



JAFFA'S ANCIENT INLAND HARBOR: HISTORICAL, CARTOGRAPHIC, AND GEOMORPHOLOGICAL DATA

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The context created by recent studies of the geomorphology of Levantine harbors and renewed archaeological research in the Late Bronze Age levels of Tel Yafo (Jaffa) by the Jaffa Cultural Heritage Project have led to efforts to identify the location of a possible inland Bronze and Iron Age harbor at Jaffa, Israel. Although several scholars during the twentieth century speculated about the existence and location of an ancient inland harbor, the extent of the proxy data in support of its identification has never been fully assessed. Nonetheless, a range of historical, cartographic, art historical, topographical, and geomorphological data can be summoned that point to the existence of a body of water that lay to the east of the settlement and mound of ancient Jaffa. This feature is likely a vestige of Jaffa's earliest anchorage or harbor and probably went out of use by the start of the Hellenistic period.

As long as biblical scholars, archaeologists, historians, and geographers have concerned themselves with Jaffa, its identity has revolved around its role as the primary port on the central coast of ancient Israel (Figures 4.1 and 4.2). Were it not for its role as a port, all traditional explanations for Jaffa's location would fail to address its *raison d'être*. It was never regarded as a particularly agriculturally productive region, nor did its immediate environs yield unique natural resources. It did not sit astride an overland route that might explain its near five-millennium-long settlement history, nor do historical sources emphasize Jaffa's independence. Instead, a review of Jaffa's history indicates, to the contrary, that Jaffa's various periods of decline in importance were

always directly related to its decline as a port (see historical overviews in Peilstöcker and Burke 2011). Jaffa's eclipse by another port is first attested with the establishment of Caesarea Maritima during the Early Roman period (Notley 2011:103) and later followed by the construction of Tel Aviv harbor in 1938 and then by the harbor of Ashdod in 1965. To the extent that Jaffa's role as a port revived, this appears to have been in direct relationship to increasing traffic due to religious pilgrimage by Christians, Jews, and, to some extent, Muslims, and added to later by Zionists. Despite historical sources that directly attest Jaffa's role as a port from the Classical period onward, geomorphological changes to the coastline of the southern Levant would suggest that Jaffa's



Figure 4.1. Map of the central and southern Levantine coast. Map by Krister Kowalski.

ancient harbor, during the Bronze and Iron Ages, was not the same harbor that serves the city today. Processes such as those characteristic of many ancient harbors around the Mediterranean, like Ephesus and Miletus, reveal the gradual silting and relocation of these harbors (Brückner et al. 2005; Kraft et al. 2007; Marriner and Morhange 2007; Stock et al. 2013). Nevertheless, no systematic effort has been undertaken to date to confirm an alternative location for the site's most ancient harbor.¹

Here we seek to outline the evidence for an internal Bronze and Iron Age harbor long since obscured by various natural and anthropogenic processes. This effort lays the groundwork for a new research initiative by the Jaffa Cultural Heritage Project, in cooperation with the Institute of Nautical Archaeology, named the Ioppa Maritima Project, one of the primary goals of which is locating the ancient harbor. We begin with the modern evidence that contributes to the recognition of the importance of Jaffa's



Figure 4.2. Map of streets in Tel Aviv-Jaffa showing location of stadium, park, and location of Ayalon and Yarkon rivers. Israel Transverse Mercator (New Israel Grid) projection. *Map by Krister Kowalski.*

ancient harbor, despite the absence of direct evidence for it, and review the earliest references to maritime activities in Jaffa as preserved in early sources such as the Hebrew Bible. This is followed by an examination of the lines of evidence, primarily from the nineteenth century CE, for the swamp located on Jaffa's eastern side that is known in Arabic as al-Bassa. In this context, we present the first effort to generate high-resolution topographic models from satellite data to explore the existence of an extensive drainage depression associated with al-Bassa that is no longer visible at ground level. The combination of this evidence supports the hypothesis that al-Bassa constitutes a portion of the original extent of an earlier body of water, an estuary, that may have functioned as an anchorage or harbor for Jaffa during the Bronze and Iron Ages.

THE RECENT HISTORY OF JAFFA'S HARBOR

The economic and political drawbacks associated with the absence of a good harbor at Jaffa were baldly evident during the nineteenth and early twentieth centuries CE (Kark 1990). Recent assessments of the port during this period reveal the limits of Jaffa's harbor facilities (Mirkin and Goren 2012; see Chapter 6, this volume). Echoing the statements of many visitors to the Holy Land, Baedeker's guidebook, for example, notes that Jaffa features "no good harbor" (Baedeker 1876:6). This statement was intended to reflect a situation whereby large ships were required to anchor west of a chain of rocks that formed a shallow anchorage, and goods and passengers were ferried in lighters through the rocks to the quayside in the harbor on Jaffa's western and northern sides, which lay exposed to the open sea.

G. A. Barton (1904:92) described the unchanged situation by the early twentieth century during his passage from Beirut in 1902:

The harbor at Jaffa is very bad. A half-submerged reef runs along the shore. Ships must cast anchor outside of this, and passengers must go ashore in small boats. This is the system in all of these Eastern harbors, but at Jaffa it is particularly bad, for the unbroken swells of the Mediterranean beat in here, and it is often dangerous to pass the sunken reef under such circumstances.

This situation was aptly captured in the Orientalist painting of Gustav Bauernfeind (see Figure 6.29, this volume; Vosseler 2013:47, fig. 2). Despite the fact that the harbor is depicted in at least one famous nineteenth-century

painting to have featured a stone-built quay on its western and northwestern sides (Figure 4.3), a limited part of it appears to have been useful for loading and unloading cargo from ships, with the stone wall serving primarily as a breakwater protecting the buildings behind it. Elements of this quay were exposed by Jacob Kaplan during his Jaffa harbor (Namal Yafo) excavations carried out in 1978 (Ritter-Kaplan 1978), and the same features were reexposed in 2007 during salvage excavations by the Israel Antiquities Authority conducted for infrastructure upgrades (Haddad 2009).

Despite such facilities, inclement weather and even modest surf wreaked havoc on the small craft ferrying persons and goods from ships offshore that were either too large for the harbor or uncertain of the approach. George Smith states that the reefs at Jaffa "are more dangerous in foul weather than they are useful in fair" (Smith 1932:130–31). During winter, the majority of the boats moored within the mouth of the Yarkon River, and smaller boats were simply beached (Hanauer 1903a:261; Avitsur 1965:30). The same situation is also documented from at least the Crusader period when the pilgrim Saewulf states that more than 1,000 people were killed trying to approach Jaffa, and this may have contributed to prominence of the harbor of Akko over that of Jaffa during the Crusader period (see Boas 2011:122). Hanauer (1903a:261) noted that artificial rock cuttings in the offshore rocks at Jaffa indicated earlier attempts to use the rocks to create a better harbor, but these cannot be reliably dated. Various schemes during the twentieth century were also proposed to dredge the harbor to accommodate larger steamships, build breakwaters (Shacham 2011:fig. 13.10), and connect the quay via tracks to railroads, including plans from an Italian syndicate to fund an operation not to exceed \$7,000,000 to improve the harbor (Anonymous 1922).² As early as the 1830s, questions even lingered about the possible construction of an inland harbor using the "Jaffa marsh" (Avitsur 1965:32).

JAFFA'S HARBOR FROM THE MIDDLE BRONZE AGE TO THE ROMAN PERIOD

Jaffa's significance became inextricably bound to its identity as a port on the southern Levantine coast from at least the beginning of the Middle Bronze Age (MB IIA, ca. 2000–1800 BCE) and continuing through the Persian period. This is borne out by the substantial quantities of imported wares from across the Mediterranean during these



Figure 4.3. *Turkish Recruits Taken to the Ship*, Gustav Bauernfeind (1888) (oil painting, 1.52 × 2.8 m, Dahesh Museum, New York).

periods recovered by excavations both by Jacob Kaplan and the Jaffa Cultural Heritage Project under the direction of Aaron Burke and Martin Peilstöcker (e.g., Epstein 1966:14; Peilstöcker 2011), which are typical of the character and quantity of those recovered from excavated ports along the Levantine coast such as Ashkelon and Akko. Before the Middle Bronze Age, there is limited evidence for Early Bronze (EB) I occupation on the mound of Tel Yafo (Gophna 2002:419) followed by an interlude during the third millennium before settlement resumed in the Middle Bronze IIA (from no later than ca. 1800 BCE). This occupational gap is characteristic of coastal settlements and the issue of EB II–III ports is a highly problematic one along the coast of the southern Levant (see Faust and Ashkenazy 2007, 2009). The limited evidence for other contemporaneous Middle Bronze Age settlements along this central stretch of coast that could have functioned as harbors provides an even stronger argument that Jaffa functioned as the main harbor in this region and served the hinterland to the east, including the hill country (see Burke 2011:64, fig. 6.1). Something about Jaffa, ancient Yapu as it was known, evoked beauty, goodness, or a fair quality. If this was not a reference to the region's or site's appearance (Burke 2011:66), it may actually reflect a characterization of the quality of Jaffa's harbor or anchorage.

Although the existence of a harbor in Jaffa during the Late Bronze Age is hardly in doubt, it receives no

mention in Egyptian sources during the New Kingdom, ca. 1550–1075 BCE. Ample Mycenaean, Cypriot, and Egyptian imported wares suggest the port's role in this commerce during this period. Indeed, the port also likely functioned as a strategic supply point for Egyptian forces campaigning in the southern Levant (Burke 2011:68), as well as a point for the disembarking of troops when necessary. Beginning in year 31 of Thutmose III, his annals refer to the annual inspection and stocking of Levantine harbors in support of his military expeditions (Säve-Söderbergh 1946:33–36; Wachsmann 1998:10). It is generally accepted that Jaffa played a role in such a staging effort (see Morris 2005:138–139, n. 90). The site's strategic importance to the Egyptians is revealed in the *Tale of the Capture of Jaffa* in which the Egyptian commander was forced to recapture the fortress from insurgent Canaanites through a ruse (Allen 2001). Jaffa's possible identification as an *htm*-fortress in Egyptian, first suggested by Ellen Morris (2005:158–159), may have permitted it to block access to routes and to limit access to the central coast by maritime traffic. This would be particularly true if the harbor was situated in an estuary with a narrow connection to the sea to the north of the tell.

It is during the Iron Age that biblical sources suggest Jaffa's role in connection with the transport of Phoenician timber for the construction of the First Temple and palaces in Jerusalem, revealing its role as an Iron Age port of call for the southern Levantine hinterland, including Jerusalem

and the hill country. In this context, it is important to note that, despite this role, there is no archaeological or textual evidence for an Israelite or Judean presence in Jaffa during the Iron Age. Likewise, the question of a Sea Peoples or Philistine presence at the site remains open, despite the presence of Philistine ceramics (Burke 2011:70–71, fig. 6.5).

The biblical text provides the first indications of Jaffa's maritime activity during the Iron Age, in connection with joint ventures between the Phoenician king, Hiram of Tyre, and the Israelite king, Solomon, originating with the latter's request for both laborers (1 Kings 5:1–10) and cedars from Lebanon (1 Kings 5:6). Solomon wrote,

Therefore command that cedars from the Lebanon be cut for me. My servants will join your servants, and I will give you whatever wages you set for your servants; for you know that there is no one among us who knows how to cut timber like the Sidonians [1 Kings 5:6, NRSV].

The tradition also preserves Hiram's reply:

Hiram sent word to Solomon, "I have heard the message that you have sent to me; I will fulfill all your needs in the matter of cedar and cypress timber. My servants shall bring it down to the sea from the Lebanon; I will make it into rafts to go by sea to the place you indicate. I will have them broken up there for you to take away. And you shall meet my needs by providing food for my household" [1 Kings 5:8, NRSV].

In addition to the timber and laborers, the context for these interactions, according to the biblical account, would also likely have included the passage of craftsmen such as the Gebalites (Byblites), who were sent to Jerusalem for stone cutting (1 Kings 5:18). Jaffa is, however, never mentioned explicitly in the account in Kings but is instead read into the text on the basis of the Persian period retelling of the tradition in Chronicles, discussed below. A scene from Sargon II's reliefs at Khorsabad in which Phoenicians are shown towing logs behind ships, most likely on the Mediterranean Sea, is evocative, however, of the maritime activity related in the passage in 1 Kings (Botta and Flandin 1849–1850 (I):pl. 33; Basch 1987:306–307, figs. 650–651).

Jaffa is explicitly mentioned by name in connection with the transport of timber for the first time only in the Persian period biblical text of Chronicles:

We will cut whatever timber you need from Lebanon, and bring it to you as rafts by sea to *Jaffa*; you will take it up to Jerusalem [2 Chronicles 2:16, NRSV].

Likewise, in the roughly contemporaneous account of Ezra concerning the rebuilding of the temple in Jerusalem during

the late sixth century BCE, Jaffa is once again explicitly mentioned.

So they gave money to the masons and the carpenters, and food, drink, and oil to the Sidonians and the Tyrians to bring cedar trees from Lebanon to the sea, to *Jaffa*, according to the grant that they had from King Cyrus of Persia [Ezra 3:7, NRSV].

Despite that the direct reference to Jaffa originates in biblical traditions authored during the Persian period, there is no real reason not to accept that Jaffa was meant to be identified with the place Solomon requested the timbers to be sent, if one accepts the importation of at least cedar through Jaffa during the Iron Age. The recovery by the Jaffa Cultural Heritage Project's excavation of more than two dozen cedar beams from the Egyptian New Kingdom Ramesside gate complex (LB IIB) in Jaffa in 2013 lends credibility to Jaffa's potential role in such a trade corridor dating no later than the Late Bronze Age (before ca. 1100 BCE).

It is also from Jaffa that Jonah, the Bible recalls, embarked on a ship heading to Tarshish, basically the contemporaneous equivalent of fleeing to "the end of the earth":

But Jonah set out to flee to Tarshish from the presence of the Lord. He went down to Joppa and found a ship going to Tarshish; so he paid his fare and went on board, to go with them to Tarshish, away from the presence of the Lord [Jonah 1:3, NRSV].

The embedded reality in this passage is that Jaffa's harbor was recognized for its ability to handle some of the largest seagoing ships of the day, which were used on the run to Tarshish and are referenced elsewhere in the Bible (1 Kings 22:47; 2 Chronicles 9:21; Wachsmann 1990:78, 80; 1998:159, 299). Jaffa, therefore, at the time of the writing of the Book of Jonah was recognized to be an important harbor from which one could embark by ship to distant shores.

While these texts evoke Jaffa's importance as a seaport to the Israelite hinterland, they provide clues neither as to the precise location of Jaffa's early harbor or anchorages nor its geography. The most direct discussion of Jaffa's harbor is only to be found in the Early Roman period in the work of Josephus, whose statements about the location of the port during the first century CE provide the earliest description of the quality of the facilities at the time, which was likely a major factor in the selection of Caesarea Maritima as a replacement during Herod's reign. His comments reveal the absence of any inland harbor at Jaffa by at least the Roman

period. Josephus describes the seaside rocky enclosure located west of Tel Yafo:

Now Joppa is not naturally a haven (lit. *harborless*; Gk. ἀλιμενος), for it ends in a rough shore, where all the rest of it is straight, but the two ends bend towards each other, where there are deep precipices and great stones that jut out into the sea, and where the chains wherewith Andromeda was bound have left their footsteps, which attest to the antiquity of that fable; but the north wind opposes and beats upon the shore, and dashes mighty waves against the rocks which receive them [Josephus, *B.J.* 3.9.3].

This text indicates the poor quality of Jaffa's Roman period harbor, describing it as harborless (Greek: ἀλιμενος). This casts serious doubt on its also serving as the location of the earliest harbor since if it had always been without a natural harbor, other locations, such as the Yarkon River, would more likely have served as the functional port for this stretch of coast.

Based on other examples along the Levantine coast, it seems likely that Jaffa had previously exploited the estuary created behind the outflow of the Yarkon River, if not also the Ayalon River as originally suggested by J. E. Hanauer (1903a) and followed later by A. Raban (1985:27). Dredging of the modern harbor during S. Wachsmann's tenure as the Inspector of Underwater Antiquities in the Israel Department of Antiquities and Museums removed sand that was virtually sterile. Wachsmann suspects that the dearth of artifacts resulted from massive dredging during the British Mandatory period. The earliest remains originating from efforts to explore the harbor in modern times included a fourth-century BCE Persian period basket handle from a jar, which was found south of the modern harbor with some later finds dated to the Roman and Byzantine periods (Sharvit and Galili 2002; Foran 2011:112).³

FACTORS AFFECTING THE IDENTIFICATION OF JAFFA'S ANCIENT HARBOR

A number of factors have limited the prior identification of Jaffa's and other early harbors along the Levantine coast. As Avner Raban noted, the main hindrance for harbors on the Mediterranean coast south of Carmel is the shallow water and shifting sands along the sea floor (Raban 1985:11). Coastal evolution associated with relative sea-level change and an abundance of Nilotic sand that

is carried north (Stanley 1989) have resulted in a barrier accretion plain that obscures former marine embayments and potential ancient harbors. As G. A. Smith wrote, "While the cruelty of many another wild coast is known by the wrecks of ships, the Syrian shore south of Carmel is strewn with the fiercer wreckage of harbors" (Smith 1932:131).

In recent years, extensive investigations have been undertaken to locate a number of ancient harbors along the Levantine coasts of Syria, Lebanon, and the Gaza Strip. Among the ports studied to date are Ras Ibn Hani (Marriner et al. 2012), Beirut (Marriner, Morhange, and Saghieh-Beydoun 2008), Tyre and Sidon (Marriner and Morhange 2005; Marriner, Morhange, and Carayon 2008; Marriner et al. 2006), and Gaza (Morhange et al. 2005). Marriner and Morhange present a typology of "wrecked" harbors in the Mediterranean basin based on earth science methods accounting for distance to the modern coastline, position relative to modern sea level, geomorphology, and taphonomy, or "how these ancient ports came to be fossilized in the sedimentary record" (Marriner and Morhange 2007:146–162). Relevant for this study are buried urban, landlocked, and lagoonal (properly estuarine) harbors (Marriner and Morhange 2007). In general, reduction in the rate of sea-level rise coupled with high natural sediment supply (fluvial and/or runoff origin), occasionally intensified by anthropogenic modification of watersheds (i.e., deforestation and agriculture), led to accelerated coastal progradation and the burial of harbors (landlocked and urban).

Urban harbors like Beirut still have an active port, but the ancient harbor is beneath a modern city (Marriner and Morhange 2007). Bronze Age Beirut had the same type of pocket beach and protected embayment as Tyre and Sidon, which were favored by Bronze Age mariners (Marriner, Morhange, and Saghieh-Beydoun 2008:2507). As seafarers sailed between larger commercial polities, natural anchorages would have been favored; thus, settlements near such proto-harbors like Tyre, Sidon, Beirut, and probably Jaffa flourished. In addition to the aforementioned ports, the preeminent Phoenician cities of Tyre and Sidon also feature buried harbors with basins still in modern use. Estuarine harbors offer natural protection as safe havens for ships. However, such low-energy embayments gradually fill with sediment deposited by natural and anthropogenic processes, making them unserviceable to even vessels of shallow draft.

THE SWAMP OF AL-BASSA AND THE COURSE OF THE AYALON RIVER

Despite the foregoing circumstantial data suggestive of Jaffa's clear importance as a Bronze Age port, the precise location of its harbor during the Bronze and Iron Ages remains unknown. The realization, as observed from Josephus, that perhaps by the start of the Hellenistic period the port of Jaffa was restricted to the western, sea, side of Jaffa—effectively the harbor's location since then—taken together with more recent observations about how the effects of silting up affected early harbors suggests that Jaffa's ancient harbor may now lie buried in a low-lying, terrestrial environ east of Jaffa. Geomorphological changes in the vicinity of Jaffa resulted primarily from the fact that the *kurkar* (calcareous aeolian sandstone) ridge approaching Jaffa from the south did not permit drainage to the west. Various maps, illustrations, and accounts beginning with Jacotin's map in 1799 until the foundation of Tel Aviv in 1909 reveal the existence of a

body of water to the east of Jaffa known in Arabic as al-Bassa, which is usually translated as “swamp” and means “depression” in Arabic. Since the early twentieth century, this swamp has been tentatively identified as the remnant of an ancient body of water that once served as Jaffa's so-called Solomonic harbor during the Iron Age (Hanauer 1903a, 1903b) and presumably functioning since the Bronze Age.

Among the most important sources indicating the existence of al-Bassa to the east of Jaffa are historical maps of the site and its environs produced during the nineteenth century CE. Maps made by P. Jacotin and A. J. Denain, Napoleon's cartographers, recording his siege of Jaffa in 1799 serve as an important first datum point for the location and prior size of al-Bassa at the beginning of the nineteenth century CE. In these maps, this body of water is identified as the *flaque d'eau* (pool of water) and the *etang* (pond) (Figure 4.4 and Figure 4.5; Shacham 2011:137–138, figs. 13.2, 13.4–13.8). Both French labels suggest that al-Bassa was a very shallow body of water at the time.



Figure 4.4. Map of coast of Palestine north and south of Jaffa by Jacotin, 1799. Jerusalem and Jaffa sheet. Courtesy of Eran Laor Cartographic Collection, National Library of Israel.

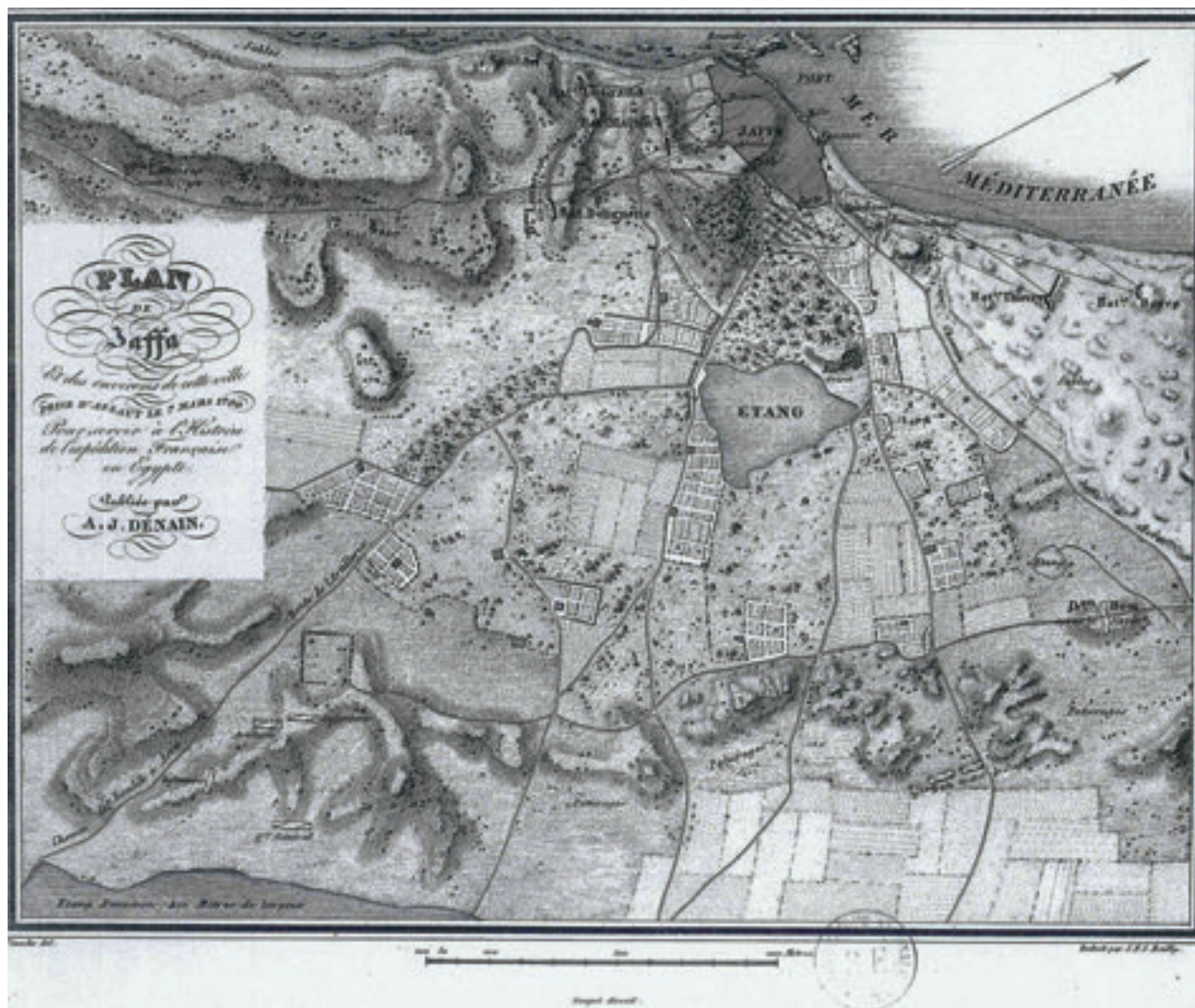


Figure 4.5. Map of Jaffa by Denain & Delamare, 1830–1831. *Bibliothèque nationale de France: fonds géographique, Res. Ge. FF. 6421.*

J. E. Hanauer, a biblical scholar, also made a number of observations during his visits to Jaffa in the early twentieth century CE about the location of the ancient harbor. Hanauer personally observed that the area called al-Bassa was “covered by a shallow lake or swamp after heavy rains, and local tradition asserts that it marks the location of the ancient harbor of the time of Solomon” (Hanauer 1903a:258). This body of water was first labeled al-Bassa (No. 37) in a series of maps produced by Theodor Sandel beginning in 1875 for the Baedeker guidebooks (Shacham 2011:fig. 13.19). The swamp’s bed according to Hanauer (1903a:260) was only 2.6 m above sea level. He observed that in the winter of 1892–1893, a lake appeared in this location following heavy rains, and after an outbreak of malaria the following summer, a “ditch was dug to drain it off” (Hanauer 1903a:259).

To this, Hanauer (1903a:260) adds that “a great many years ago people related that they had heard of boat anchors having been dug up in the ‘Baasah,’ as the lowest part of the hollow is called” and that shafts sunk to 11 m for wells suggested the presence of a “massive sea wall.” Tolkowsky (1924:27) indicates that these “anchors” were made of metal: if correct, this suggests that if they were anchors at all, they were of a rather late date since Levantine Bronze and Iron Age anchors were made of stone (Wachsmann 1998:255–293). Tolkowsky’s observations draw on awareness of the finds stemming from George Barton’s excavations in 1902 to the northeast of Tel Yafo. Barton claimed that the “existence of an ancient inner harbor at Jaffa, used in the Maccabean period and in the time of Saladin, and possibly also in the time of Solomon, was rendered probable” by his excavations (Moore and Barton 1903:41). While

Tolkowsky may have been mistaken regarding the period during which the inner harbor functioned, Barton appears to have listed those periods in his report and in his letter to Hanauer, based on what he encountered and the local tradition linking the inland depression with the Solomonic harbor (Hanauer 1903a, 1903b). Nevertheless, Barton later concluded that the elements he encountered during his excavations between April 20 and completed May 12, 1903, were not, in fact, the remains of an ancient harbor. These excavations were carried out near land belonging to a Mr. Murad in the vicinity of al-Bassa in an effort to identify an ancient anchorage (Barton 1903:185). He encountered a wall buried only half a meter down, which he suggested was of relatively late in date and was determined to be 4.5 m above modern sea level (Barton 1903:186). Excavations also produced cannonball fragments and a nineteenth-century coin (Barton 1903:186, n. 16).

David Roberts's 1839 painting of Jaffa from the north-east, created only 40 years after Napoleon's map, depicts a wide and flat expanse that appears to be the western part

of a dry alluvial plain to the east of Tel Yafo (Figure 4.6). Although it appears as little more than a flat and undeveloped area behind the low-lying ridge, its connection to the sea through the ridge suggests the location of an ancient drainage basin that once connected a former river mouth or an estuary at al-Bassa to the sea. This gap in the ridge is not visible in David Roberts's painting but does appear on Jacotin's map as one of the locations where Napoleon's forces were stationed and where they met resistance (Figure 4.5; Shacham 2011:fig. 13.5). The geological map of the area (Figure 4.7A, marked in blue) shows the same gap between the *kurkar* ridge forming Tel Yafo and the lower lying rocky element north of the tell. Today in the field, abundant artificial fill hides most original topography and underlying geologic units, but limited exposures to the north reveal coarse-grained, shell-rich sandstone that represents a facies variation of the *kurkar*. The topographic break and change in lithology may have resulted from tectonic activity and subsequent erosion (note the most southern fault in Figure 4.7B). At this point along the coast, a ravine still exists



Figure 4.6. Jaffa as portrayed in one of David Roberts's paintings, 1839. Note the flat area (dry alluvial plain?) to the left of both Tel Yafo, which lies on the *kurkar* ridge, and the continuation of the ridge in the foreground. View northeast.

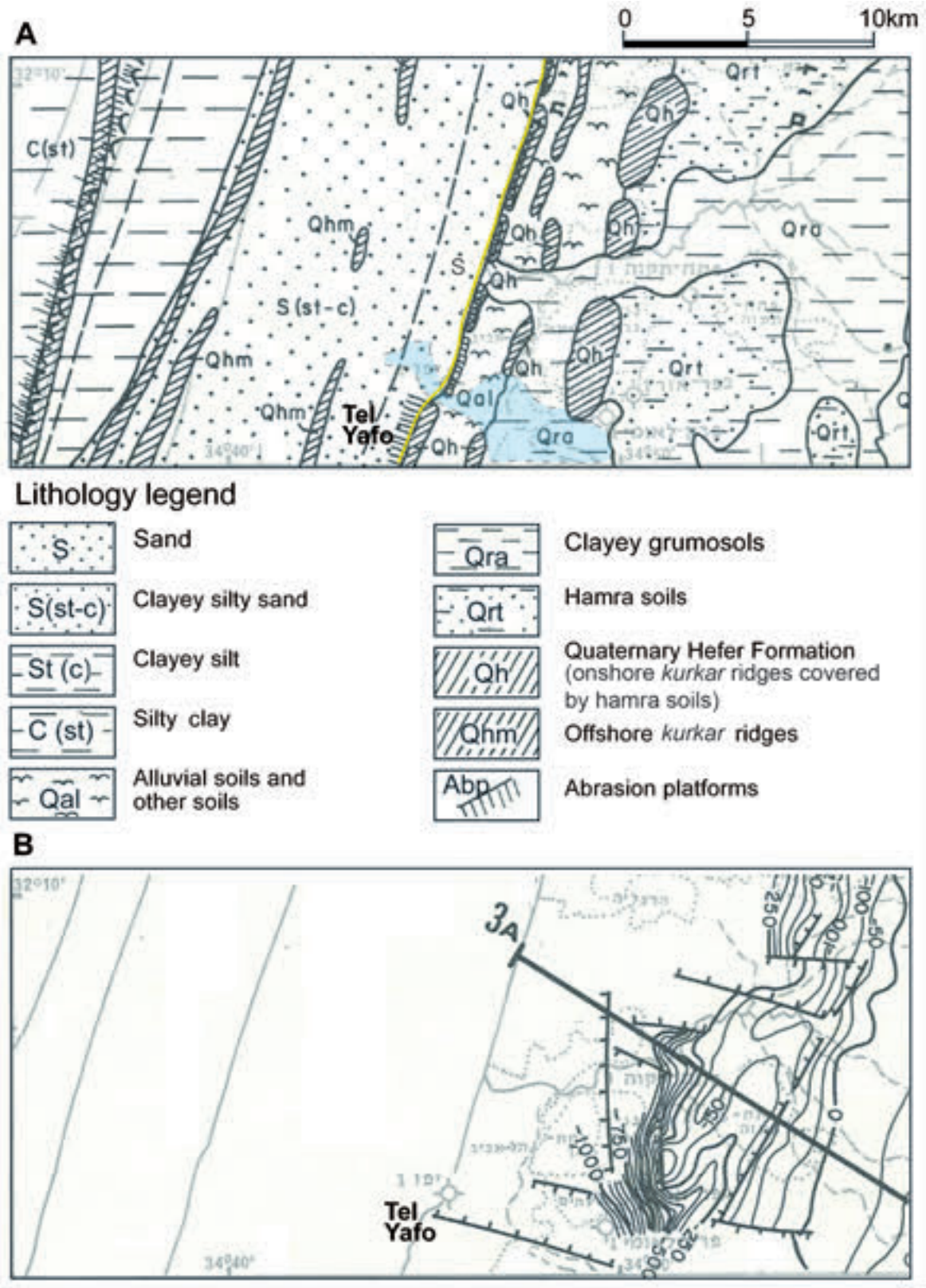


Figure 4.7. (A) Geological map of the southern Sharon and the continental shelf, including the study area. Note the yellow line representing the present coastline and the area marked with blue representing the gap between the kurkar ridge forming Tel Yafo and the lower lying rocky element north of the tell, which presumably allowed drainage of the former Ayalon River and connected the depression east of Tel Yafo to the sea. (B) Structural map of the southern Sharon and the continental shelf. Faults are shown as solid lines with tick marks indicating the down-thrown [down-faulted] side. Note that al-Bassa and the proposed path of the Ayalon River are situated in a structural graben, or a down-dropped basin (figure after Gvirtzman 1990:20, 46).

(possibly the “Ditch” on Hanauer’s map), spanned by a bridge, which appears to drain storm runoff from the part of the city built up and around Groningen Park, which lies in the center of the al-Bassa feature. Additionally, a *kurkar* ridge outcrop in the surf immediately north of the ravine mouth limits the northern extension and overall width of the topographic break. This geomorphological evidence further supports the hypothesis that the body of water to the east of Jaffa, the vestiges of which are presumably just out of view on the left in Roberts’s scene, may have been quite sizable in antiquity and could certainly have provided a sheltered anchorage behind the linear lower lying rocky elements that form the shoreline to the northeast of Tel Yafo. Such was Avner Raban’s (1985:27) suggestion concerning the original course of the Ayalon River in antiquity.

The question of the gradual disappearance of the al-Bassa swamp is then directly related to the loss of its water source, as well as local sedimentary processes. For some time, it has been assumed that its source was a channel of the Ayalon River (Raban 1985:27), which would have flowed westward forming an estuary that connected to the Mediterranean north of Tel Yafo. It was only later then that the course of the Ayalon River was diverted to follow the eastern side of a ridge extending from immediately north of Highway 44 (Derech Ben Tsvi) and west of the Ayalon Highway (Highway 20) to a point north of Ha-Rakevet St. and west of Ha-Masger St. (Figure 4.2). Rainey and Notley (2006:37) state that the Nahal Ayalon formerly emptied into the sea near Jaffa, but “prior to human habitation it was deflected northward by the intrusion of sand and had to flow behind a sandstone ridge until it joined the Nahr el-’Auja” [Yarkon River]. According to Raban (1985:27), a layer of river pebbles found in a core drilled off Jaffa’s headland, which was not dated, “proves the theory of the existence of an ancient outlet of the N. Ayalon at this part of the shore.” We have not been able to confirm this observation, but Raban (1990–1993:100) suggested the possibility that the change in the wadi’s course was “an artificial enterprise” and posited that it may have occurred in the second millennium BCE as a way to improve the estuarine harbor at Jaffa, citing engineering parallels in the Nile Valley and Minoan Crete. By using the natural depression east of Tel Yafo, including the former river mouth or estuary of the Ayalon that was undoubtedly deepened by an ingression of the sea, such efforts would have yielded an inland harbor east of Tel Yafo with an area of approximately 30 to 40 ha. The date and feasibility of

this proposed harbor, in addition to other harbor locations and migrations, are discussed below.

In conjunction with the drainage systems of seasonal wadis and the stable output of the Yarkon River, marshes and wetlands were probably prominent characteristics of the landscape of the coastal plain, similar to the landscape that prevailed northward on the Carmel coastal plain. Discontinuous longitudinal north-south *kurkar* ridges (onshore and offshore) parallel to the coastline and separated by longitudinal troughs characterize the southeastern Mediterranean coast (Figure 4.7A; Sade et al. 2006). Until two to three thousand years ago, most of the coastline of Israel that is now covered with sand consisted of wetland sediments accumulated in the coastal and eastern bedrock troughs (Sivan et al. 2004:1046; Sivan et al. 2011 and references therein). Coring along the Carmel coast (e.g., near Tel Dor), approximately 60 km north of Jaffa, showed that the coastal marshes created by these features dried up prior to the beginning of the Pre-Pottery Neolithic (ca. 8100 BP), yet marshes east of the coast (in the eastern troughs) survived into historical periods (Sivan et al. 2004:1046; Cohen-Seffer et al. 2005:117–118). During the early Holocene, rising sea level associated with wetter hydro-climatological conditions led to higher groundwater levels and to increased sediment transportation by longshore currents, resulting in accumulation of sandbars blocking the paleo-river mouths. These are the main processes explaining the origin of these wetlands, whereas their disappearance is not clear (Sivan et al. 2011:89–90). While swamps in the area to the east of Tel Michal, slightly over 10 km north of Jaffa, were drained in the Byzantine period, the valley bottoms along the coast were below the water table and were swampy as late as the early twentieth century (Karmon 1959; Grossmann 2001:13). Geomorphological studies indicate the existence of swampy ground east of the Exhibition Grounds site in Tel Aviv (to the north of Jaffa) (Golan 2009). Kaplan (Anonymous 1971:26) noted marshy soil with meager Early Bronze Age sherds overlying the Chalcolithic remains at the site. Tolkowsky (1924:2) even speculated that prior to the introduction of orange groves, marshes in the area east of Jaffa, such as al-Bassa, would have served as a natural barrier against approaching enemies. However, around Jaffa, the drainage of swamps was associated with efforts to enable settlement and agricultural production during the late nineteenth century (Kark 1990:9, 43, 46, 207).

EFFORTS TO IDENTIFY JAFFA'S INLAND HARBOR

The cartographic, art historical, and historical evidence compiled above constitute proxy data revealing a need for further efforts to explore the potential existence of an inland harbor or anchorage to the east of Tel Yafo that would have served the settlement during the Bronze and Iron Ages. Additional data, however, supply further support in favor of the existence of an estuarine harbor or anchorage in the vicinity of the al-Bassa depression. These data stem from the georectification of Jacotin's map, analyses of digital elevation models for the area, and coring efforts in the vicinity of al-Bassa during the twentieth century.

As groundwork for the identification of Jaffa's ancient harbor, Jacotin's map from 1799 (i.e., Shacham 2011:fig. 13.4) was georectified. This process was intended to permit a ground-truthing of the al-Bassa depression. It revealed that the body of water labeled *Flaque d'eau* and *Etang* on Jacotin's maps does, in fact, correlate with the location

of what is identified on later maps as al-Bassa, discussed above (Figure 4.8). While the process of georectification of early maps such as these involves inaccuracies, the result is sufficiently accurate to indicate the general location of this body of water given its size. A number of specific inaccuracies, however, should be noted. First, there is the question of the accuracy of the original 1799 map. Jacotin, for example, traveled with the French army during their campaign in Palestine. Jacotin states that he had to work under very difficult conditions while the army was either on the march or involved in heavy combat with Ottoman forces. The army also experienced a shortage of food and spreading diseases (Jacotin 1826:88). Because of marauding Arabs, he could not wander freely and had to stay near roads (Jacotin 1826:88). This means that areas further away from roads are mapped far less accurately than those adjacent to them. Fortunately, the area for our interests is situated between two roads. Taking into account the difficulties under which Jacotin worked and the methods he employed, such as measuring distances by time, a multitude

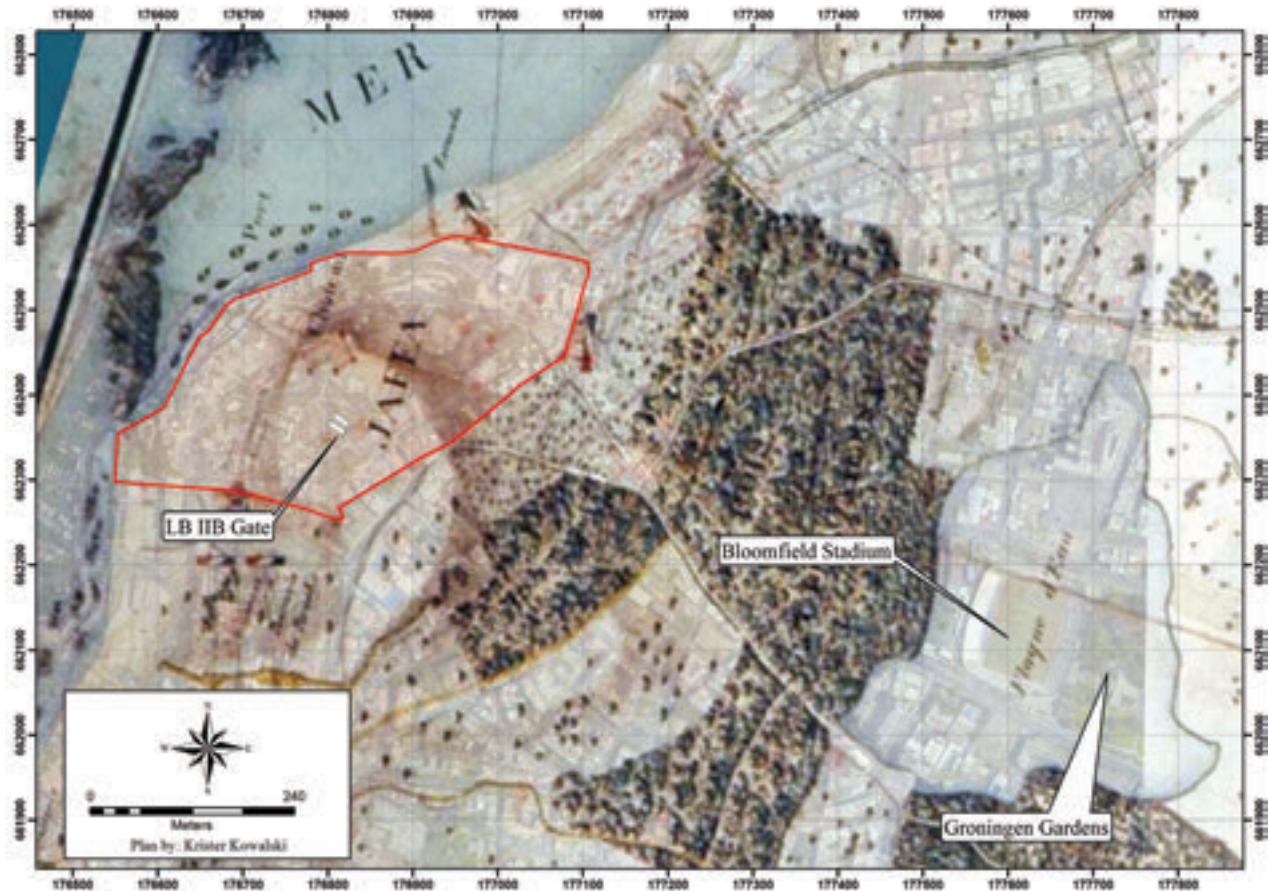


Figure 4.8. Georectified version of one of Jacotin's maps (see Shacham 2011) overlaid on an orthophoto of modern Jaffa and showing the location and orientation of the LB IIB Ramesside gateway (twelfth century BCE) excavated by the Jaffa Cultural Heritage Project; Israel Transverse Mercator (New Israel Grid) projection. Outline of the fortified city of Jaffa in Jacotin's map is highlighted in red. *Map by Krister Kowalski.*

of errors in his maps are to be expected. Nevertheless, Jacotin completed the first trigonometric surveying of Palestine (Karmon 1960:153). Contrary to other maps of the same age, everything visible on these maps was, in fact, surveyed by Jacotin and, therefore, not copied from earlier maps as later became the case for many maps of Jaffa. The second source of inaccuracies originates with the georeferencing process itself. As is often the case when georeferencing very old maps, there are very few common control points that can be used. This is because, first, the landscape underwent substantial modifications over the more than 200 years since the mapping was done, and Jaffa is today part of the large metropolitan area of Tel Aviv. The countryside outside of Jaffa's walls, as seen in the old maps, is, therefore, now completely built over. Also, the old city of Jaffa itself changed considerably, and there are no remnants of the old city wall on the surface, which served as a distinct border between the "outside" and the "inside" and provided Jaffa with definitive boundaries. Second, Jacotin could only map rough outlines of the city itself or buildings in the surroundings. This leads to the problem that only corners of the city wall can be used as common control points. Although the city wall is no longer visible, its layout can still be estimated by the course of modern streets. Yefet St., for example, follows the course of the old moat (Figure 4.2; Pierce 2011:57). Unfortunately, there are no control points in the area outside the city itself. Despite

these caveats, it appears that the body of water on the 1799 map was centered approximately 600 m to the east of Tel Yafo, in the general area today occupied by Bloomfield Stadium and the Groningen Park, east of Jerusalem Blvd. A geographical depression remains visible in this area today, where the streets slope toward the center of the body of water as it appears on Jacotin's map.

The use of hydrological geographic information system (GIS) tools enables the possibility to identify stream networks that could have fed this inland basin or estuary. This analysis employs a digital elevation model (DEM) obtained from the Shuttle Radar Topography Mission (SRTM) and the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) data. The SRTM DEM features a 90-m contour resolution outside the United States, while ASTER data offer a 30-m resolution.⁴ It is important to note that the error in the vertical and horizontal data of both DEMs can be substantial, especially in urban areas (Hirt et al. 2010). Nonetheless, the results reveal the underlying contours of the terrain for which the data are not otherwise readily accessible (Figure 4.8).

Both DEMs were run through the ArcGIS Hydrological Toolbox to determine drainage networks (Figure 4.9). Drainage Network Analysis indicates that the main stream and its feeders drained into a depression (marked by a dotted white line), which includes the original location of al-Bassa swamp (Figure 4.10 and Figure 4.11). A triangulated

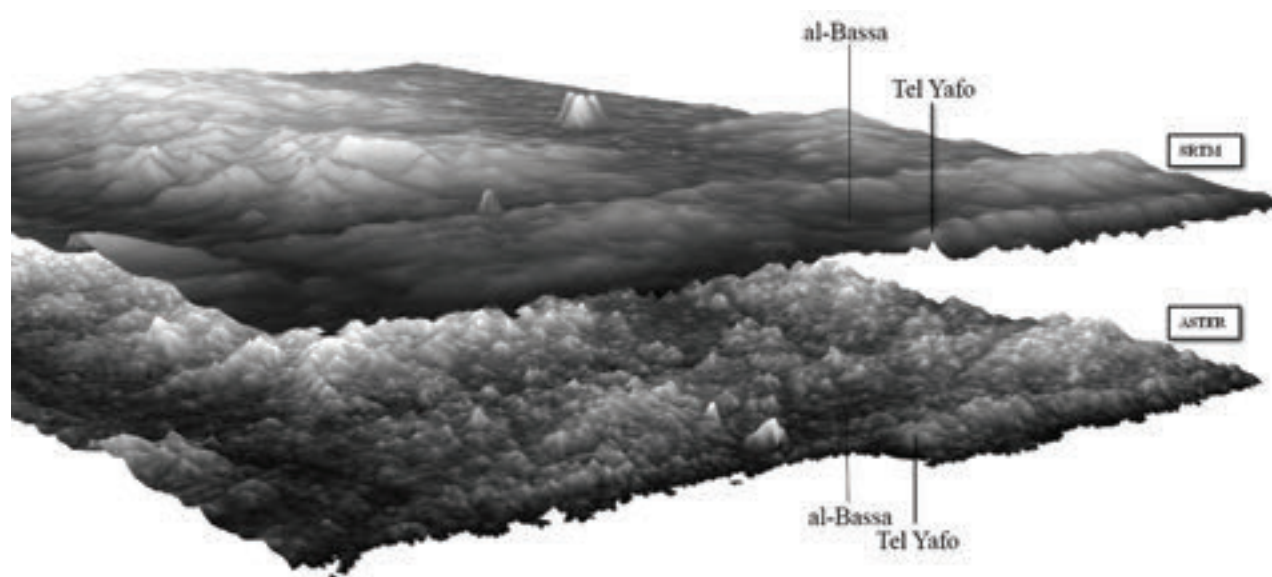


Figure 4.9. Visual comparison of SRTM and ASTER data created with ArcScene. While SRTM's resolution produces a more generalized terrain surface, ASTER depicts every large building as a vertically exaggerated anomaly. The al-Bassa depression to the left of Tel Yafo is visible in both layers. *Map by Krister Kowalski.*

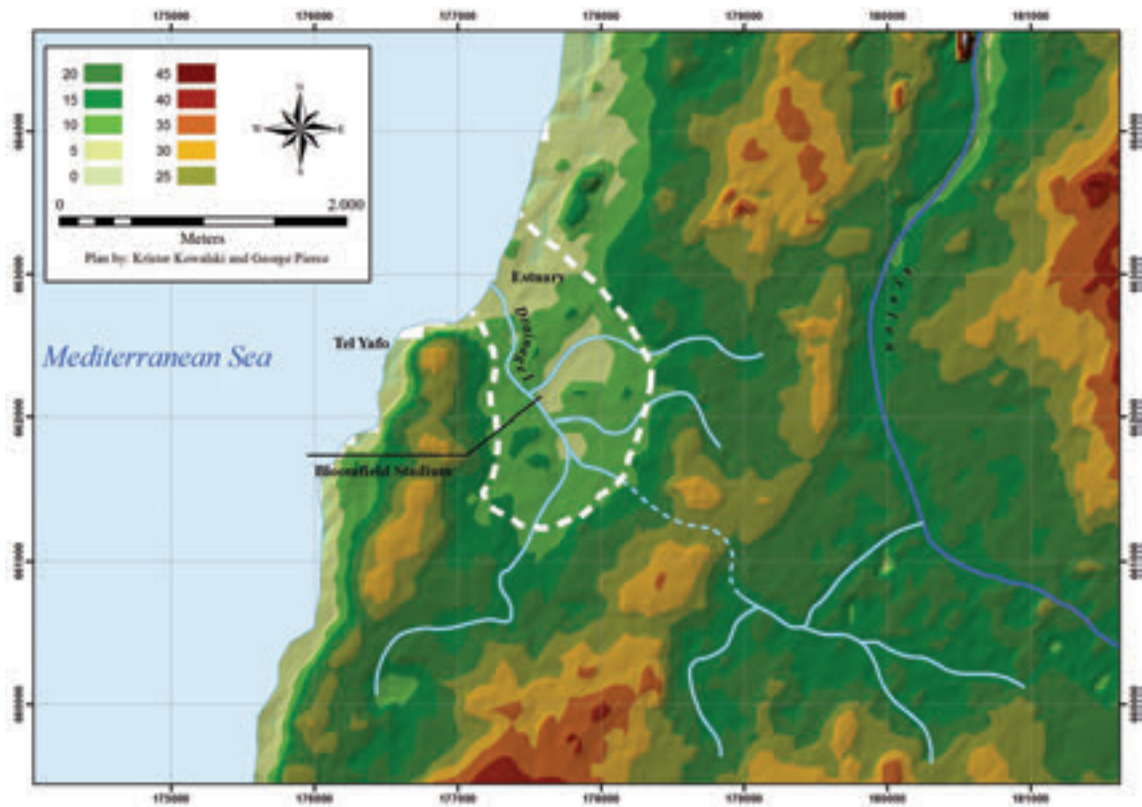


Figure 4.10. Drainage Network Analysis created with the ArcGIS Hydrology Toolbox using SRTM data (Drainage 1); Israel Transverse Mercator (New Israel Grid) projection. Map by Krister Kowalski and George A. Pierce.

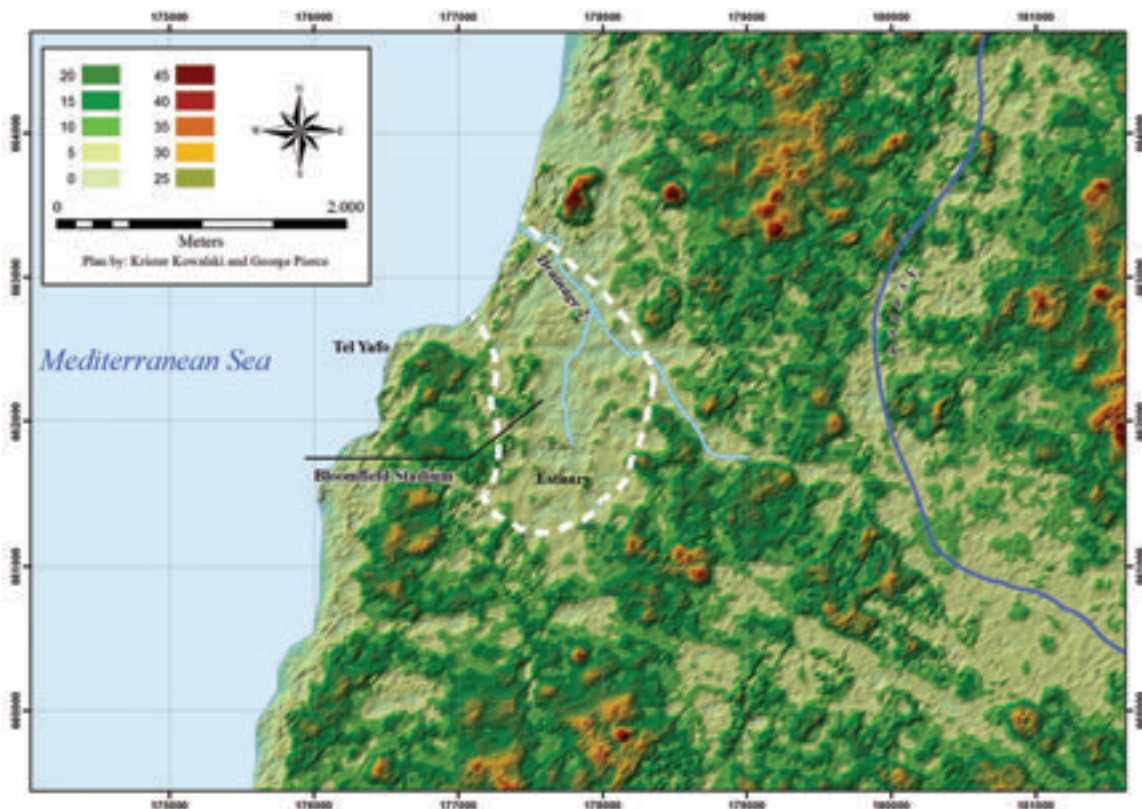


Figure 4.11. Drainage Network Analysis created with the ArcGIS Hydrology Toolbox using ASTER data (Drainage 2); Israel Transverse Mercator (New Israel Grid) projection. Map by Krister Kowalski and George A. Pierce.

irregular network (TIN) for each DEM was generated to locate the drainages that combined to form the main outlet drainage of the estuary to the west. The SRTM data located the drainage about 350 m to the north of the tell (Drainage 1 in Figure 4.10), while the ASTER data placed the drainage's outflow roughly 800 m north of the tell (Drainage 2 in Figure 4.11). The slight differences between the results are likely a product of the errors in the DEM elevation data, since SRTM data tend to exaggerate elevation differences more than the ASTER data. The SRTM results (Drainage 1), however, correlate most closely with a drainage system still visible at the beach north of Jaffa.

In addition to some degree of error in the DEM data, other issues in these reconstructions merit discussion. For example, the Drainage Network Analysis shows only possible drainages based on the elevation data employed. They do not necessarily reveal the actual location of ancient streams or wadis. They also do not indicate the amount of water these drainage systems transported. The size of the estuary is, therefore, only an estimate based on the location of the drainages and indications of the size of the depression. Also, no connection to a water system to the east was identified in this analysis, which is complicated by the fact that the drainages around Jaffa are isolated from the ancient drainage system.

Despite these caveats, the DEM data permit a fairly reliable reconstruction of the paleo-topography of Jaffa's environs. While the SRTM data generate a situation closer to that presently attested, the combined results from these drainage models, shown as the dotted lines around the

estuary and its mouth in Figures 4.10 and 4.11, suggest the situation in antiquity. The significance of this is that the estuary could have featured a substantially wide mouth with a sufficiently deep center able to accommodate the passage of Bronze and Iron Age ships. In a W-E profile generated from these data, the al-Bassa depression is easily identified just to the east of modern Bloomfield Stadium (Figure 4.12 and Figure 4.13), which also makes clear the heights of the *kurkar* ridge on which Jaffa was established (now Tel Yafo) and that of the underlying ridge to the east. These ridges were responsible for limiting drainage of this area and, consequently, would have had significant control on estuary morphology.

In addition to the topographic data, five cores taken in 1933 and in 1964 reveal the underlying sedimentary sequence (Table 4.1; Figure 4.14 and Figure 4.15). The bedrock in the vicinity of al-Bassa consists of calcareous sandstone overlain by light brownish to ochre clayey-silty sand (loam), both of which are best understood as part of the upper Hefer Formation of the Pleistocene Kurkar Group, distributed in the coastal plain and the continental shelf of Israel (e.g., Gvirtzman et al. 1997; Avnaim-Katav et al. 2012:676–677). In well logs, the uppermost sedimentary unit has been described as dark gray to black sandy, silty, clayey sediments, which we interpret as having been deposited in a low-energy environment that could include a fluvial valley mouth/estuary, a lagoon, or coastal wetlands.

Tell Mashuk, a potential candidate for Paleo-Tyre on the littoral opposite Tyre in Lebanon, may serve as an

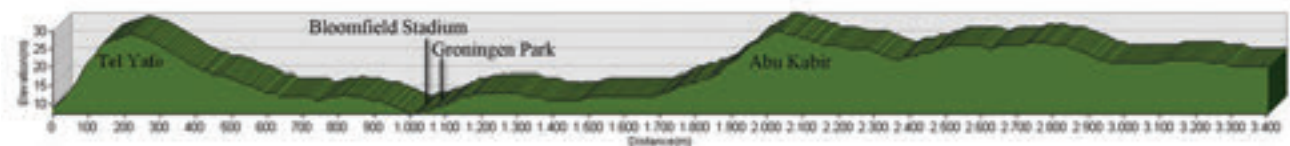


Figure 4.12. West to east elevation profile of ridges and depressions based on DEM data. See Figure 4.13 for location. Map by Krister Kowalski.

Table 4.1. Locations of five cores made in 1933 and 1964 in the vicinity of al-Bassa.

JCHP Designation	GSI No.	Source	Location (English)	Date	Core Length (m)	Elev. (m, rel. SL)	North	East
1933-001	3728	Yafo Municipality	Yafo (al-Bassa)	1933	53	6.2	162.2	127.4
1933-002	3729	Yafo Municipality	Yafo-Migdal Hamayim	1933	30.6	3.5	162.2	127.4
1933-003	3730	Yafo Municipality	Yafo	1933	49.3	8.2	162.22	127.52
1964-002	3731	Mekorot (Israel national water company)	Makhsom Dan 3	1964	115.3	7.4	162.13	127.9
1964-001	3725	Mekorot (Israel national water company)	Makhsom Dan 4	1964	118.5	7.5	161.916	127.719



Figure 4.13. Location of west-to-east profile (see Figure 4.12) from the top of Tel Yafo on the west through the depression (i.e., al-Bassa) at Bloomfield Stadium to the east of Abu Kabir. Map by Kristin Kawalki.

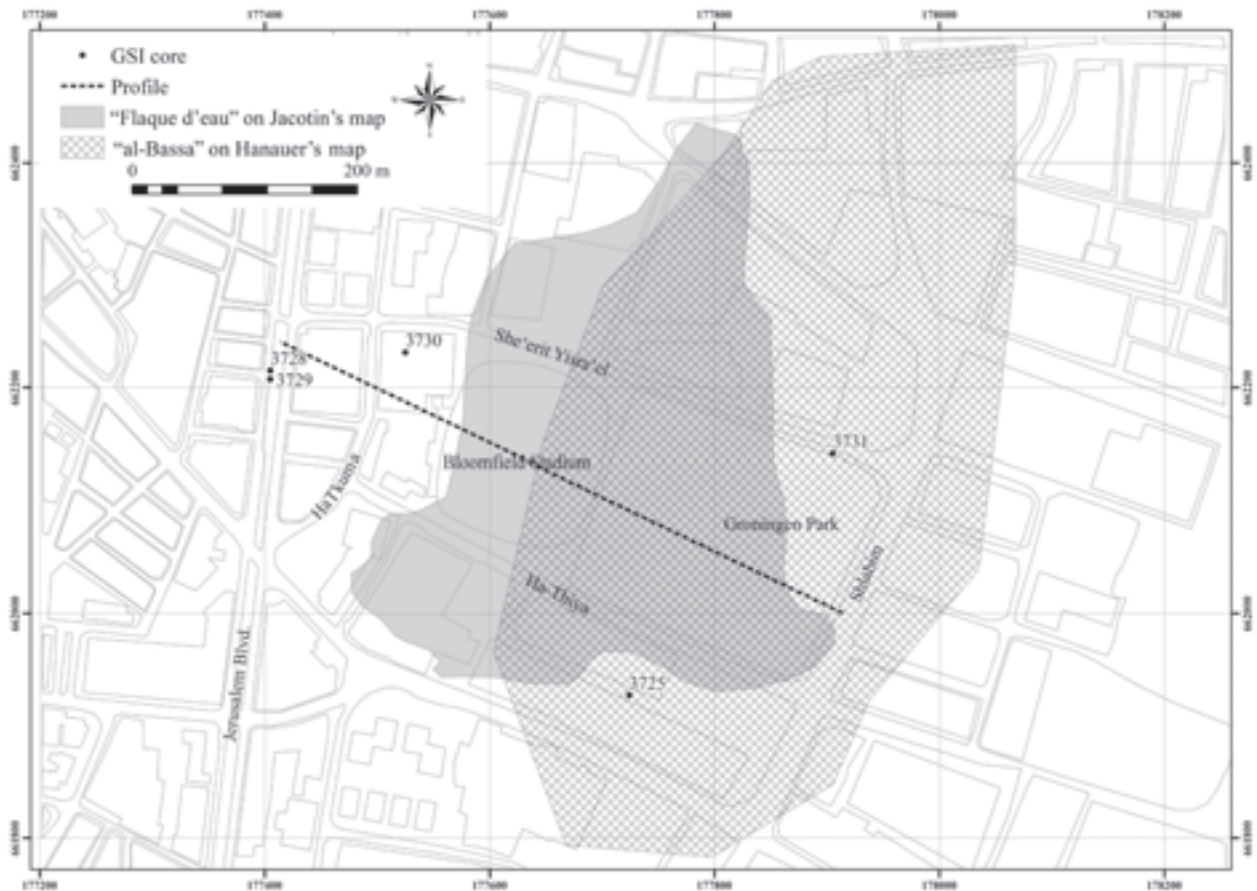


Figure 4.14. Locations of cores taken in 1933 and 1964 within the al-Bassa depression; Israel Transverse Mercator (New Israel Grid) projection.
Map by Krister Kowalski.

analogy for the environs of Jaffa, if Jacotin's *Flaque d'eau* was a remnant of an estuarine harbor, as suggested by the preceding analysis (Marriner, Morhange, and Carayon 2008:1305–1306). Geoarchaeological studies of the sediments near Tell Mashuk indicate that the coastal environment was flooded 6,000 years ago, and an estuary with communication to the sea subsequently would have served as the likely Bronze to Iron Age anchorage. Concerning the silting and eventual blockage or infilling of Jaffa's probable estuary, it is likely that "in the absence of a fluvial flushing system, any inlet would gradually have been blocked by beach ridge accumulation" (Marriner, Morhange, and Carayon 2008:1305–1306). At Tell Mashuk, for example, once the bar had formed and had cut the estuary off from the open sea, the area became marshland and remained so until the nineteenth century.

A parallel course of natural events should be considered for Jaffa in which the basin adjacent to the city was an estuary that functioned as a harbor during the Bronze and Iron Ages with the eventual formation of a beach

accretion ridge that formed the lagoon, cut off from the sea during the late Persian or Hellenistic periods. The estuary formed by the previous outflow of the Ayalon River may have been protected from open marine waves and currents, as well as associated sediment influx, by offshore bedrock ridges or reefs, much like the northern harbor of Tyre in antiquity (Marriner et al. 2005:1319) or by a baymouth bar or barrier-spit complex. Over time, the body of water was filled with sediment deposited as, but not necessarily limited to, fluvial gravel-sand-silt, shoaling lagoon sand-silt, marine storm washover, paludal mud, wind-blown silt, the fine material from decomposition of mudbrick constructions, and the refuse generated by use of the harbor as a dump as evidenced by the wood, leather, ceramics, and macrofauna recovered from cores of Tyre's northern harbor (Marriner et al. 2005:1324). With regard to terrestrial-derived sediment, Sandler and Herut (2000) have shown that sediment supplied to the Israeli coast and shelf has a significant component of stream-derived clay along with a minor windblown component.

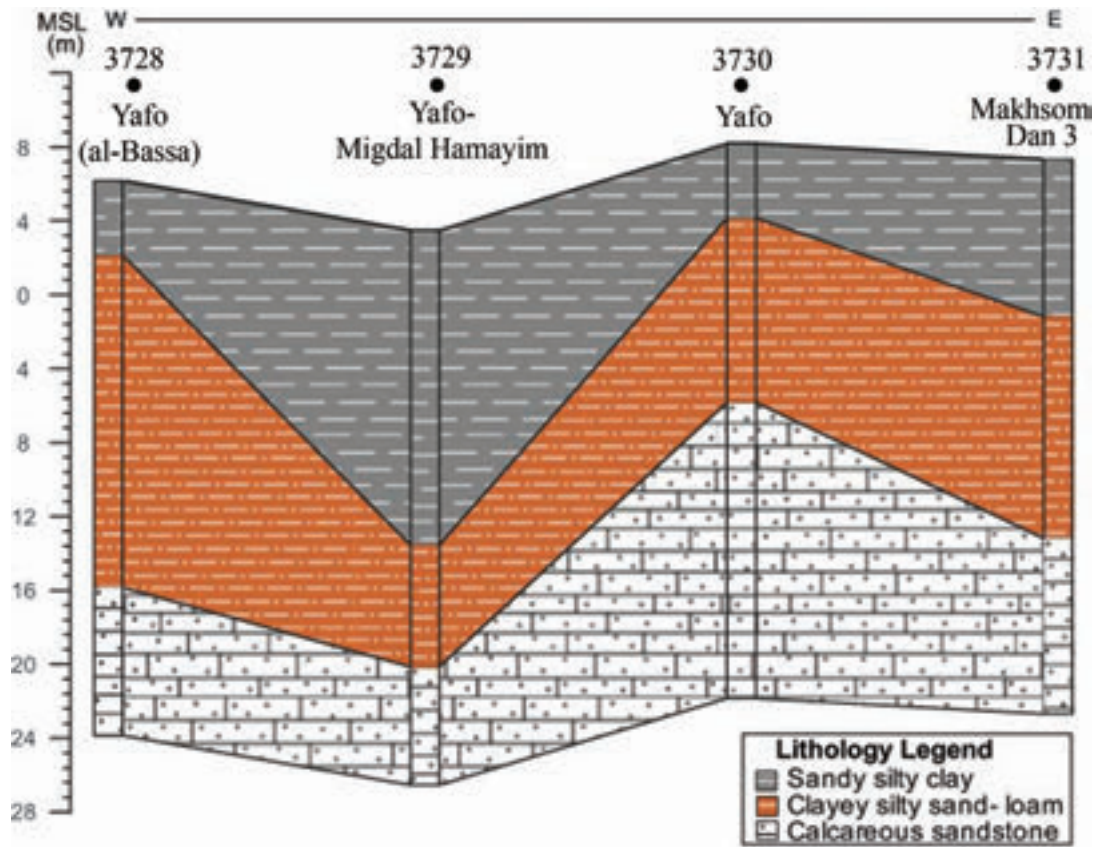


Figure 4.15. West to east cross section of sedimentary units based on four cores completed in 1933 and 1964; elevation of core top as reported but not verified.

Remnants of the al-Bassa swamp reappeared almost annually following winter rains until the early part of the twentieth century. The remains of the depression appear to be indicative of the center and deepest parts of the original stream bed and estuary. The Ramesside gate of the Late Bronze Age (twelfth century BCE) excavated by the Jaffa Cultural Heritage Project since 2011 is revealed to align approximately with this depression and may likewise suggest the direction of the harbor's landing, tracing an east-southeast line from the southeastern side of the tell (Figures 4.8 and 4.13). Although it cannot be used to pinpoint the missing features with accuracy, this analysis is useful in defining the location of the center of the estuary and potential anchorage located to the east. The line of the gate appears, therefore, to reflect a compromise in the gate's orientation by serving both the harbor to its east and the road leading away from the site, which would have circumscribed the southern end of the harbor to connect with routes toward the south, east, and north.

CONCLUSION

A review of the available evidence for Jaffa's harbor prior to the Classical period supports the suggestion that an ancient harbor or anchorage was located to the east of Tel Yafo, in the area east of Jerusalem Blvd. surrounding the area now occupied by Bloomfield Stadium and Groningen Park. If this hypothesis is correct, then this harbor appears to have gone out of use prior to the First Jewish Revolt (ca. 70 CE) and perhaps some centuries earlier, and for this reason, Josephus characterized Jaffa's harbor as inadequate. Historical maps and illustrations reveal that al-Bassa is likely to have been a late-surviving remnant of a body of water that served in ancient times as a sheltered harbor or anchorage. This harbor was likely an estuary or lagoon formed by the debouchment of the original course of the Ayalon River to the north of Tel Yafo. The site itself may have comprised two urban nuclei with a citadel or upper city on the present mound and a lower city near the harbor, as at Sidon and Beirut, and this possibility should also be explored further.

NOTES

1. Throughout this chapter, we employ the terms *harbor* and *port* to distinguish between the role that Jaffa played as a place from which ships went to and fro (*a port*) and reference to a specific physical, manmade, or natural location or installation around Jaffa (its *harbor[s]*) in which ships could be sheltered. The distinction is clarified by the recognition that a port can exist without a proper harbor per se. Ships could, for example, anchor offshore while employing smaller craft to bring goods ashore despite the nature of the coastline. It is also possible that a single port (i.e., a city functioning as a port) may feature multiple, contemporaneously functioning harbors or, as we would argue here, a port might witness substantial modifications, either natural or anthropogenic, such that the location of its harbors shifted over time.

2. According to a brief column in *Steam Shovel and Dredge*, “commensurate with harbor improvement, the city of Jaffa itself is making plans to come out of its lethargy and reap rich rewards,” which included proposed waterfront construction of warehouses, restaurants, hotels, and private residences (Anonymous 1922). Only, however, since the late 1990s have such plans actually gained steam and various such constructions have been undertaken, albeit largely through the revitalization of older structures.

3. The authors do note, however, that in various places, the accumulated sand was as much as 3.5 m thick (Sharvit and Galili 2002:54*).

4. The SRTM data were obtained through the “DEM Explorer” website created by the Center for Spatial Information and Science and Systems of the George Mason University. ASTER data were downloaded directly from the website of the Japanese Ministry of Economy, Trade and Industry, NASA’s partner of the ASTER program. The raster files were cut out to the area around Tel Aviv.

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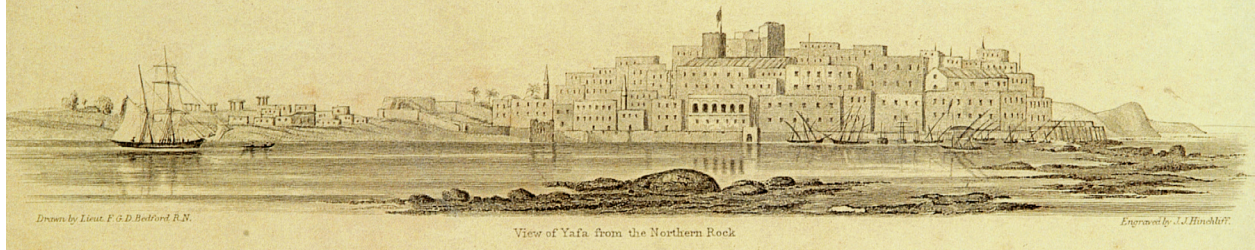


THE HISTORY AND ARCHAEOLOGY OF JAFFA

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THE JAFFA CULTURAL HERITAGE PROJECT



THE JAFFA CULTURAL HERITAGE PROJECT SERIES, VOLUME 2

AARON A. BURKE AND MARTIN PEILSTÖCKER, SERIES EDITORS

THE HISTORY AND
ARCHAEOLOGY OF JAFFA 2

EDITED BY
AARON A. BURKE, KATHERINE STRANGE BURKE,
AND MARTIN PEILSTÖCKER

MONUMENTA ARCHAEOLOGICA 41

COTSEN INSTITUTE OF ARCHAEOLOGY PRESS, LOS ANGELES

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Library of Congress Cataloging-in-Publication Data

The Library of Congress has catalogued this record under LCCN: 2017047201

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IN MEMORIAM

YEHOSHUA (SHUKA) DORFMAN (1950–2014)

DIRECTOR GENERAL OF THE ISRAEL ANTIQUITIES AUTHORITY

WITHOUT WHOSE VISION, THE JAFFA CULTURAL HERITAGE PROJECT WOULD NOT HAVE EXISTED.





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PREFACE

THE PRESENT VOLUME IS the second in the Jaffa Cultural Heritage Project publication series. It represents the culmination of a decade of fieldwork and analysis by the Jaffa Cultural Heritage Project, under the direction of Aaron A. Burke and Martin Peilstöcker and the publication of *HAI* 1 (Peilstöcker and Burke 2011). While the project has successfully carried out seven seasons of excavations since 2007, a significant contribution of the project has been the fostering of a collaborative research environment, which has created a dialogue among a growing number of researchers in Israel and abroad who have worked on various aspects of Jaffa's history and archaeology. The present volume is a testament to the extent of these collaborations, which involve not only archaeologists but also historians, geographers, and specialists from a wide range of disciplines, with coverage extending from prehistory through the modern period.

A major problem for research of Jaffa prior to the Jaffa Cultural Heritage Project's inception was a lack of visibility of studies relating to Jaffa's history and archaeology, which were scattered among preliminary reports, specialist studies, and a number of publications in Hebrew that were largely inaccessible to many researchers. Before the publication of *HAI* 1, the only book-length treatments of Jaffa's archaeology or premodern history in English were Samuel Tolkowsky's nearly century-old but still indispensable *The Gateway of Palestine: A History of Jaffa* (Tolkowsky 1924), later published in Hebrew in 1926, and Ruth Kark's *Jaffa: A City in Evolution (1799–1917)* (Kark 1990), which was translated from the Hebrew edition.

Many large edited volumes suffer from a lack of integration and editing that provide coherence to disparately themed, if still related, studies of a subject. To avoid this, the editors have adopted a number of measures that are all the more significant for Jaffa given the number of contributors to this volume, the diverse character of their contributions, and the many periods represented. Some contributions have been retitled, with the author's permission, to clarify the content of individual articles. We have also supplemented all articles, except those in Parts III and IV, with abstracts, which will assist in clarifying the significance of individual contributions. Among the most superficial but essential measures has been the standardization of placenames. This has resulted in an extensive and revised gazetteer for Jaffa (see Appendix 1). Since a number of excavations have been conducted in certain places (e.g., Armenian Compound, Postal Compound), excavation license numbers have often been relocated to notes but are important for identifying all of the excavations carried out in one area. These are collected in Appendix 2, updating the list published in *HAI* 1 and providing references for reports that have appeared at least through the end of 2015. Whenever possible, efforts have also been made to standardize the presentation of ceramic and other finds. Likewise, repetitive historical background information has been extensively abbreviated and sometimes shortened by inserting references to discussions among earlier publications, notably to historical overviews in *HAI* 1, which were not cited in the original submissions. Many terms in foreign languages, particularly Arabic, are rendered in italics, and Arabic plurals are retained (e.g., *bayāra*, pl. *bāyarāt*). Insofar as this may complicate recognition of their significance, these terms are included with

definitions in the index. The index itself is extensive and includes references to all historical personages, as well as places of relevance to Jaffa and its setting. Last, the reader may encounter a few occasions where the editors have added endnotes, prefixed as *Editor's note*, intended to include information that was otherwise unknown to the authors during their study. Such measures, taken together, we hope will add to the utility of individual contributions and create further cohesion among the themes addressed in the five parts of this work.

The present volume has been under production for several years. We would like to thank the contributors for agreeing to have their works included in this venue and for their patience during its production. It is our hope that these works, collected together in a single volume with notable unifying themes, will increase the visibility of these studies and thus further the integration of Jaffa's history and archaeology in these related disciplines. The editors thank Nadia Ben-Marzouk (UCLA) for her assistance with the assembly of the volume and fact-checking of the bibliography, and Amy Karoll (UCLA) for her work on many of the figures. Likewise, we thank Krister Kowalski (Johannes Gutenberg Universität, Mainz) for

his assistance in the production of maps for a number of the contributions. We also thank Randi Danforth and the Cotsen Institute of Archaeology Press for agreeing to publish the volume, but also for the excellent appearance of the final product. Additional acknowledgments are included at the end of each contribution.

Aaron A. Burke, Katherine Strange Burke,
and Martin Peilstöcker
The Jaffa Cultural Heritage Project
October 2017

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