The Roman Port of Berytus

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Abstract: Though Berytus served as a key port throughout the Roman Period, the Classical harbour is still not well understood. This paper proposes a new interpretation of published material regarding the Roman city of Berytus through an examination of archaeological and geomorphological data uncovered over the past several decades. It will be shown that despite the fragmentary state of evidence and the lack of focus on Roman remains, a holistic approach can allow us to situate the harbour basin in the Roman Period, more definitively characterise and date maritime installations uncovered in the Beirut Central District excavations, and ultimately shed light on the evolution of an important maritime hub in the Roman Empire.

Key Words: Beirut archaeology; Roman economics; Roman trade; Roman ports; Eastern Mediterranean

Introduction

Located in central Lebanon, the city of Beirut is characterised by a long history of continuous occupation thanks to the site's access to water, strategic geographical location and effective harbour. Even in ancient times, the city was seen as infinitely old, as suggested by Nonnus sometime between the fourth and fifth centuries AD, stating Beirut to have been 'the nursemaid of cities… first to appear, born with time, old as the universe' (*Dionysiaca* 41.361-7). Recent excavations have explored the nature of the city and its development over time (Perring et al. 2003), but there remains the need for in-depth analysis of the harbour and its relationship with the city, as well as the maritime networks within which Beirut was involved.

In the Roman period, the port city of Berytus served as one of the main centres of exchange in the eastern Mediterranean. After the settlement of the veterans of the Battle of Actium, the city was elevated to the status of *colonia*, resulting in an expansion of the existing city limits, a lavishing of public spaces and a refurbishing of the harbour (Elayi 2010: 160-61; Hall 2004: 95; Marriner 2009: 210; Millar 1993: 36; Perring et al. 2003: 204, 220; Seeden and Thorpe 1997: 236; Stuart 2002: 98-104, Fig. 5). In addition, the city began producing several new amphora types starting in the first century BC and packaging Berytus wine and oil to be subsequently distributed (Reynolds 1999; 2000b; Reynolds et al. 2010). These developments suggest the port city to have benefited economically from Roman colonisation, which translated into urban growth and expansion. With evidence of harbour installations utilised in the Roman period having been uncovered along the northern coast of Beirut (Butcher and Thorpe 1997: 299, Fig. 8; Perring 1997: 25-26), we are now able to better understand the layout of the port city and how it facilitated the loading and unloading of ships, the transportation of shipped goods to the market and the subsequent exchanges that took place within the ancient souks.

In this paper, the author examines harbour installations found in Beirut to situate and date the harbour basin in the Roman period. This is done by first providing historical context and outlining the time period of focus, then presenting and discussing archaeological and geomorphological data uncovered in the city (see Figure 1), and briefly comparing results to other maritime sites in the eastern Mediterranean.

History

The Phoenician coast was under Persian rule before being conquered by Alexander the Great, and passed to Seleucid control after his death (Butcher 2003: 22). After years of internal strife and local disputes, Antiochus III 'the Great', the ruler of the Seleucid kingdom from 222-188 BC, began the first of many clashes with Rome (Butcher 2003: 27). These feuds, among other reasons, led to the decline of the Seleucid kingdom. As a result, later Seleucid rulers were forced to grant independence to some of the more powerful cities, such as Tyre in 126/125 BC, Tripoli in 112/111 BC and Sidon in 111 (Butcher 2003: 29).

Beirut received its independence from Seleucid control several decades later by Tigranes, the king of Armenia, in 81 BC (Butcher 2003: 23-26; Hall 2004: 45; Lauffray 1977). Thus, the city existed for several decades in the 'power vacuum' that had been left after the withdrawal of Tigranes and before the arrival of Pompey in 66 BC.

Shortly thereafter, Beirut was incorporated as a Roman territory in 64-63 BC with Pompey's deposing of Antiochus IV and reorganisation of the political structure of the region (Hall 2004: 45; Sartre 2005: 43). In 42 BC, Mark Antony took control of the eastern provinces after the battle at Philippi, and eventually gifted a selection of land and cities (the Bekaa Valley and coastal towns) to Cleopatra (Josephus *Ant.* 15.95; Plutarch 51.2.1-2, 3.1; Hall 2002: 142). This appears to have included most of the Levantine coast 'with the exception of Tyre and Sidon, which he knew to have been free from the time of their ancestors, although she earnestly pleaded that they be given to her' (Josephus *Ant.* 15.95). After the defeat of Mark Antony at the hands of Augustus at the Battle of Actium, it is believed that Augustus settled two legions in Beirut around 31 BC based on numismatic evidence and Strabo's reference to the settlement of soldiers after Actium (Strabo 16.2.19; Hall 2004: 46; Millar 1993).

After colonisation, Berytus quickly rose in status. Local rulers favoured the city, and at different times were said to have bestowed monumental structures in the form of statues, sculptures and a theatre. Marcus Julius Agrippa II, the client king ruling in the coastal provinces, was said to have given the people grain and olive oil and presented the population of Berytus with annual spectacles (Josephus *Ant.* 20.211-13). Over time, the city grew and expanded its territory, acquiring large tracts of land in the Bekaa Valley and further south, reaching some point slightly south of Jiyeh. In the reign of Septimius Severus (193-211 AD), Berytus was included in the newly organised province of *Syria Phoenice*, which was a further subdivision of the Syrian province (Hall 2002: 149-51). This came during a second period of intense private and public construction in the city, and marks an important urban transition. Therefore, the main period of focus in this paper resides between the 'independent' period and the later Roman Period to compare the physical evidence to transitional phases in the city's history.

Harbour installations

Archaeological data can help in shedding light on the abovementioned developments. Excavations in Beirut have revealed several phases of a quay (BEY 039), tanks/vats (BEY 007) and a series of ashlar blocks that may be indicative of a quay in the north-western quarter of the Roman city (BEY 007), the analysis of which may provide crucial insight regarding the location of the ancient coastline and the continuous use of the harbour before and after Roman colonisation. This section examines these features to better situate the Roman harbour, and analyse construction methods and associated material.

BEY 007

BEY 007, located in the northwest region of the Beirut Central District (BCD) excavations, was excavated in 1996 under the direction of Helga Seeden and Reuben Thorpe (Thorpe et al. 1998: 31). Exploring the area offered a rare opportunity, as the site is situated on a high promontory that runs N-S, and appears to make up the western limit of the ancient harbour basin (Thorpe et al. 1998: 32). Excavators were hopeful to better understand the waterfront of the Hellenistic/Roman city and associated maritime activity.

As mentioned earlier, excavations at BEY 007 uncovered maritime installations that can be tentatively dated to the Classical period; however, preservation of archaeological material from this phase is quite poor (Butcher and Thorpe 1997: 299). Most of these deposits were fragmentary and truncated by later periods of activity in the Ottoman period as well as modern construction (Thorpe et al. 1998: 36, 43, 46). Regardless, the data still sheds light on the Roman port when taken in context with other BCD sites.

Tanks/vats

The eastern portion of the main area of excavation of BEY 007 turned up two large rock-cut tanks or vats of an unknown function, one of which lies in close proximity to the other features (Figure 2). The only surviving portions of the tanks are those that were cut directly into the bedrock, with later phases having been truncated by Ottoman occupation and modern construction (Thorpe et al. 1998: 36). These remaining parts of the vats are around 3 by 1 metres in size and reach around 1.5 metres in depth (Thorpe et al. 1998: 36). The insides of the vats were plastered with a coarse, pink mortar with pottery and tile inclusions and subsequently covered by a fine-grained pink mortar to give a more refined finish (Thorpe et al. 1998: 36). Much of this pottery has been roughly dated to the Classical period by the excavators, and similar vats dated to the late Roman or Byzantine period were found at BEY 006 (Thorpe et al. 1998: 38). Thus, it seems that the tanks can be tentatively dated to the late Roman/early Byzantine period.

One possible function for these tanks could be as a fish tank, as described by Columella in his treatise on agriculture:

> …the best pond is one which is so situated that the incoming tide of the sea expels the water of the previous tide… for a pond most resembles the open sea if it is stirred by the winds and its water is constantly renewed… The pond is either hewn in the rock, which only rarely occurs, or built of plaster on the shore… If the nature of the ground permits, channels should be provided for the water on every side of the fish-pond… It will be well to remember that gratings made of brass with small holes should be fixed in front of the channels through which the fish-pond pours out its waters, to prevent the fish from escaping (Columella 8.16.7).

It is difficult to say definitively if these were indeed fish tanks, as the upper portions have been heavily truncated in the Ottoman period and from modern construction. However, they are reminiscent of basins found in Sarepta in the south of Lebanon, which are dated to the late Roman period (Pritchard 1971). They are identical in size, are carved into the bed rock, and lined with plaster. Similar examples have also been found at Chersonisos and Mochlos on the northern coast of Crete (Pritchard 1971). In Sarepta, the fish tanks were fed by carved channels, and located adjacent to the quay. This differs from those observed in BEY 007, as the tank closest to Sea Wall Phase 1 (SWP1) is actually about 15 metres southwest of the feature. If the two features (quay and tank) are to be interpreted as contemporaneous, there may have been a problem in water flow reaching the tank consistently. Additionally, the tanks may have been used in the growing of *murex*, from which a purple dye could be produced that the coastal Levant was famous for throughout history. Another possibility is the utilisation of the tank as a basin for fresh water, as observed in Sarepta (Pritchard 1971: 47). This will be discussed in more detail later.

Rock-cut steps

In between these tanks, a sequence of ten rock-cut steps were uncovered on an east-west axis. They cut through the natural break of slope of the bedrock, with the lowest step on or just below the waterline (Thorpe et al. 1998: 36). More specifically, the lowest step cut through the level bedrock, and the sides of this cut were plastered with a pink mortar similar to that used in the vats described earlier (Thorpe et al. 1998: 36). The steps descend from west to east, eventually opening up and leading into a natural cove in the north-western corner of the harbour basin in the late Roman period (Thorpe et al. 1998: 36-38).

At a later phase, a wall of squared and roughly faced sandstone blocks reinforced with a thick, weak, orange, sandy mortar overlay the plaster at the base of the rock-cut steps (Thorpe et al. 1998: 37). This wall has not been dated, though it was most definitely erected after the formation of the steps. At the north-eastern end of the cove, two courses of squared limestone blocks were observed. These were joined with a thick, pink mortar with sandstone packing and faced on the southern edge, and the northern side of these walls was bonded to the projecting bedrock spur (Thorpe et al. 1998: 37). Since only the southern side of the wall is faced, and the northern side is bonded to the bedrock, this indicates that the cove south of the wall would have been intended to be a closed-off space. As the rock-cut steps lead to this designated space which lies adjacent to the ancient coastline, it is quite likely that these features can be dated to the same period. Furthermore, it is possible that the rock-cut tanks discussed in the previous section are also of a similar time period, as attested by the presence of a similar pink mortar.

A parallel can again be drawn with Sarepta, as similar rock-cut steps were observed leading from the edge of the quay to a nearby basin that was possibly used to purify water or hold fresh water (Pritchard 1971: 47-48). The distance of the tank observed in BEY 007 from SWP1 supports this proposition, as this would have prevented sea water from flowing into the basin.

Sea wall

In the eastern extension of the main area of excavation, a series of 'sea walls' were observed. SWP1 has been tentatively dated to the Classical period based primarily on construction technique (Seeden and Thorpe 1997: 228; Thorpe et al. 1998: 38), and phases 2-4 were built in the Ottoman period. Phase 1 of the sea walls was uncovered in the south-eastern corner of excavation and consists of large, ashlar limestone blocks set on roughly a northwest-southeast axis. The width of the wall varies from 0.3 to 0.7 metres (Thorpe et al. 1998: 38), though this variability could be due to the heavy truncation and poor preservation of the upper courses of the wall. Most of the ashlar blocks seem to be closer to 0.7 metres in width, with several outliers in the extreme south-eastern area of excavation. The upper courses of the wall lay between 1.83 and 2.50 metres above sea-level (Thorpe et al. 1998: 38).

This construction technique of ashlar blocks being laid adjacent to one another and perpendicular to the coastline is quite typical of harbour construction in the eastern Mediterranean throughout the Hellenistic and Roman periods. Examples include Amathous in Cyprus, Elaia in modern-day Turkey, Sarepta and Tyre in south Lebanon. However, without ceramic material or numismatic evidence, it is difficult to narrow in on a specific phase based solely on this site.

BEY 039

In BEY 039, a sounding of 68 metres^2 was excavated on the western side of Allenby Street (Elayi and Sayegh 2000: 225). The sounding revealed what appears to be a quay with a possible mooring post. The quay is characterised by several rows of rectangular, limestone, ashlar blocks associated with three phases of construction. The blocks are situated longitudinally and oriented in an east-west direction (Elayi and Sayegh 2000: 229). Though the stratigraphic sequences are complex and the area was quite disturbed, three strata can be roughly distinguished.

Stratum I

Stratum I is situated about 0.95 metres above actual sea-level and was uncovered about 2.45 metres beneath Allenby Street. It is composed of ashlar blocks consisting of 'ramleh', a type of limestone found locally. The stones are 0.60 metres long by 0.30 metres wide, and are bonded together by a greyish mortar, composed in part by lime and ash (Elayi and Sayegh 2000: 230). About 1.40 metres from

the edge of the quay, a cylindrical mooring post of the same ramleh material was uncovered, with two deep grooves on either side, likely from the usage of moored ships. It was also found slightly inclined towards the port, which may be the result of repeated use (Elayi and Sayegh 2000: 230). This mooring post was the only one found; however, gaps in the array of limestone blocks were located at regular intervals in relation to the mooring post. Finally, several Roman bronze coins were found *in situ* in context with the blocks in stratum I along with a needle for repairing fishing nets (Elayi and Sayegh 2000: 230). Unfortunately, while ceramic sherds were noted in the excavators' overall stratigraphic sequences (Elayi and Sayegh 2000: 226-31), they have not been specifically linked to the three strata of the quay, nor have they been published or analysed in detail.

The use of mortar to bind the stones together is typically associated with Roman engineering, though it seems to have come into use earlier (Blackman 1982b: 197). As this stratum overlays two other rows of ashlar blocks which were not bonded with mortar, and did not provide similar dating material, it is likely that this layer represents the refurbishment of older harbour installations in the Hellenistic or Roman periods with new construction techniques. As observed at Atlit, Tyre, Sidon and Akko, it seems that older harbour works were often refurbished and continued to be used in the Roman period (Galili and Rosen 2008; Haggi 2010; Marriner et al. 2014). This proposition is corroborated by the large number of *sigilatta* and other ceramic sherds from the Roman period that were observed throughout BEY 010 (Elayi and Sayegh 2000: 196-99), the settlement immediately adjacent to the quay of BEY 039. This phase is also near identical in the placement of the ashlar blocks, the size of the stones and the use of mortar to SWP1 in BEY 007.

Stratum II

Stratum II, located about 0.65 metres above actual sea-level and about 2.75 metres beneath the lower part of Alleby Street, is characterised by a similar row of ashlar blocks in the same orientation (Elayi and Sayegh 2000: 230). These blocks are considerably larger, measuring on average 0.60 wide, 0.50 high, and more than 1 metre in length (Elayi and Sayegh 2000: 230). They are assembled 'joint vifs', joined together without mortar through overlapping stones to reinforce the structure. More specifically, not all the ashlar blocks are perfectly rectangular and situated regularly; rather, certain stones are carved to fit into each other. Several blocks were joined together with lead-enforced dovetail joints, possibly those that would have been most exposed (Elayi and Sayegh 2000: 230). Another bronze needle for the repair of fishing nets was also discovered between these blocks (Elayi and Sayegh 1998; 2000: 230).

The use of the dovetail joint is usually associated with Hellenistic construction (Elayi and Sayegh 2000: 231; Martin 1965: 254-55; Raban 1991; Seeliger et al. 2013), which appears to be consistent with the possible phases of the maritime installations. This does not suggest the technique to have changed or gone out of use in later periods, as the technique remained in use for a long period of time (Blackman 1982b: 197). Thus, more precise dating is not possible solely through architectural analysis. However, the distinction between each stratum (mortar, dovetail joints, diagnostic material) supports a clear chronological sequence.

Stratum III

Stratum III was found at 0.15 metres above actual sea-level and 3.25 metres beneath Allenby Street. This layer is quite similar to stratum II in terms of the dimensions of the ashlar blocks in the same layout and orientation (Elayi and Sayegh 2000: 231). These blocks are joined in a similar fashion to that of stratum II with the overlapping stones, with certain blocks joined with dovetail joints. Several large hollow cavities were observed with traces of reddish-brown material at the interior, indicating the utilisation of iron joints, presumably coated in lead to prevent damage to the stones (Elayi and Sayegh 2000: 231). At the borders of the quay, it appears that the blocks are faced towards the sea, though they have very much eroded (Elayi and Sayegh 2000: 231). This layer was quite moist, likely due to the fact that it is close to actual sea-level. This stratum likely represents Iron Age/Early Hellenistic installations, especially since the adjacent site of BEY 010 revealed extensive remains of an Iron Age/Hellenistic settlement.

Sedimentary cores

In order to clarify the complicated situation detailed in previous sections, geomorphological analyses provide crucial insights. The ancient harbour basin of Beirut currently lies landlocked beneath the modern city along the northern coastline. This coastal progradation is largely due to silting up from a lack of upkeep in the harbour, as well as construction works since the nineteenth century (Marriner et al. 2008: 2504). Urban developments have made excavation difficult and limited to specific times and locations in the city. Thus, geomorphological analysis traces the development of the ancient harbour over time using a non-destructive method.

The western façade of the city is exposed to the dominant winds and waves as well as dangerous eddies, such as the one near Ramlet el Bayda (Davie 1987: 147). The western shores did not benefit from the natural protection of the rocky promontory of Ras Beirut, and any port would have been quickly filled in, especially as the sea is quite shallow in this area. Thus, the primary focus for archaeologists and geomorphologists studying the ancient harbour of Beirut has always been the northern coastline, specifically the cove of Ain el Mreisseh, the cove of Hotel Saint Georges and the Bay of Saint André (Figure 3). As the archaeological material and ancient city largely centred

around the Bay of Saint André, it was proposed to begin geomorphological analysis in this area (Marriner et al. 2008). 25 cores were drilled in and around the hypothesised location of the ancient harbour basin in Beirut in collaboration with the BCD excavations (Carayon et al. 2011: 51). 20 of these cores, depicted in Figure 4, were undertaken by Marriner et al. (2008). This campaign was based largely on Davie's proposed location for Beirut's ancient harbour (1987). The cores were drilled to the east and west of the ancient tell to test this hypothesis, and the results have been analysed to better understand geomorphological processes at play along Beirut's shores. This section summarises the analysis of these cores and discusses some of the implications regarding harbour upkeep in the Roman period as well as the transition from a high-energy to a low-energy marine environment.

Eastern basin

Cores Be III, Be V, and Be XX, located in the anchorage east of Burj al-Mina, have all revealed 'medium grain marine sands' which reflect an area not significantly sheltered (Marriner et al. 2008). It is possible that this sandy area could have been used as a fair-weather shelter from the Bronze Age onwards for shallow draught vessels, but based on recent analyses, it is certain that there did not exist a well-protected harbour comparable to that observed in the western basin. These results seem to corroborate the general situation of the Roman city with the main street leading to the harbour basin (Figure 5). The western edge of the eastern harbour basin lies near the outskirts of the city, and no harbour installations have been found in this area.

Western basin

The western basin is located west of Burj al-Mina and was hypothesised to be the ancient city's main harbour (Davie 1987). As mentioned earlier, this basin underwent significant transformations over different periods of occupation and it is necessary to better understand the rate of coastal progradation to situate the harbour more accurately, assess the nature of the marine environment and specify any upkeep that may have taken place in the past.

Based on the quay uncovered in BEY 039 (see below), as well as a Middle to Late Bronze Age shoreline in BEY 069 (Marquis 2004), Marriner et al. (2008) have estimated a 70-metre progradation of the coastline between the Early Bronze Age and Roman period. As this figure is based on excavations, it is largely dependent on the dating of associated archaeological material. In this case, the feature uncovered in the BEY 039 sounding is often described as an Iron Age III/Persian quay, which has allowed it to be a marker for the rate of coastal progradation and the reformation of the ancient coastline from the Bronze Age through to the Roman period. It must be recalled that this identification is tentative, and the possibility of reuse of maritime installations in later periods could extend this timeline to the Hellenistic or Roman period, proposing a smaller degree of progradation. Thus, the Roman coastline proposed by Marriner et al. was likely much closer to BEY 039 than has been estimated. In the northern portion of the port basin, it appears that the coastline remained fairly stagnant over the past 6000 years (Marriner et al. 2008: 2508).

Cores Be VIII, Be IX, and Be X were analysed in detail and samples were taken from individual phases of each core for radiocarbon dating. Each core depicts a change from a high-energy marine environment to a low-energy marine environment based on the sequence of sediments (Marriner et al. 2008: 2508). The transition from coarse-grained sand to silts and clays reflects the implementation of artificial harbour works in the Iron Age and Hellenistic/early Roman periods, which is corroborated by the faunal data observed in each core (Marriner et al. 2008). Interestingly, in Be VIII and Be X, there is a hiatus in sedimentary sequences observed between the Iron Age and Roman Period, which has been interpreted as the result of dredging practices in the Roman period which removed earlier strata from the geological record (Marriner et al. 2008: 2508). This pattern seems to be consistent with Roman harbours in general, as dredging and regular upkeep of harbours became much more widespread (Oleson 1988; Rickman 1988).

Ultimately, the results of the cores suggest Davie's proposed location to have been quite accurate, with a continuous utilisation of the harbour since at least the Iron Age. The coastline in 1840 is based primarily on Davie's map. The recreations by Marriner et al. of the Hellenistic-Roman and Bronze Age-Iron Age coastlines were constructed based on a combination of the rate of progradation, sediment analysis of the discussed cores and archaeological material. However, the interpretation of the quay uncovered in BEY 039 has proved to be key in this hypothesis, and the ceramic data from the cores and archaeological work in BEY 143 and 147 provide corroborative evidence. If the same installations were refurbished and reutilised in the Roman period, it would suggest the Roman and most definitely the Hellenistic coastline to be farther inland. The author has proposed this to have been the case, as depicted in the Roman coastline in Figure 1, which follows the quay uncovered in BEY 039, as well as the installations uncovered in BEY 007. Given that the ashlar blocks in BEY 007 and BEY 039 are almost identical, lie on a similar axis and were joined with mortar, the author proposes here that they be taken as contemporaneous.

Construction and continuity

This paper has combined multiple lines of evidence for a brief overview of the harbour in the Roman period. It is clear from sedimentary analysis of the cores undertaken in

the western harbour basin, the archaeological evidence uncovered in BEY 007 and BEY 039, and the orientation of the city grid that the Roman harbour basin was located roughly in the area between Burj al-Mina and the Ottoman/Late Roman quays identified in BEY 007. Furthermore, based on this evidence, it seems that harbour installations that have been unequivocally attributed to the Iron Age and early Hellenistic period were likely refurbished and reutilised in the Roman period.

More specifically, stratum I of the quay identified in BEY 039 appears to represent a phase of construction associated at least with the Hellenistic Period and likely the Roman Period. The use of mortar differentiates this layer from strata II and III, and the Roman coins and ceramics suggest a later date than the previous two. The blocks used in stratum I are smaller in size than the other two, and actually match those observed in BEY 007 quite closely. Thus, it is possible that the feature observed in stratum I in BEY 039 could be associated with the 'sea wall' observed in BEY 007.

In stratum II, the construction technique implemented large headers set parallel to each other. This technique is quite typical of Phoenician construction (Iron Age to Hellenistic), though the actual manifestation of this technique is variable across the Levantine shore. In the harbour of Tyre, for example, large ashlar blocks of comparable size to those in strata II and III in BEY 039 are laid in the same fashion. Two courses have been observed in the underwater surveys conducted by Noureddine and Mior (2013), with a third protruding through the sediments at certain places. However, Tyre is notorious for the lack of consensus in the dating of the mole. For Carayon, the feature could be associated with a later period, possibly no earlier than Roman (2008: 651). Based on preliminary sedimentary soundings, it is supposed that there existed a previous mole, possibly dated to the Iron Age/Persian period (Carayon 2008: 651). However, the study of 70 pottery sherds collected during the excavation of the mole by Descamps and Sicre indicates an earlier date of construction, possibly between the 6th and 4th centuries BC (Castellvi et al. 2007: 68). The nature of the ashlar blocks used to construct the mole in Tyre and the technique utilised are quite similar to strata II and III of BEY 039. However, unfortunately, it is difficult to definitively date the features based on this comparison.

The construction technique of joining two blocks together with a joint, sometimes reinforced with lead, is also observed at a number of sites throughout the eastern Mediterranean such as Elaia, Sarepta, Akko, Araq el-Amir and Dor (Elayi 2010: 160; Pritchard 1978; Sharon 1987: 38). As discussed earlier, the dove-tailed joint is often associated with Hellenistic construction, though it may have been utilised over a long period of time. At Elaia in modern-day Turkey (see Figure 6), the dove-tailed joint is used at a harbour with an estimated date of construction at the end of the third century BC (Seeliger 2016). Dove-tailed joints are also observed in the massive harbour at Amathous, where the estimated date of construction is around 315 BC (Empereur 1987, 2016). The port of Amathous is also characterised by large, ashlar masonry and heavy, lead-enforced joints.

However, in the Roman port at Sarepta, a number of blocks of the Roman jetty were joined together using a similar joint. The date of construction of the first phase at Sarepta has been dated to the first century AD (Pritchard 1971). These blocks were of a comparable size to those observed in BEY 007 as well as stratum I in BEY 039, and excavations at Sarepta also uncovered a number of large tanks reminiscent of those observed in BEY 007, though the ones in Beirut were severely truncated. Thus, it is difficult to utilise a single factor to date construction phases at the quays in Beirut; rather, the combination of all maritime installations as well as the geomorphological analysis point to an initial construction date in the Iron Age for the first phase, with refurbishment in the Hellenistic period and later in the Roman period.

The evidence indicates to a significant degree of continuity in the utilisation of the harbour at Beirut from the Iron Age to the Roman period. Previous courses served as the foundation for later Roman ones. Despite the lack of archaeological preservation of the upper remains, also resulting in the truncation observed in BEY 007, the available evidence points to an Iron Age instalment of a quay near the Iron Age settlement in BEY 010, a refurbishing of this quay in the Hellenistic period and again in the early Roman period. Strata II and III of BEY 039 both revealed large, ashlar blocks (larger than stratum I and the maritime installations in BEY 007) joined together with the dove-tailed joint, and found in association with Iron Age and early Hellenistic archaeological material. Given that ashlar blocks of stratum I of BEY 039 and the quay in BEY 007 were not joined together with dove-tailed joints, and were bonded with mortar, the author proposes that these features can be differentiated from the other strata discussed and represent late Hellenistic/early Roman developments. This would also match the increase in private and public construction seen in the city itself in the Augustan period, probably associated with the arrival of Roman veterans to the newly formed colony.

Thus, the Roman coastline proposed by the author in Figure 1 is largely based on the work of Marriner et al. (2008), as well as the research of Davie (1987), but adapted according to the archaeological analysis in this paper. The author suggests the coastline in the Roman period to have followed the installation uncovered in BEY 007 (as it appears that the feature can be tentatively dated to the Roman period), as well as the quay in BEY 039 (given that stratum I appears to be a refurbishment in the early Roman period). If stratum I from BEY 039 and SWP1 from BEY 007 are to be understood as contemporaneous, the actual coastline in the Roman

period would have been about 70 metres farther inland than initially anticipated.

BEY 143 and 147

This hypothesis can be further corroborated when considering BEY 143 and 147. The sedimentary cores were taken roughly in the vicinity of BEY 143 and 147, which are located at a key intersection within the Roman city between land and sea. Specifically, BEY 143 lies just outside the abovementioned archaeological remains in BEY 039, and BEY 147 lies in the centre of the presumed ancient harbour basin. Therefore, although no maritime installations were uncovered on either site, they are in an important position to shed light on the stratigraphic sequences within the ancient harbour basin and provide comparative data for strata I-III from BEY 039.

The deepest soundings at these sites have revealed Hellenistic diagnostics, first-century AD bowls and other Roman ceramics (Figure 7) (Curvers and Stuart 2007: 189). Crucially, this material underlays a series of strata, one of which may be directly correlated with a low-energy marine environment sediment. The overlaying stratum has been dated to about 500-800 AD, indicating a gap in the sediments from the first century AD to the 6th century AD, and further proof of cleaning operations in the harbour basin (Curvers, personal communication). A similar pattern has also been observed at BEY 147 (Curvers and Stuart 2007: 191). The fact that ceramics from the first century AD have been uncovered even after dredging activities in the Roman period indicates that this portion of the harbour would have been use in the Roman Period.

Concluding thoughts

Though some of the data is fragmentary, a holistic examination of BEY 007, 010 and 039 suggests an active harbour throughout the Hellenistic and Roman Periods. Having established that the harbour was in use in the Roman period and well-maintained, it would be expected that commercial connections should reflect this activity. However, it must be stated that future work that undertakes this endeavour cannot definitively indicate causation, but only correlation between commercial success, urban growth and harbour upkeep. In other words, it is a fairly straightforward process in tracing the distribution of a Beirut product around the Mediterranean, quantifying the finds and comparing commercial patterns to fluctuations in urban development. It is much more difficult making the jump to stating Beirut grew and expanded during a certain time period *because* of an expansion in commercial distribution. Regardless, these are considerations that will be undertaken in the next step of the author's research, and will hopefully provide another line of evidence with which to better understand the Roman port of Berytus, the primary node in a complex and multi-faceted commercial maritime network.

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Figure 1: Map of Beirut depicting excavated sites from the BCD excavations (data provided by Hans Curvers)

Figure 2: Harbour installations uncovered in the eastern area of BEY 007; Phase 1 has been roughly dated to the Roman period, but may have been constructed in the Hellenistic Period; sea wall phases 2-4 represent the Ottoman quay (data provided by Hans Curvers)

Figure 3: The bays of Beirut

Figure 4: Coastal change in Beirut based on core analysis and archaeological work (after Carayon et al. 2011: 52, Fig. 9)

Figure 5: Roman street grid of Beirut based on recent excavations; Decumanus Maximus West (1) and East (2), Cardo Maximus South (3) and North (4); Imperial Thermae BEY 045 (5); Central Forum BEY 009 (6); Temple and large, domestic dwellings BEY 004 (7); Roman amphora kilns BEY 015 (8) (data provided by Hans Curvers)

Figure 6: Example of dove-tailed joint observed in breakwater at Elaia (photo courtesy of Nicholas Carayon)

Figure 7: Northern section of sounding in BEY 143 depicting amphora sherds at bottom layer (photo provided by Hans Curvers, ceramic dating conducted by Paul Reynolds)