

ASHQELON DURING THE EB I PERIOD – A CENTRE FOR COPPER PROCESSING AND TRADE

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Ashqelon is found on the eastern Mediterranean seashore, on the southern coast of Israel (Fig. 1). The Early Bronze Age I (henceforth EB I) site comprises to date one of the largest and most intensively excavated EB I occupations in the southern Levant. Accelerated development in the Ashqelon region, conducted primarily since the early 90's and until today, has brought about numerous rescue excavations at the site, the majority of which have been undertaken by the Israel Antiquities Authority (BAUMGARTEN 2004; 2006; BRANDL & GOPHNA 1993; BRAUN & GOPHNA 2004; GOPHNA 2004; GOLANI 2004; 2005; 2007; 2008A; 2008B; GOLANI *in press*; GOLANI & PARAN *in press*; HAIMI 2009; KHALAILY 2004). These excavations have uncovered remains of a large and sporadic settlement of the EB I period that is spread out in a wide swath, at least one kilometer wide, parallel and adjacent to the coastline, from Tel Ashqelon in the south to at least five kilometers northwards parallel to the coast (Fig. 2).

Although the ancient topography of the site has undergone tremendous changes due to a thick overburden of sand dunes and modern development, the EB I settlement was apparently situated within a natural geographical 'trough', a shallow and elongated depression formed between two parallel inland kurkar stone ridges that run parallel to the coastline. Within this area, a distinct ecological niche was found wherein fertile soils, a high water table and varied flora and fauna, created a self-contained 'subsistence area' of distinctive character where a specific pattern of agricultural subsistence was exploited throughout the EB I (GOPHNA 1997).

The site is composed of several non-nucleated patches (Fig. 2) whose chronological range spans the entire EB I period of the southern Levant, contemporaneous with the beginning of the Egyptian middle Predynastic or Naqada I period, to the end of the Protodynastic period. The numerous excavations conducted to date have revealed a wealth of information. Part of this data includes a large assemblage of radiocarbon

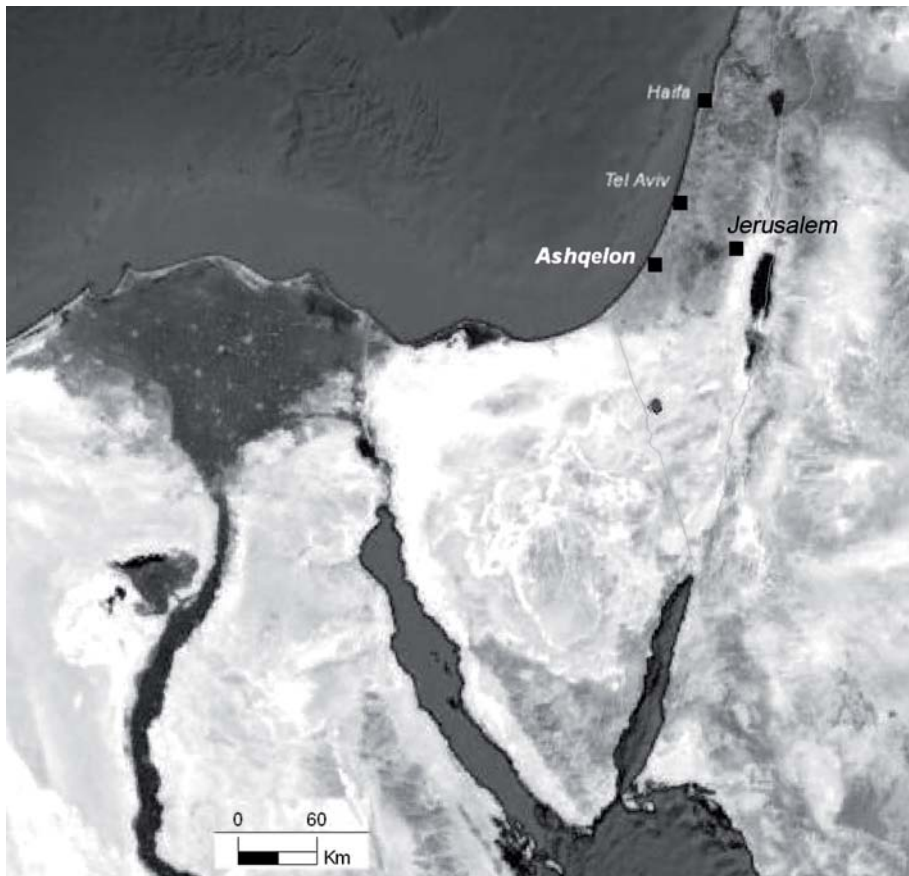


Figure 1. Location of Ashqelon.

dates from various excavation areas (Fig. 3) that show a continuous occupational sequence spanning nearly a thousand years, from the earliest stages of the EB I period in the first quarter of the fourth millennium BCE, all the way to its very end at the beginning of the third millennium BCE, when the site was abandoned. These dates, along with the material cultural remains that are characteristic of the EB I in southern Canaan (GOLANI & SEGAL 2002), posit Ashqelon as one of the earliest and longest-lived EB I occupations in this region (GOLANI 2013). The period in question, contemporaneous to much of the Naqada period in Egypt, is important as it marks not only the development of trade and cultural contacts with neighboring Egypt, but in its later portion, also includes the transition from a village-based to an urban-centered society in the southern Levant.

The reason for the intensive EB I occupation at Ashqelon is two-fold: 1) a high groundwater table that is easily accessible through digging of shallow wells (GOPHNA & LIPHSCITZ 1996: 145; NIR 2008) and 2) the position of Ashqelon on the western side of

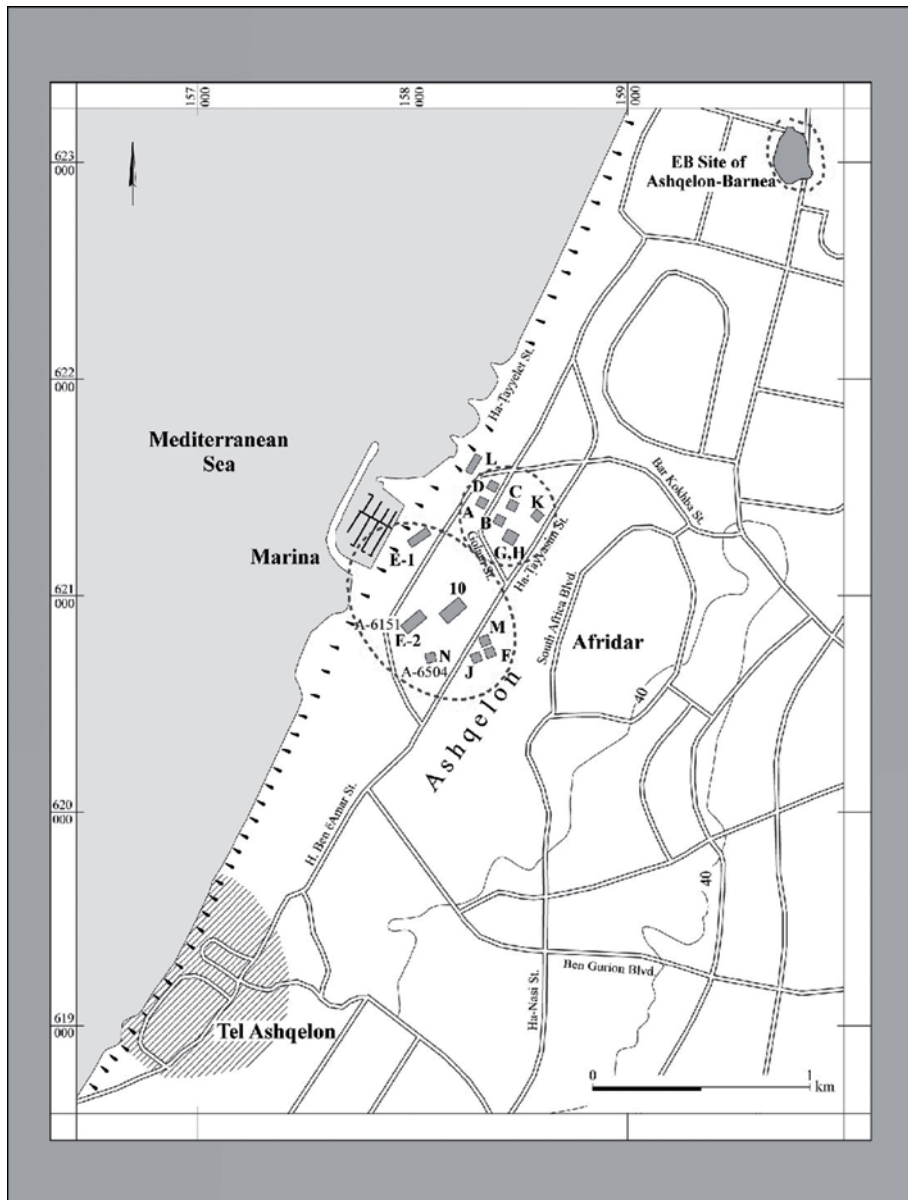


Figure 2. Location of EB I excavation areas at Ashqelon and habitation 'patches'.

a break in the sand dunes that constrict this area to the east, allowing easy access from the inland regions to Ashqelon on the coast. The direct access to the coast apparently made Ashqelon an important entrepôt for maritime and land trade throughout the

EB I (GOPHNA 2002). Increased precipitation, rising groundwater and the formation of marshlands due to inadequate drainage apparently caused this region, as well as much of the coastal plain in Israel, to be largely abandoned from the onset of the EB II period at around 2900 BCE (FAUST & ASHKENAZY 2007).

The extensive excavations at Ashqelon revealed architectural remains of the EB I period that included numerous examples of building units typical of the southern Levant during this period (BRAUN 1989; GOLANI 1999; GOLANI & YANNAI *in press*). Curvilinear architecture of stone, yet more commonly of mudbrick, is present from the earliest phases of occupation at the site. The scale of the excavations enabled large lateral exposures that showed many of these buildings to have been incorporated within walled compounds that also included circular storage structures (GOLANI 2005; 2007; 2008a; GOLANI & YANNAI *in press*). The compounds were separated by alleyways and open spaces. This form of spatial organisation in which domestic and storage structures are found surrounded by an enclosure wall is also present at the earliest stages of settlement at the site.

The excavations produced an abundant ceramic repertoire of the EB I period (*cf.* YEKUTIELI 2000) that also included imported Egyptian pottery as well as locally-made ceramic vessels made in the Egyptian tradition. In addition, the excavations produced numerous flint tools, some of which also appear to have been imported from Egypt, as well as a wealth of groundstone vessels, the majority of which were made of basalt that was imported to the site as finished vessels. The fact that at least during the later stages of settlement at the site, over 50% of the groundstone vessels were made of imported basalt stone is a clear indication of the volume of trade in which Ashqelon was involved and the relative wealth of its inhabitants (ROSENBERG & GOLANI 2012).

Numerous infant burials were also revealed during excavations as well as secondary burials of adults in attached stone cists, a relatively rare mortuary custom (GOLANI & NAGAR 2011). The faunal remains from the excavations also comprise one of the largest assemblages of this period excavated to date. The assemblage typically includes sheep/goat, cattle and pigs, yet has also revealed an unusually large percentage of domesticated donkeys that are evidence for increased use of these pack animals for overland trade (HIZMI 2004). The excavations also produced a large assemblage of molluscs and fish remains, some of which, such as *Chambardia rubens* and Nile perch (*Lates niloticus*) were also apparently imported from Egypt (LERNAU 2004).

THE METALLURGICAL INDUSTRY AT ASHQELON AND THE MANNER OF ITS ORGANIZATION

One of the most intriguing aspects of the large EB I settlement at Ashqelon is the abundant evidence of a metallurgical industry that apparently processed semi-refined copper into tools. In nearly all the areas excavated to date were found small rounded fire-pits, often lined with small stones (Fig. 4). Such pits were found in concentrations or as singular installations in open areas and adjacent to domestic buildings. The earth

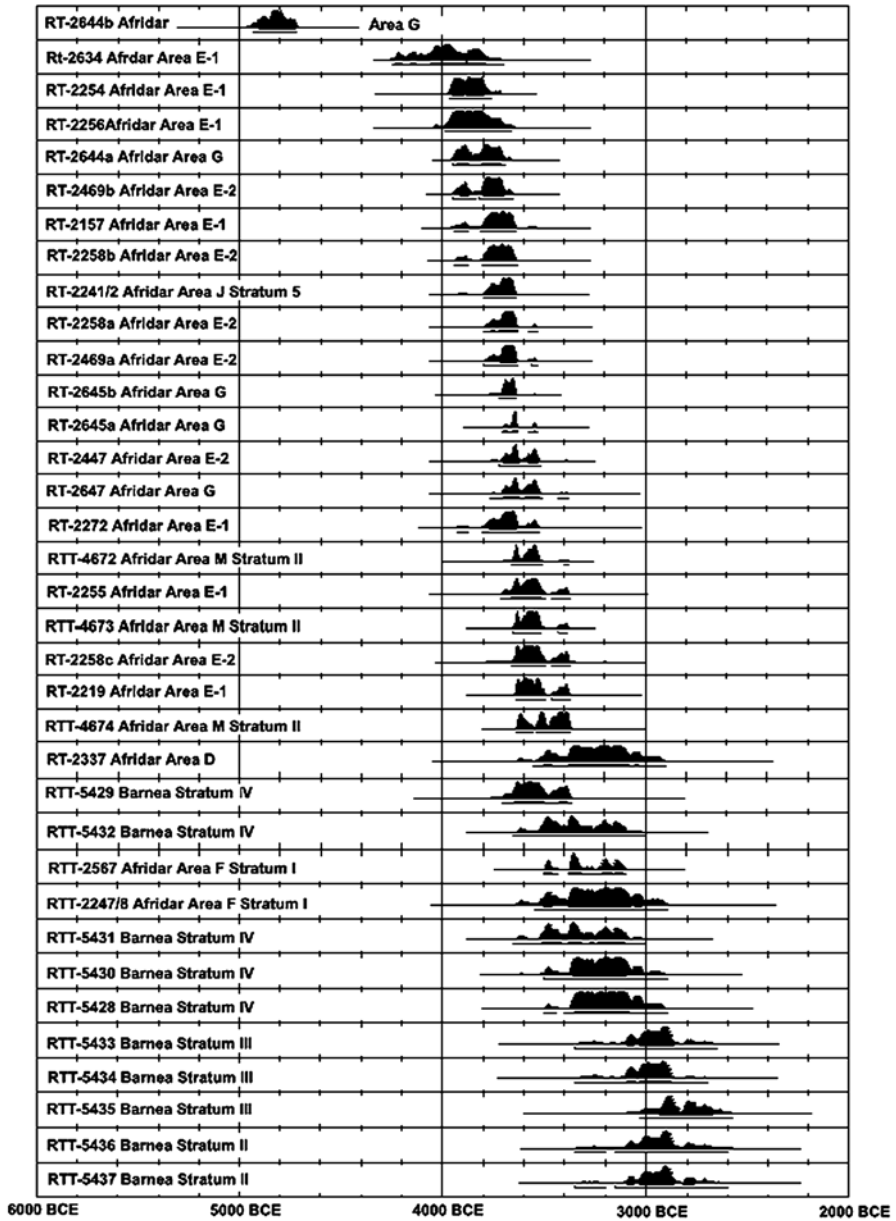


Figure 3. Radiocarbon Dates from EB I excavation areas at Ashqelon.

around these fire-pits was often found to have been baked by heat and within these small pits, a white-coloured ash was revealed that originated from burned plant matter (SHALEV 2003). Adjacent to these small fire-pits, large flat stones were often found (Fig. 4) that may have been used for grinding and pulverising, while in addition, large amounts of burnt mudbrick material were found in the immediate vicinity. Notable is the total lack of copper ore itself, such as malachite, not found in any of the excavations at Ashqelon or on any of the stones from the site supposedly used for grinding or crushing.

The connection of the fire-pits to a metallurgical industry was provided by large amounts of copper slags, copper lumps and droplets, as well as fragments of broken clay crucibles along with burnt ash and mudbricks that were found strewn on the ground or dumped within other, larger storage pits of cup- or bell-shaped form that were dug into the ground in the immediate vicinity that were re-used as refuse pits. These items all appear to have been the waste products of an intensive copper production process.

The manner in which the fire-pit installations functioned may be reconstructed as follows: a shallow circular cup-shaped pit was dug into the earth and lined with small stones on the inside. Around the pit, a low circular wall of mudbrick was formed, creating a small circular chamber that was open at the top and partially submerged into the ground. At the bottom of the pit-chamber was placed a crucible, consisting of a small roughly-formed hemispherical clay bowl that was filled with refined/semi-refined copper. The chamber was then filled with

hot coals atop the crucible that were then heated using air blown in through *tuyeres* fashioned from reeds and clay. The intense heat caused the copper to melt and sink to the bottom of the crucible, while other minerals were left at the top, often spilling over the top of the crucible. The latter were recovered as slag. The entire apparatus was then left to cool off, after which it was broken up and dismantled, the crucible was broken, and the copper at its bottom was removed for further processing. No exit hole for excess slag was found within these installations. The slag, which apparently remained within the installation, was removed at the end of the process. Similar smelting installations are common during the Chalcolithic period (GOLDEN 1998: fig. 8.20). This was a primitive though effective process that also produced large amounts of industrial waste which was very apparent in the excavations.

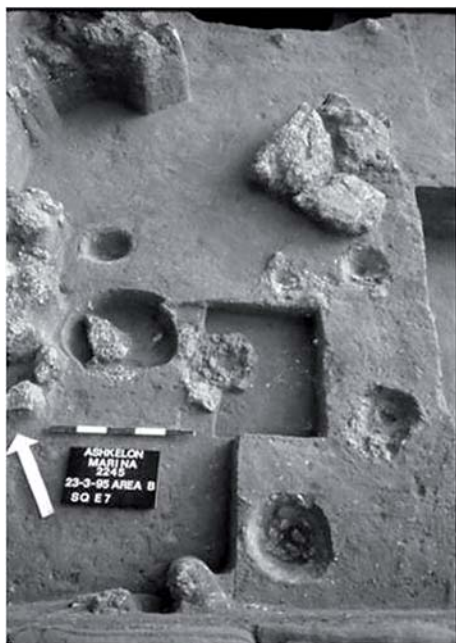


Figure 4. A concentration of fire pits uncovered in Area E-2.

Such installations, all apparently connected to the processing of copper, were found already in the earliest stages of the site's occupational history beginning around 3800-3700 BCE and continued to have been in use until its end. At a somewhat later stage, after 3500 BCE, the metallurgical activity was also found concentrated within walled compounds positioned alongside of other, domestic compounds and separated from them by alleyways. The industrial compounds were identified as such because of the large amounts of industrial waste and metallurgical installations found within them and their lack of domestic buildings and circular storage structures that were typical of domestic compounds that were also revealed at the site. This concentration of industrial activity in walled compounds is significant as it marks a distinct change from a localised or individual 'cottage industry' copper production that is characteristic of the Chalcolithic period to a more concentrated and focused production mode (SHALEV 2003: 322) that was possibly controlled by a strong kinship group or corporate administration within the site that wished to separate its activities from those of others.

One of these industrial compounds was completely excavated, revealing an irregularly-shaped area surrounded by a mudbrick wall encompassing 270m² (Fig. 5). Two entranceways screened off with mudbrick partitions were revealed in the south and east. To the west and facing the sea was an area where intensive burning took place while the remains of more melting installations were found scattered within the compound. In and around this region were found numerous burned mudbrick fragments and ash, copper slags, prills and crucible fragments.

The products of all this metallurgical activity were numerous yet limited in variety. They consisted primarily of various awls, pins and needles in addition to axes and occasional knives or dagger blades and copper strips of unclear function (Figs. 6-7). Most of these are utilitarian tools typical of the EB I period. Completely lacking in the repertoire of products were various metal objects of cultic nature such as maceheads, crowns and sceptres that are well-known in the copper industry of the preceding Chalcolithic period. Though Chalcolithic metal technology continued into the EB I period (SHALEV 1994), one of the major differences between the two periods is a clear shift towards the production of utilitarian tools and the virtual lack of cultic metal objects. This appears to reflect one of the major changes that characterise the EB I as opposed to the Chalcolithic period; namely, the transition to a market or trade-oriented economy.



Figure 5. An industrial compound from Ashqelon Barnea

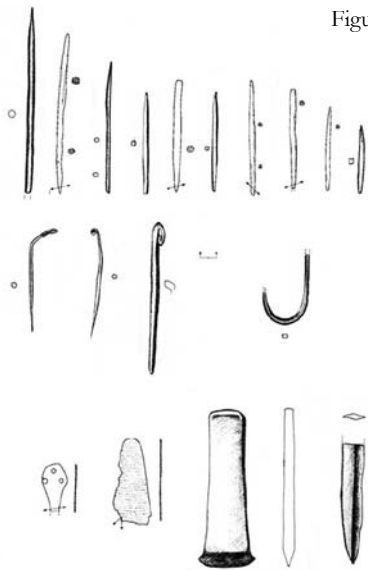


Figure 6. Various copper tools recovered from excavations at EB I Ashqelon.



Figure 7. Copper awls from EB I Ashqelon.

These same types of utilitarian products are known from contemporaneous sites in pre-dynastic lower Egypt as well. At Tell el-Farkha and Ma'adi, knives, axes, awls and distinctive loop-ended pins, identical to those found at Ashqelon, were found as well (CZARNOWICZ 2012a: figs. 1: 2, 4; 2: 1, 5; 4: 1-4; RIZKANA & SEEHER 1989: pls. 3: 10-23, 4: 6). This of course raises the question of whether these items from lower Egypt were Levantine imports or whether they were Egyptian products, possibly paralleled in the Levant at the same time.

Metallographic analysis on some of the Ashqelon items was undertaken by the Israel Geological Survey (SEGAL *et al.* 2004). However, this was only done on a very limited amount of copper items from the very early phases of the copper industry at the site (Areas E and G at Ashqelon Afridar). The analysis showed a very limited use of the lost wax method that was well-known in the Chalcolithic period. Most of the tools, such as awls and axes may have been made by pouring the molten metal into open moulds, then further working by hot or cold forging processes into finished tools. Though assumed, at present, none of these supposed moulds has yet been found at Ashqelon. These may have been made of clay that had disintegrated. Some of the tools, such as the awls, could also have been made by cutting a chunk of copper and working it into the desired shape by hot or cold forging. Square-sectioned and round-sectioned awls were found made by two slightly different methods; after open casting, the square-sectioned awls and an axe were found to have undergone a stage of incomplete hot mechanical forging and a further stage of mechanical cold forging which gave them a greater hardness

than round-sectioned awls. After open casting, the round-sectioned awls underwent only incomplete hot forging, which made them less durable than square-sectioned awls. Square and round-sectioned awls were once thought to be indicative of the EB I and the Chalcolithic periods respectively (SEBBANE & ILAN 1989) but at Ashqelon they are found together in the same occupational strata and appear to have been produced in different levels of hardness, possibly for different functions.

THE SOURCES OF ASHQELON'S COPPER

On these same items, metallurgical analysis of lead isotope ratios and their comparison to those known from the copper ores of Feinan in southern Jordan, Timna in southern Israel and those of Sinai (Fig. 8) has shown greater similarity to the ores and slags from Feinan and Timna, positing these regions as a likely source for the copper industry at Ashqelon. However, these analyses were done on only a very small selection of objects dating to the very initial stages of settlement at Ashqelon and further testing of objects from later stages of settlement should be done to gain a more complete picture.

The region of the Arava between the Dead Sea and the Red Sea has been extensively investigated and is well-known for its rich copper deposits that have been mined for copper since the Chalcolithic period or even earlier (ROTHENBERG 1999). Copper mining and smelting during the Late Chalcolithic and the beginning of the EB I period is known primarily from the region of Feinan region, also known as Wadi Fidan (ADAMS & GENZ 1995) and from the region of Aqaba on the Red Sea, near to which are the sites of Timna (ROTHENBERG & GLASS 1992), Tall Hujayrât al-Ghuzlân and Tall al-Magass (EICHMANN *et al.* 2009; KHALIL 2009; *cf.* SHALEV 1994: 633-636 for summary and references). During the second half of the fourth millennium BCE and nearing the end of the EB I period, remains of mining settlements are known from the sites of Feinan 17 (HAUPTMAN & WEISGERBER 1992) and Feinan 100 (WRIGHT *et al.* 1998). The latter site also produced remains of open casting moulds as well as crucibles. In the regions of Timna and Feinan, numerous mines have been identified associated to copper working installations and quantities of slag bear witness to copper smelting near the mining sites themselves. These, however are often difficult to date as the mining technology itself was essentially the same in both the Chalcolithic and the Early Bronze Age and datable remains at the mining sites are extremely meager. However, SHALEV (1994) has suggested that as copper production in the Chalcolithic period is typified by a distinct structure of craft specialisation at all stages of production, probably by the same people who mined and then smelted the copper ore after transporting it to the village production sites; that of the EB I period is marked by specialisation at each stage of the production process wherein initial smelting of the copper ore was carried out near its source. GOLDEN (2002) has also noted that the transition from the Chalcolithic to the Early Bronze Age is marked by a reconfiguration of production locales; initial smelting during the EB being carried out in the mining area itself.

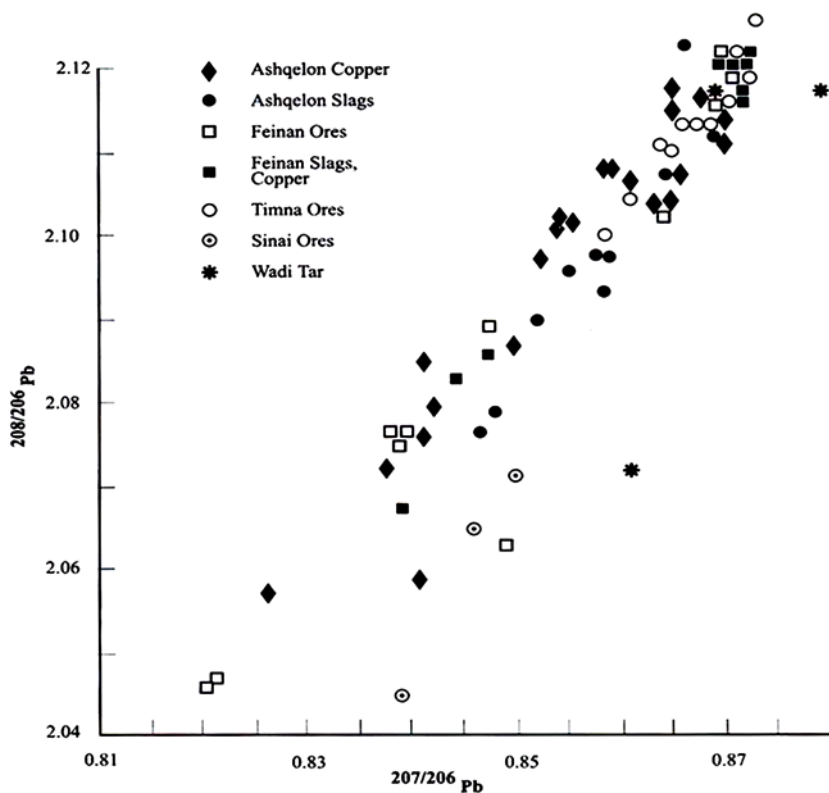


Figure 8. Lead isotope analysis of selected copper objects from Areas E and G at EB I Ashqelon, Afridar.

MOVING THE GOODS: ASHQELON AND COPPER TRADE DURING THE EB I

At Ashqelon, no remains of copper ore were found in any of the excavations. Furthermore, analysis of the copper slags from Ashqelon revealed a very high copper content (SEGAL *et al.* 2004), much higher than would be expected if the copper was initially refined from ore itself. Transporting semi-refined copper is more economical than transporting a much larger amount of raw ore over long distances. In addition, working the copper ore into finished copper tools would have required a large amount of fuel for burning, and the Feinan and Timna regions have only sparse vegetation. The conclusion, in line with Shalev's analysis, is that copper ore was probably smelted near the mining areas, and was then transported overland to Ashqelon as 'black copper' or as copper ingots that were then further refined at the site to remove the remaining impurities and then cast and worked into tools (Fig. 9). This clear division of labour and specialisation posits the mining and refining sites as the first station in a developed network.

Two sites in the Timna region, Tall Hujayrāt al-Ghuzlān and Tall al-Magass in Jordan, may be excellent examples of mining settlements dated to the earliest stages of the EB I period, or the second quarter of the fourth millennium BCE (KLIMSCHA 2009: figs. 1-4). The excavators have determined that the sites could have supported several hundred people a year, while the various finds clearly indicate that the inhabitants were involved primarily with copper mining and smelting during the first half of the 4th millennium BCE (EICHMANN *et al.* 2009; HAUPTMANN *et al.* 2009; KHALIL 2009). It is notable that both sites have produced copper ingots and ingot moulds, conclusive evidence of on-site copper production, yet no ingots or ingot moulds have been found to date at Ashqelon. This is further indication that at Ashqelon, copper processing into tools was probably done from complete ingots of pre-smelted copper or from semi-refined copper. Examples of such ingots are also known from Ma'adi already during the early stages of the EB I (RIZKANA & SEEHER 1989: pl. 4: 9-11, I: 9-11), suggesting that they may have been imported to the site as valued raw material.

Mining and initial processing of copper ore in southern Jordan and Timna may have been just the initial stage of a developed copper industry and trade network that moved semi-refined copper and/or copper ingots from the south to Ashqelon for final production into tools or further distribution of the ingots as raw materials. This could have been done by overland donkey caravans and during the EB I, numerous ceramic figurines of domesticated donkeys attest to their intensive use as pack-animals for transport (HIZMI 2004). The remains of numerous sites of the EB I along a land route running through northern Sinai certainly indicate overland traffic between Egypt and the southern Levant (OREN 1973; YEKUTIELI 1998). The faunal assemblage at Ashqelon revealed an exceptionally large amount of donkeys, up to 20% of all the fauna in some of the excavated areas, and this evidence suggests Ashqelon as a terminal point for donkey caravans during the EB I. Ashqelon could have functioned as a staging area for such caravans coming to the site laden with copper and leaving with copper and copper tools towards Egypt via northern Sinai or by ship as well.

At Ashqelon, the identification of industrial compounds devoted to processing and refinement of copper, alongside of domestic compounds, now enables a better understanding of metallurgical activities alongside of domestic ones. As of now, these industrial compounds appear to have been a phenomenon of the later portion of the EB I period only. In general, the study of spatial organisation is often difficult due to the small scale of most excavations. However, in the present case, the large-scale lateral exposures at Ashqelon now make this a possibility. What is clearly apparent is that the metallurgical industry at Ashqelon during the EB I was certainly not a small-scale 'cottage industry' devoted primarily to the fabrication of tools and various prestige items as known during the Chalcolithic period, but during the late EB I at Ashqelon, was a well-organised large-scale industry geared towards the production of utilitarian items for redistribution and sale. The metallurgical industry at Ashqelon was probably able to produce above

and beyond the needs of the local population of the site, suggesting that it was primarily export-oriented. This goes hand in hand with our present understanding of the late EB I period in the southern Levant as one of expanding trade contacts and the creation of an economic bureaucracy leading to the rise of an urbanised society.

ASHQELON, EGYPT AND THE COPPER TRADE

Much has been written about the nature of Egyptian-Canaanite relations during the late EB I. The presence of Egyptian artefacts such as imported ceramics, flint tools and molluscs, pottery made in the Egyptian tradition, ceramics such as bread-moulds that also indicate Egyptian-style food production probably by Egyptians, various *serekhs* and architecture made in the Egyptian tradition all appear to show clear Egyptian contacts if not an actual Egyptian presence. As is generally agreed, this could have taken the form of exploitive colonisation or even outright conquest, yet the presence of Canaanite products in Egypt at the same time also indicates that these were bi-lateral relations. As the list of clearly imported Egyptian items found in southern Canaan is a limited one, we may ask what were the Egyptians receiving from Canaan?

Just as a clear Egyptian presence is found in southern Canaan, the Canaanite presence in Egypt is also clear. The presence of Canaanites in the Nile Delta can probably be documented at Ma'adi (WATRIN & BLIN 2003) with the appearance of typically Levantine curvilinear architecture with clear parallels in Canaan during the EB I (GOLANI 1999) as well as with Levantine pottery, such as that found at Tell el-Farkha (CZARNOWICZ 2012b). In addition, curvilinear architecture is also known from Tell el-Farkha during the predynastic period (CHŁODNICKI 2012: figs. 16, 19; CIAŁOWICZ 2012: fig. 5) at the same time when it was most common in the southern Levant during the EB I, suggesting shared use of Levantine architectural traditions.

Imported Canaanite jars, such as the hundreds of such vessels found at Tomb U-j (DREYER 2011) and their clear association with wine is generally considered one of the main parameters for what was moving from Canaan to Egypt, yet the wine, and most probably the jars as well, appear to have been restricted to the Egyptian elites. Conclusive evidence of any other types of produce is difficult to pinpoint and even the Egyptian predilection for beer making, as has been uncovered at Tell el-Farkha (CHŁODNICKI *et al.* 2012), does not appear to have been an export to the southern Levant, as the Canaanites may have preferred their own wine to imported beer. I suggest that one of the main articles being traded to Egypt from the southern Levant was copper and copper tools.

This suggestion opens up interesting avenues for future research. As metallurgical analysis of copper tools from Ashqelon has so far been carried out only on a small selection of items that are all associated to the very early stages of the EB I settlement, other metal artefacts from later occupational stages at the site should be tested to see if they also originated in southern Jordan and if there were other sources as well. This

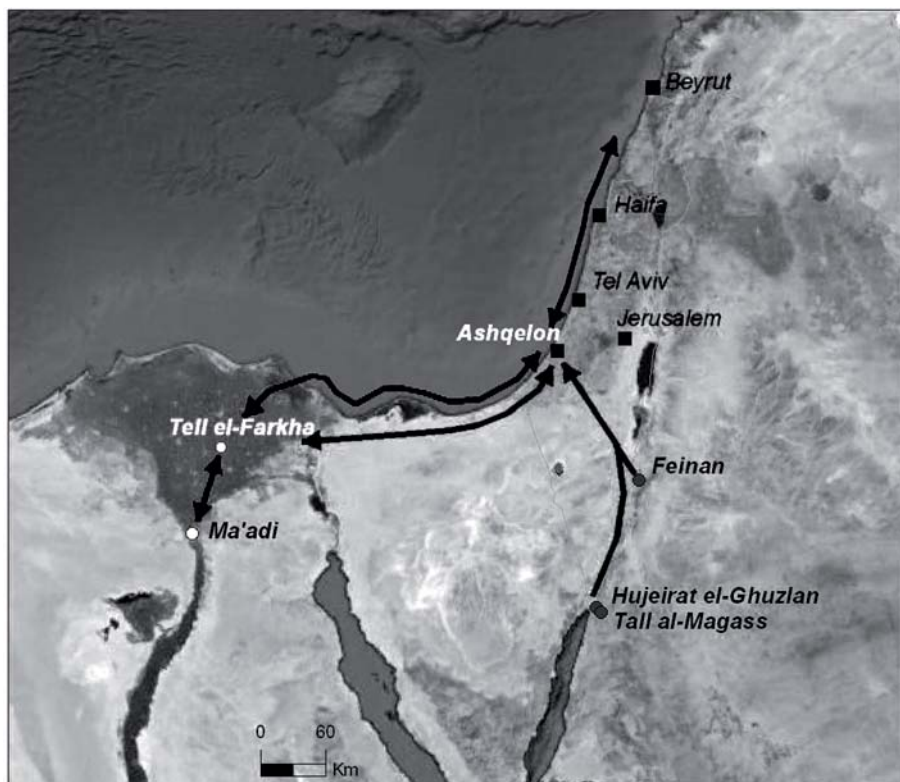


Figure 9. Suggested overland route of copper from the Arabah to Ashqelon and beyond.

is important in anchoring the suggested trade network that apparently existed between southern Jordan and Ashqelon during the EB I period and in exploring the connection of Ashqelon with other mining centres and trade routes as well. Recent research on a selection of copper tools from Tell el-Farkha has indicated the source of the copper to be found in Feinan and southern Sinai (see REHREN & PERNICKA *this volume*). While copper from Feinan could probably have arrived to Egypt via Ashqelon, that from Sinai suggests a different trade route from the south, originating from Sinai and leading to the Nile delta via the gulf of Aqaba or the Egyptian eastern desert.

Another question concerns where the copper tools were exported to. Future research on metallurgical remains in pre-dynastic Egypt as well as contemporaneous sites in northern Israel and Lebanon should examine the source of the copper tools and the manufacturing methods in order to pinpoint production centers or conversely, to examine if different technological industries or manufacturing centres existed at the same time. Remains of metallurgical activities at the Halif Terrace, not far from Ashqelon, and Tell es-Shuna in Jordan suggest that centralized copper processing was being carried out at

these sites as well during the EB I (*cf.* GOLDEN 2002; REHREN *et al.* 1997). If direct trade of copper and copper tools can be established between the southern Levant and Egypt, it may be worthwhile to examine what was its scope and nature; what could have been traded in return and if this was this a maritime or an overland route (possibly both). At present, copper production does not appear to have been a major component in Egypt during the pre-dynastic period and Egypt does not appear to have had significant copper deposits that were ever mined. Though the excavators of Ma'adi do report the presence of copper ore at the site, they also state that this was ore with low copper content that they assumed was only used for pigmentation (RIZKANA & SEEHER 1989: 17). Remains of copper processing in Egypt are more likely representative of working processed copper into tools, as suggested by the presence of copper ingots at Ma'adi and by the presence of typically Egyptian copper tools, such as broad and rounded small knife blades (CZARNOWICZ 2012a: 351-352, figs. 1:3, 3:11-12) that are not found in the southern Levant.

In summary, at this stage it is clear that the EB I occupation at Ashqelon represented a community that among other things, apparently specialised in copper working. The position of Ashqelon on the seashore and at the terminal end of an overland trade route was key to its success in copper working and its export outside the southern Levant. Predynastic Egypt stands out as the likeliest candidate for copper imports from the southern Levant and the nature and scope of this trade should be further examined in the future.

ACKNOWLEDGEMENTS

I would like to thank AGNIESZKA MACZYŃSKA and any and all other colleagues for organization of the Poznań conference and for inviting me to give a paper from which this article developed. My appreciation is also extended to MARCIN CZARNOWICZ for information freely given concerning Tell el-Farkha and for many insightful comments on the nature of Egyptian-Canaanite relations in the EB I. Special thanks are due to all the participants in the conference with whom I had many fruitful discussions.

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