-shape	AD 350-400	—	1.7	12-15
Dramont F	4	iron T-shape	c. AD 400	—	1.36-1.7	12
Yassi Ada A	11	iron T-shape	AD 626	78.75-141.75	2-2.565	20
Agay	3	iron Y-shape	c. AD 950	—	c. 1.25	20-25
Serçe Limani A	8	iron Y-shape	c. AD 1025	50-60	1.2-1.4	15

* For the relevant bibliography see Note 6.

⁵ This anchor features in the catalogue accompanying the Israeli Exhibition at Genoa in 1992, *The Maritime Holy Land* (page 96), for which no editor is credited.

⁶ For the bibliography referring to the anchors from these wrecks see, in chronological order: Ulu Burun (Puluk, 1991: 8; Pulak, 1992: 8), Porticello (Eiseman and Ridgway, 1987: 19), Ma'agan Michael (Rosloff, 1991: 223-4), Comacchio (Berti, 1990: 63), Chrétienne H (Santamaria, 1984: 48 and 52), Sud-Lavezzi B (Liou and Domergue, 1990: 47), Nemi (Speziale, 1931: 314; Steffy, 1994: 71), Dramont D (Joncheray, 1975a: 13), Grand Rouveau (Corsi-Sciallano and Liou, 1985: 65), Isis (McCann and Freed, 1994: 49, 51), Dramont F (Joncheray, 1975b: 119-20; Joncheray, 1977: 6), Yassi Ada A (Haldane, 1985a; van Doorninck, 1982a: 121-31), Agay (Visquis, 1973: Plate 6), Serçe Limani A (Steffy, 1982: 30; van Doorninck, 1988a). For the location of these sites and revised estimates of the date of some of these wrecks, see under the respective entries in Parker, 1992.

⁷ These dimensions have been extracted from the drawings published in van Doorninck, 1988a: 24.

⁸ Broken pieces of bronze implements amongst the cargo from the 13th-12th century BC wreck at Hahotrim were destined for recycling (Wachsmann and Raveh, 1981: 117). One amphora from the Hellenistic wreck at Megadim held an assortment of 100 kg of bronze coins, arrowheads, handles, nails, tacks, ingots, architectural clamps and statue fragments (Misch-Brandl *et al.*, 1985: 12-16; Raban and Galili, 1985: 351-55; Galili, 1992: 27-9). Twenty roofing lead sheets of 750 kg recovered off Sdot Yam exemplify Late Roman recycling (Galili *et al.*, 1993: 68).

rectangular ashlar with surface dimensions of 60 x 25 cm each. In both cases, disproportionate loading seems to have resulted in the carrier turning turtle. In the South Bay, ashlar masonry is once again associated with two shipwrecks, both attributable to the Byzantine period (Dor F and Dor G). Insufficient portions of Dor F were exposed in 1991 to determine whether the stone constitutes ballast or a cargo, but the ashlar on Dor G extend continuously over the site's perimeter and surely served as a primary cargo component.

In the latter two cases, solid confirmation that the rectangular masonry originated from a freshly exploited quarry has not yet been secured. As Oliphant appreciated toward the close of the 19th century, stripping and relocating ancient structures following dilapidation and abandonment was endemic in Palestine: "Unfortunately, since the Turkish occupation,

all the coastal cities have been used as quarries for the construction of mosques and fortifications. The marble and granite pillars and columns, and the curved blocks of stones which formed the outside casings of the walls, have been carried away, leaving nothing but the mere skeletons of ruins as forlorn and desolate as the peasantry who find shelter beneath them" (Oliphant, 1887: 16). The two Byzantine shipwrecks in the South Bay may provide clarification that this process commenced well over a millennia previously.

The transportation of perishable commodities, reflected by the large range of amphorae recovered, typifies a more common and expansive stream of trade conducted within Dor. Twenty-five of the two-handled containers within the Dor collection are bag-shaped, with a low centre of gravity, a very short neck, and ribbing/grooving covering most of the shoulder and

body. Although the form is pre-eminent in nearly all late Byzantine site's throughout Israel, the container's role in trade is largely under-estimated. Yet in the later Byzantine period, the conveniently stowed, compact bag-shaped amphora replaced its Gazan counterpart as the chief storage jar and amphora in Palestine.

Alongside a number of domestic contexts which illustrate how the vessel might contain diverse produce, nearly all of the examples emanating from wreckage and scattered on the harbour floor as isolated debris are pitch-lined, indicative of wine content. But since the container was standard in Byzantine Palestine, does the plethora of material within the bays at Dor imply fortitude merely in regional trade by local coasters? Certainly Dar (1986: 161) has estimated that in the course of one year a normal individual would be expected to obtain and store five jars of oil and no less than fifteen wine jars, figures which maintain a massive local market. However, Safrai's survey of the Roman economy argues that the majority of vineyards in the Land of Israel were cultivated with the express intention of export. The foreign market thus accounted for approximately 35% of general Roman trade (Safrai, 1994: 394 and 401).

The ever-mounting list of discoveries of bag-shaped amphorae beyond the homeland contributes to the reality of large-scale wine export. The trail of finds includes 8th century AD contexts in Syria (Chidiac, 1990: 38) and recent implications that imitation bag-shaped jars were produced in Egypt (Engemann, 1992: 156-7). Examples are also identified at Carthage where the percentage of amphorae originating from the Eastern Mediterranean soared to 25-30% of the total population by c. AD 475-500 (Fulford, 1980: 71). In addition to the corpus from Corinth and Athens, familiarized through Johnson's work (1986: 589-97), other examples may be observed in recent publications from Sarachane in contexts of the late 6th to early 7th centuries AD (Hayes, 1968: 215; Hayes, 1992: 65) and in shop E17 at Sardis where the latest coin dates the context to AD 612-16 (Stephens Crawford, 1990: Fig. 558 and 96-7). Soundings at Chios yielded a fully restorable example (Boardman in Ballance *et al.*, 1989: plate 25.243), and further amphorae also feature along the Black Sea at Histria (Scorpan, 1977: 274). French excavations are also perceiving this class with mounting frequency: six necks were observed in the locality of the wreck Fos 1 (Giacobbi-Lequement, 1987: 171-2) and others at Marseille and Lyon (Bonifay and Villedieu, 1989: 29-31), the western-most distribution of the form. Examples from Period 2B at Marseille

represent 7-9 % of the total Rims/Bases/Handle count and, stratified in a phase of the late 6th or even first half of the 7th century AD (Bonifay, 1986: 271 and 291-2), overlap chronologically with the Dor material.

Both domestically and abroad, a surprisingly poorly-known shipwreck off Turkey undeniably contains the key corpus of amphorae in question. At a depth of 25-35 m, the Iskandil Burnu ship was transporting a mixed cargo when she foundered in the late 6th century AD. The primary cargo within the 18 x 4 m ship is a collection of about 260 bag-shaped amphorae (Lloyd, 1984: 61; Lloyd, 1985: 4-5), clearly obtained at a Palestinian coastal locality. Recovery of this key corpus would boost attempts to define subtle morphological changes in the class during Late Antiquity.

Intensification of Trade in the Byzantine Period

Almost without exception, traditionally archaeologists and historians have linked the development of neighbouring Caesarea Maritima with the inevitable demise of Dor (cf. Dahl, 1915: 79; Peleg, 1984: 10). In this spirit, Sharon surmises that "a further decline occurred...when shortly being annexed to Herod the Great's kingdom, the new port of Caesarea was built on the site of Straton's Tower, a former dominion of Dor...Economic rivalry from this new maritime Center was to prove the final downfall of Dor" (1987: 24). Along identical lines based on excavations upon Tel Dor, where the latest stratum is confined to the first third of the 3rd century AD, Stern disassociates a Byzantine church at the foot of the Tel with broader occupation, concluding "Byzantine Dor was therefore essentially synonymous with the Church" (1994: 32).

The repercussions of these views affect numerous more general studies. In a deliberation over the date of a Jewish inscription uncovered at Binyamina (immediately east of Caesarea), Barag discounts the possibility the script is related to the Pompeian era of Dor because "Dora was deserted in the mid-third century CE (Stern, 1994: 319). The use of the era of Dora about a century and a half after it ceased to exist as a city, in an inscription belonging to a building in the territory of Caesarea, capital of *Palaestina Prima*, is therefore improbable" (Barag, 1994: 179-80). In opposition to this argument, di Segni defends the relation of the inscription with the era of Dora, emphasizing that to "interpret a lapse in the documentation of a city era as evidence of a lapse in the era itself" is misleading: the period spanning the mid-third to early 5th centuries is characterized by a

prominent lack of inscriptions and documents at numerous local cities including Gaza, Gerasa and Scythopolis (di Segni, 1994: 185). Apparently neither scholars are familiar with published literature on the maritime status of Dor in Late Antiquity (cf. Raveh and Kingsley, 1991), nor the publications on the Byzantine ecclesiastic complex (cf. Dauphin, 1993).

The controversial church (now fully excavated by Dauphin) on the north-east edge of the mound encompasses 1000 m² and, beyond Jerusalem, prevails as one of the largest and earliest ecclesiastical basilicas uncovered in Israel (Dauphin, 1986a: 88; Dauphin, 1986b). A *terminus ante quem* for the structure's establishment is granted by a bronze tremessis of Constantius II (AD 337-361). Although the church, unique in plan within Palestine, was destroyed by fire the root of the destruction can neither be attributed to the Persian invasion of 613-4, nor to the Arab conquest of AD 636 (cf. Constantelos, 1973): historical documentation records the retention of a local bishop in AD 649 (Dauphin, 1993: 97).

The discovery of a fragment of rock from Golgotha, the traditional location of the Crucifixion,⁹ leads Dauphin to argue the basilica was a popular rest-point for pilgrims arriving in Palestine and destined for Jerusalem.¹⁰ Tombs containing two saints within the southern aisle provided an opportunity for the sick to undergo incubation, and further enhanced the complex's reputation as a necessary stopping stage (Dauphin, 1982-3: 30). As for Jerome's reference to the desertion of Dor, Dauphin stresses that this statement is extremely misleading since the author was purely concerned "in sites as fossilized embodiments of biblical events", those archaeological vestiges worthy of a visit (1993: 92). Reviewing the testimony of the church, Dauphin concludes the pottery repertoire "underline[s] the role of Byzantine Dora as a major port and road junction on the trade and pilgrim routes linking Egypt and N. Africa to the Syro-Cilician hinterland" (Dauphin, 1981: 118).

Contrary to the conventional judgement, the results of the underwater surveys compellingly validate not only the reality that Dor harbour flourished during the Byzantine period, but establish that between the 4th and 7th centuries AD, the volume of traffic operating

within the harbour achieved levels unsurpassed throughout the site's prolonged history. Within this time span, twenty iron anchors, six shipwrecks and thirty-three of the forty-three total isolated amphora necks are clustered.

The argument for Byzantine intensification at Dor is multi-faceted, but comfortably corresponds with current socio-economic impressions of Byzantine Palestine. With a population density tenfold greater than Gaul (Broshi, 1980: 3-4), the region achieved prosperity unrivalled until today, and "never before had the size of the population, the volume of trade, or the intensity of cultivation reached the extent that it did under Byzantine rule" (Wilken, 1988: 236). Barag's examination of 433 pottery vessels plucked from the sea classified 109 as Byzantine, a figure twice as great as for any of the preceding era's (1963: 17).

Significant in terms of regional trends, Dor's renaissance is closely paralleled at Apollonia to the south, where samples of oak measured 66% in the Persian period, 75% in the Middle Ages, but plummeted to 5% in the Byzantine period when this natural resource was obliterated to fuel the regions thriving glass industry. Simultaneously, the local swamps were drained for the first time, viticulture expanded, and Apollonia developed as the heart of a 60 hectare region (Raine, 1989: 25; Roll and Ayalon, 1989: VI-VII).

The production of wine also inevitably flourished at Dor, at least as early as the Late Roman period (cf. Kingsley and Raveh, 1994b). While touring the vicinity toward the middle of the 19th century Tristram and companions were introduced to a series of wine presses "to which our attention was directed by Mr. Sandwith, their discoverer. In all cases, both on Carmel and elsewhere, a flat or gently sloping rock is made use of for their construction. At the upper end a trough is cut about three feet deep, and four and a half by three and a half feet in length and breadth. Just below this, in the same rock, is hewn out a second trough, fourteen inches deep and four feet by three in size. The two are connected by two or three small holes bored through the rock close to the bottom of the upper trough, so that on the grapes being put in and pressed down, the juice streamed into the lower vat" (Tristram, 1865: 105-6).

A group of some eight wine presses examined c. 2 km north-east of Dor's basilica are likely candidates as those described by Tristram. The proposition that wine was transported from here to Dor harbour for regional and international export in bag-shaped

⁹ For an updated discussion questioning this location, see Gibson and Taylor, 1994: 59.

¹⁰ Another coastal *mutatio* of probable 4th century date could be visited just to the north of Dor at Tel Megadim (Broshi, 1993: 1002).

amphorae during the Byzantine period has been addressed previously (Raveh and Kingsley, 1991: 204) and remains a credible scenario.

Dor in Relation to Caesarea

Past presumptions asserting the construction of Sebastos, the port of Caesarea, induced a trickle-on effect by cornering the restricted regional market and contriving the decline and fall of Dor must now finally be acknowledged as naive. Admittedly, the maritime record covering the Roman period, (including three iron anchors, a lead reinforcement collar, and one amphora neck) proves somewhat meagre. Yet, city coins and weights minted at Dor between the years 64/3 BC and AD 211/2 coincide with Sebastos's operational zenith and proudly display a galley, aphlaston, or the *Tyche* of Dor grasping a ship's rudder or naval standard (Meshorer, 1986-87), registering the prime influence of the sea in serving Dor's economy. In Segal's study of Roman theatres, the diameter of the 2nd-3rd century AD Dor leisure complex is estimated at 60 m, only 2 m smaller than the one at Caesarea which was capable of holding 4,500 people (1995: 51 and 99). If the city of Dor's urban character was indeed dwindling at this time, how can we explain the erection of such a vast 'ghost' theatre?

By the Herodian period the city's North Bay was transformed into the *foci* of purple-dye production, an industry which apparently remained rooted to this location in the 6th century AD (Raban and Galili, 1985: 343). In AD 111/112 Dor's mint was permitted to strike coin issues incorporating the legend 'holy, city of asylum, autonomous, ruler of the seas', a prestigious title usually only bestowed upon particularly large harbour cities such as Tripoli and Sidon in Phoenicia (Meshorer, 1985: 16). Although these issues have received minimal interpretive attention, at least one authority has expressed the opinion that the title was awarded Dor because of its status as a convenient naval station and chief port within its respective district (Dahl, 1915: 91). Since Dor could hardly have fulfilled the role 'ruler of the seas' without controlling some kind of formal protective haven, the partially artificial northern harbour was almost certainly functional by this date (Kingsley and Raveh, 1994a). Even at the moment of inauguration, therefore, Caesarea did not occupy a position of splendid isolation along the local coastline.

However, both this body of water and the anchorage to the south could never have accommodated vast

Roman merchant vessels, such as the 1st century AD 40 m long ship wrecked outside Sebastos's northern breakwater (Fitzgerald, 1989: 8; Fitzgerald, 1990: 36-7; Fitzgerald, 1994), a class of ship which frequented Herod's deep-water harbour. Dor's limited capability was, nevertheless, bolstered by the proliferation of the private entrepreneur in the 4th century AD and general preference toward a reduction in merchant vessel sizes (Lopez, 1959: 71; Raveh and Kingsley, 1991: 200-1). The era when 340-1,300 ton super-tankers transported grain between Egypt, N. Africa and Rome had drawn to a close (cf. Eisman and Ridgway, 1987: 109), and John Moschus's tale of how an unusually heavy early 7th century AD ship of 230 tons was unlaunchable, even with the power of a 300 man work-force (Jones, 1973: 843; van Doorninck, 1972: 139) may hint that standard shipbuilding practices, dormant for centuries, may have become unfamiliar, if not exactly forgotten.

The small rise in sea level at Dor in the early 3rd century AD peaked around AD 600 (Raban and Galili, 1985: 349), elevating the sea to a height 1.2 m greater than today. Chances of ship's hulls grounding on sandbanks thus reduced, and the complexities of navigation were generally eased.

With an estimated 20 acres of hinterland, compared with Caesarea's 237.5 acre back-garden (Broshi, 1980: 4-5), Dor was still positively rustic from an urban perspective. Nevertheless, the haven was always a reliable alternative while Caesarea, with all the financial and political advantages, was in crisis. The Center for Maritime Studies exemplary dedication toward the harbours of Caesarea Maritima, under the overall direction of Raban, has recently focused on the collapse of Herod's creation by discussing traces of shipwrecks scattered over the ancient submerged breakwater. Amongst the twenty-three wrecks which foundered after parts of the port had already subsided (Raban, 1992a: 113-5), the loss of a vessel including ships nails, lead sheeting and lead ingots is most instructive: this merchant vessel sunk soon after AD 81-96 (Raban, 1994: 3), almost immediately following the publication of Josephus's glowing description of the establishment of Sebastos. The demise of Sebastos, therefore, may have been triggered earlier than AD 130, as Fritsch and Ben-Dor postulated (1961: 55).

While the transformation of Sebastos into a Palestinian Atlantis evidently did not impel a universal boycott of Caesarea, the port's maritime supremacy must have become drastically curtailed, with a shift in the character of trade. Byzantine sequences within the

coastal warehouses prove merchandise still reached the shore (Blakely, 1988: 35-9); Byzantine wreckage at Sdot Yam (Galili *et al.*, 1993: 68) denotes a continued maritime presence in Late Antiquity. The escalation in trade in the Late Roman and Byzantine periods at coastal cities like Dor and Apollonia, however, is surely not just coincidental, but, in the opinion of the present writers, partially linked with the loss of Sebastos's structural integrity.

A further pivotal explanation behind this failure to grasp a commercial stranglehold revolves around geography: if Caesarea was the daughter of Edom in the 1st century AD (Holum *et al.*, 1988: 108), graced with glorious public monuments, sophisticated aqueduct systems and a state-of-the-art port, then Dor was parochial. Sebastos was abnormal, Dor typified hundreds of small anchorages and harbours around the Mediterranean basin. Moreover, if the two sites are today no more than fifteen minutes from one another, the two belonged to separate provinces in the Roman period and were thus divided by a psychological and political barrier.

Just as earlier Late Bronze Age city-states of Syria and Palestine had been "caught in a tide of shifting alliances and allegiances as the military and diplomatic might of the main protagonists ebbed and flowed throughout the region" (Merrillees, 1986), so the location of Dor in later periods remained strategically sensitive. Bearing in mind that Dor was never an allotment in Herod the Great's territory, neither of Herod Agrippa's or later of the Procurators, but was included with the northern district of the Ptolemais (Baly, 1974: 131), the dilemma of maritime compatibility reduces in stature.

Even if Herod craved the naturally attractive islets at Dor as the geographic base for a new port, rather than commencing building on a totally open and barren shore, this segment of coast was outside his sphere of control (Avi-Yonah, 1979: 116; Schurer, 1979: 120). If Roman Caesarea was the northernmost city of Palestine, Dor was the southernmost outpost of Phoenicia (Gera and Cotton, 1991: 261): a thick line drawn from the southern tip of the Carmel Mountains curves to the shore midway between Caesarea and Dor (termed Thora) in the Tabula Peutingeriana (Tsafir, 1986: plate 1).

Rather than proposing the two populations were socially unacquainted or hostile, from a maritime perspective both harbours probably dealt with different markets and separate orbits. As a border city throughout large tracts of its existence, we cannot

confirm what nature of privileges the city was rendered, or evaluate the associated benefits accompanying the title 'ruler of the seas'. Whether the unique islet geomorphology at Dor prompted hostility for possession in antiquity and thus directly provoked a regional division, lingers as an outstanding question.

Stemming from the natural harbour configuration, how did the local authorities control entry and taxation? Perhaps the complexity of strictly enforcing maritime legislation caused the harbour to develop into the equivalent of a modern free port, "an area of a port separated from the customs area of a nation by a stockade. Ships may enter such a port, discharge, load, and depart without formalities... Regardless of location a free port, in its strictest sense, involves a plot of ground wherein merchandise is not subject to customs formalities and, at least theoretically, to customs jurisdiction" (Thoman, 1956: 6). Trading in this fashion, is it possible that Dor succeeded in poaching business from Caesarea where port taxes would be rigorously upheld?

Toward the Future

Without epigraphic testimony, extracting pertinent responses to these enquiries is likely to persist in defying routine underwater survey programmes. Even though the establishment of every port, harbour or anchorage is conditioned by a unique set of conditions which may complicate balanced relativity studies, the present project has proven drastically hampered by the unavailability of quantitative data. Comparisons of maritime assemblages between coastal harbour sites may provide artificial definitions since each facility functions in a unique manner, but access to comparative numerical statistics on complete assemblages would enable fluctuations in levels of trade at any one site to be more formally assessed.

The compilations of such a data base, however, relies on a carefully pre-conceived research strategy, a far cry from the Cultural Resource Management approach which dictated most of the underwater surveys at Dor in the earlier years: in the wake of the detrimental impact coastal development has induced in terms of sediment erosion, the greater percentage of underwater surveys in Israel are preoccupied with monitoring and constraining site disturbance by unlicensed divers. In relation to an official Israel Antiquities Authority estimate that 60 % of exposed artefacts are illegally harvested from the sea (Galili and Sharvit, 1992: 273), the vigilance of the on-going surveys at Dor proved a remarkable success,

documenting and safe-guarding endangered deposits immediately after exposure.

Whether or not the maritime archaeological record is indeed being stripped from the seabed at a rate which will eradicate any remaining deposits in 10-20 years time (cf. Galili and Sharvit, 1992: 273) is a profound issue, with far-reaching consequences. Yet alongside the essential struggle to safeguard museum pieces, if a greater appreciation of the vast national maritime heritage is to be extrapolated, then careful sampling followed by publication of the more mundane, rather than the exotic deposits, is an essential future step. As

Sir Flinders Petrie eloquently phrased the matter, a "work that has cost days, weeks, or years of toil has a right to existence. To murder a man a week before his time we call a crime; what are we to call the murder of years of his labour?" (Lipe, 1984: 9).

Part 2 Appendices