

## The Roman Port of Ayla and its Economic Hinterland

### Introduction

The Nabataean, Roman and Byzantine port of Ayla (modern 'Aqaba) served as a transfer point for cargoes between ships sailing the Red Sea and caravans linking the port with roads running north to Palestine and Jordan. Recent analysis of evidence recovered by the Roman Aqaba Project, as well new evidence from other sites in the region, now permit a reconstruction of its economy in a regional context. Major questions include the degree to which Ayla was more than simply a transfer point between ships and caravans, and a center of economic consumption and production in its own right? Furthermore, how did its economy evolve over the seven centuries of Roman rule? In order to answer these questions we will review both the constraints and opportunities offered by the regional environment, consider the limitations of the available evidence and then offer an assessment of this evidence from an economic perspective.

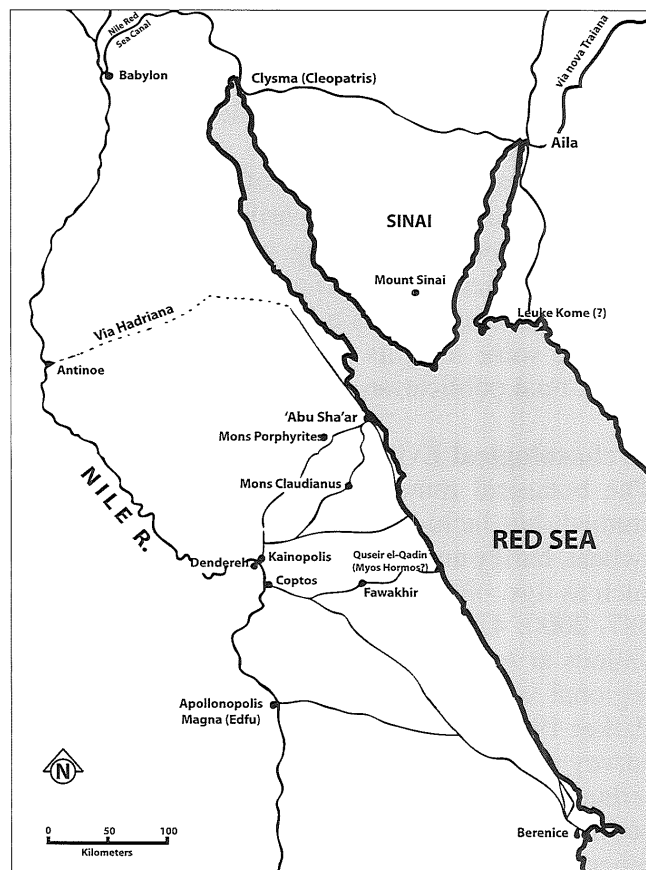
### Regional Environment

Ayla's *raison d'être* seems clear – it lies on one of the two shortest land bridges that connect Africa and Asia and separate the Mediterranean and Red Seas (FIG. 1). Although situated in an arid environment (*ca.* 40mm annual precipitation), Ayla was a coastal oasis by its access to groundwater via shallow wells. But beyond water and ready access to rich marine resources, there were few other environmental advantages to the site, which lies in an active tectonic zone and was thus subject to frequent earthquakes. Even access by sea was hindered by the prevailing strong northerly winds and constricted nature of the Gulf of 'Aqaba, narrowed even further by treacherous reefs along the coast and the rock strewn opening into the Gulf of Suez. Yet, despite all these obstacles, the site flourished

in the Roman and Byzantine periods, in fact well into the Early Islamic period.

### The Nature of the Evidence

The evidence for Ayla's economy is in some ways rich and varied but in other ways frustratingly limited. The extant documentary sources, including literary sources and inscriptions, are both fragmentary and laconic (Schertl 1936). They range over the seven centuries of Roman rule but provide little more than an outline of the city's his-



1. Map showing location of Ayla on the Red Sea.

tory. On the other hand, the Roman Aqaba Project has produced an archaeological record that is now quite extensive, with a plethora of diverse evidence from both its regional survey and extensive excavation of a series of well stratified contexts (Parker 1997, 1998, 2000, 2002, 2003). Together, all this evidence allows a diachronic reconstruction of the urban economy. However, one must also stress the limitations of the archaeological evidence. The Roman Aqaba Project could only excavate what now appears to be the north-western edge of Ayla (FIG. 2). Various factors prevented excavation of the urban core and near the shoreline, where for example harbor installations might be expected. Further, soil conditions are not conducive to the preservation of organic remains, metal and some other materials. This is in strong contrast to other Red Sea ports, such as Ayla's competitors on the Egyptian coast with their extraordinary preservation of organic remains. This differential bias in evidence is reflected most obviously in the absence of commercial products known from documentary sources as central to the site's economy, such as frankincense and spices. Finally, analysis of some important categories of evidence, such as faunal and botanical remains, as well as ceramics, is still ongoing. Nevertheless, there has been sufficient progress in most kinds of evidence to offer some significant insights into Ayla's economy.

In this paper, the aim is to offer an overview of Ayla's economy based primarily on new archaeological evidence, beginning with the organic remains and then turning to artifactual evidence. In essence, this represents a kind of progress report, offering some insights as we move the project towards final publication.

### Archaeological Evidence

The botanical remains from Ayla are still being studied, but include abundant evidence for grains (wheat, barley and rye), various legumes and fruits, such as figs, olives, grapes and dates (Parker 1998: 387, 2000: 421-22). In addition to extensive excavations at Ayla itself, the project also conducted a regional survey (Smith, Niemi and Stevens 1997; Parker 1998: 375-76, 2000: 374-75). Although this survey recovered much evidence about Ayla's hinterland, it failed to find many agricultural sites that could have provided significant amounts of food or other resources. On the other hand, on-going analysis of paleobotanical remains suggests some lo-

cal production of several key cultigens, especially grains such as wheat and barley (Ramsay 2008). Dates were likely also produced locally, as they are today. Based partly on early modern ethnographic parallels, one may suggest that limited agriculture in Wādī 'Araba and perhaps other adjacent areas supplied Ayla with some food, but the city must have relied primarily on imports from more distant sources.

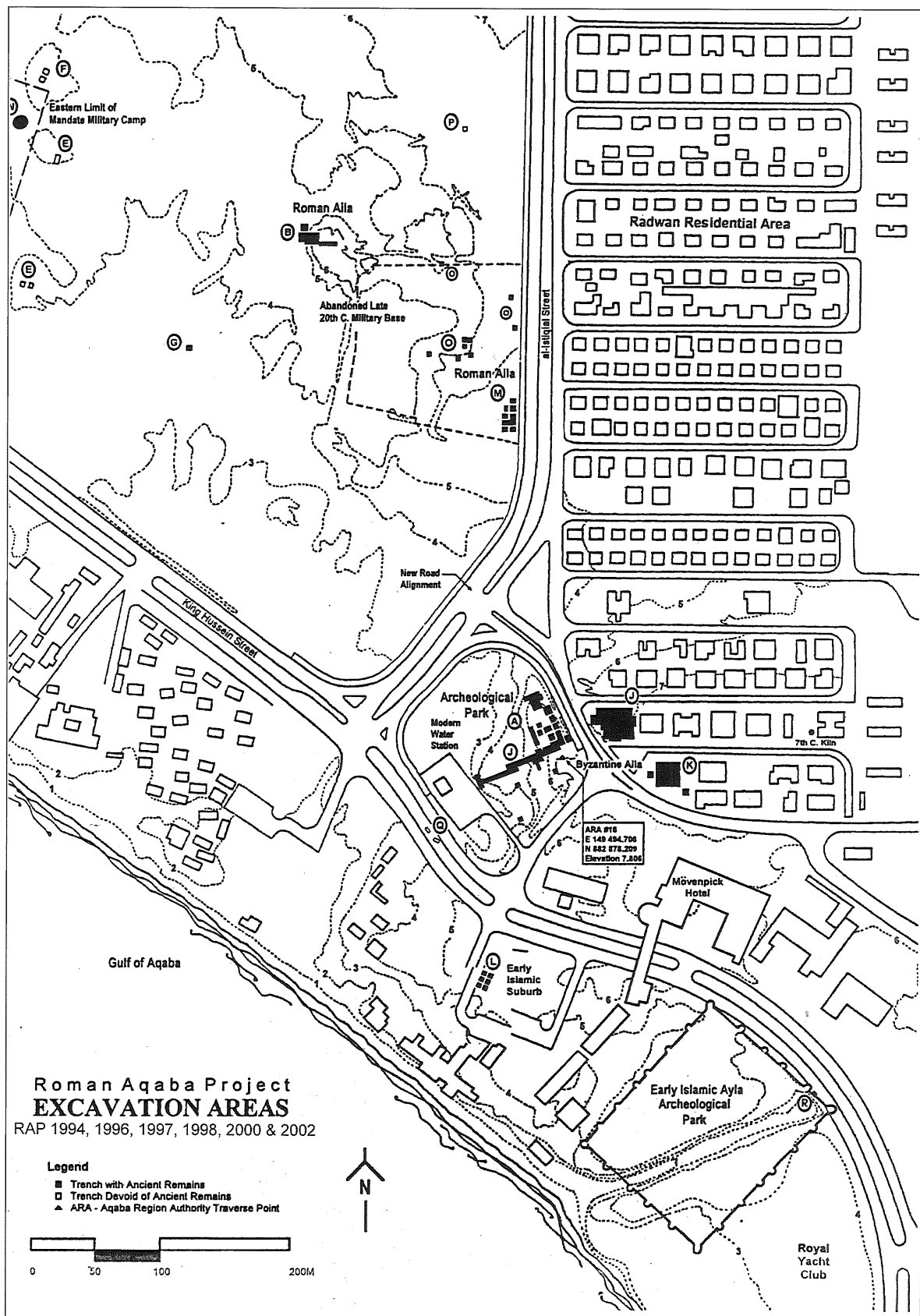
Fuel posed a similar problem. Although animal dung was adequate for many purposes, such as cooking, it could not have sustained the higher temperatures needed for local industries such as ceramics and metal-working. However, the charcoal analyzed to date consists entirely of locally available wood, such as palm, acacia and tamarisk (Parker 1998: 387, 2002: 422). One would assume that any wood from local wild flora would have been quickly exhausted by the city's demand for fuel.

The excavation yielded a large assemblage of faunal remains (Parker 1998: 387-88). Fish and shell fish, still under study, were clearly major sources of food. Evidence from a 1st century AD context of *himation*, the highest quality fish sauce of the ancient world, suggests the possibility of local production of this product (van Neer and Parker 2008). The remains of the terrestrial species alone number nearly 40,000 specimens. Preliminary analysis suggests some intriguing results. Sheep and goat comprise the overwhelming majority of the sample, with goat outnumbering sheep by a ratio of *ca.* 5:1, presumably because goats were better suited to the regional environment. The sex and mortality profiles suggest regular and sustained importation of sheep and goat on the hoof from external sources. Camel, cow, pig and chicken were secondary meat sources. Hunting was at most only a minor source of nutrition. Other bones suggest the presence of work animals, such as donkeys, dogs and cats (Parker 2002: 422-23).

Turning to the artifactual evidence, Ayla was a significant importer of ceramic table wares, amphorae (reflecting imported olive oil, wine and other food products), glass and various kinds of stone throughout its history, with major changes in sources visible over time.

Beginning with imported stone, this table summarizes the quantities of stone and the principal uses of each type (FIG. 3). Owing to the poor nature of the local bedrock for architectural purposes,

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2. Site plan illustrating the excavation areas of the Roman Aqaba Project.

Common Types of Imported Stone at Aila		
Type of Stone	Number	Percentage
Steatite (mostly vessels)	413	46.4%
Basalt (mostly millstones)	106	11.9%
Sandstone (mostly architectural uses)	97	10.9%
Marble (mostly architectural uses)	96	10.8%
Limestone (mostly architectural uses)	46	5.2%
Alabaster (mostly vessels)	45	5.1%
Chert (mostly industrial debris)	39	4.4%
Gypsum (mostly architectural uses)	29	3.3%
Coquina (mostly grindstones)	8	0.9%
Quartzite (mostly architectural uses)	8	0.9%
Slate (mostly tools)	4	0.4%
Total	891	100.0%

3. Table of imported stone recovered at Aila.

it is not surprising to find stone imported for special construction. Of particular note is marble, most likely from the Aegean. In keeping with regional patterns, marble does not appear at Aila until after the Roman annexation of AD 106. Steatite cooking vessels, probably imported from the Arabian peninsula, begin appearing in small numbers only in the 4th century but mostly represent imports after the Muslim conquest. Alabaster was also used for specialized vessels, including a tray from the putative church.

Turning to glass, there is no evidence of any local industry and thus all of the nearly 18,000 glass fragments recovered at Aila must represent imports, probably from Egypt and Syria - Palestine. Consistent with other urban sites in the region, the Aila glass as a whole consists largely of blown tablewares and lamps (Jones 2000). However, in contrast to these sites, the glass from Aila, particularly from the putative church, is exceptionally rich and varied, including examples of some of the most unusual and luxurious classes of ancient glass vessels known, including a so-called 'cage cup' from the putative church, the first such example attested in the region (Jones 2005).

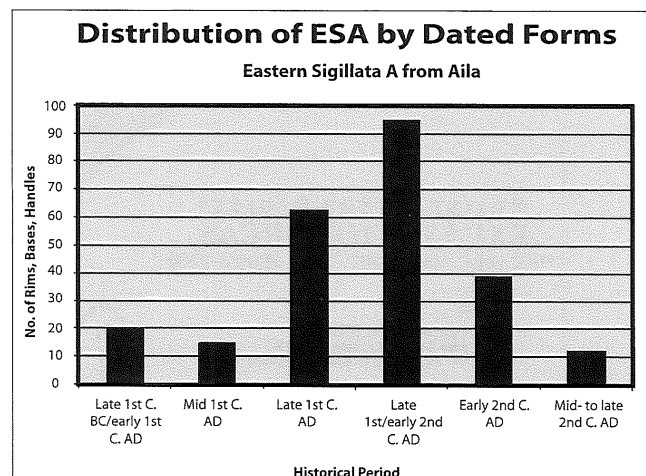
When considering the ceramics from the site, one of the most interesting observations is the significant quantity of imported Roman and Byzantine coarse ware, as suggested by both macroscopic analysis and a small sample examined through microscopic and chemical analysis. This is particularly evident in cooking wares imported to Aila from the Petra region in both the Early Roman and Late Roman periods (Parker forthcoming). Presumably these coarse wares accompanied the Nabataean fine wares to Aila. Wide distribution of Roman coarse wares from production centers has already been demonstrated in northern Palestine (Adan-

Bayewitz 1993) and may be expected elsewhere in the region.

Among the ceramic fine wares, Nabataean painted and unpainted fine wares naturally predominate from the 1st century BC to 2nd century AD. The table (FIG. 4) shows that the mid-1st century was the peak period of importation for Nabataean painted fine ware. For fine wares imported from beyond Nabataea, Eastern Sigillata A dominates from the foundation of Aila in the late 1st century BC until the early 2nd century AD (FIG. 5). The source of ESA remains an enigma, although the north-eastern Mediterranean, perhaps around Tarsus or Antioch, remains the most likely possibility. Then, as elsewhere in the region, there is a puzzling absence of fine imported table wares until the mid-3rd century, when African Red Slip wares begin appearing in quantity. ARS dominates the Aila market throughout the 3rd, 4th and early 5th centuries, with limited competition from other fine wares from Egypt, Cyprus and the eastern Aegean (FIG. 6). One of the most striking features about these late Roman fine wares at Aila is the early appearance of Egyptian

Nab Painted Fine Ware by Dekorphase (after Schmid 1996)			
Dekorphase	Dates	No. of Sherds	Percentage
1	ca. 150-50 BC	0	0.0%
2a	ca. 50-30/20 BC	8	0.4%
2b	ca. 30/20-1 BC	80	4.2%
2c	ca. AD 1-20	49	2.6%
3a	ca. AD 20-70	1,150	60.1%
3b	ca. AD 70-100	399	20.8%
3c	ca. AD 100-150	217	11.3%
4	ca. AD 150-300	12	0.6%
Total		1,915	100.0%

4. Table of imported Nabataean painted fine ware recovered at Aila.



5. Table of closely datable Eastern Sigillata A sherds recovered at Aila.

% of Late Roman Fine Wares at Aila		
Type of Ware	Sherds	%
African Red Slip	2294	76.2%
Egyptian Red Slip	551	18.3%
Cypriot Red Slip	131	4.4%
Phocaeen Red Slip	34	1.1%
Total	3010	100.0%

6. Late Roman fine wares at Ayla from all stratigraphic contexts site-wide.

Red Slip in the 3rd century. ERS is rare elsewhere in Jordan and Palestine until the late 6th century, yet at Ayla it appears centuries earlier. I believe that the early appearance of ERS at Ayla is best understood in light of the imported amphorae, explained below.

The imported amphorae, totaling nearly 6,000 sherds, are suggestive about the port's commercial connections and overall economy. On the other hand, interpretation is hampered by several factors, including the facts that a significant minority of imported amphorae remain unidentified, some identified amphorae are of uncertain origin and few other sites in the region offer quantified assemblages for comparative purposes. Nevertheless, several significant patterns have already emerged.

The first point about imported amphorae at Ayla in the Early Roman / Nabataean and Late Roman periods is their relative scarcity, especially compared to other contemporary ports in the region. The numbers are so small for this period that one may conclude that Ayla was not a major transshipment point for wine, olive oil and other foodstuffs normally carried by amphorae in this period. The few amphorae recovered from this period likely reflect local consumption. In this period (late 1st century BC to 3rd century AD), amphorae from Gaza predominate at Ayla. The camel caravans carrying aromatics from Ayla to Gaza attested by literary sources probably returned to Ayla with Gaza amphorae, many containing wine. This is best illustrated by the accompanying table of amphorae from excavation Areas B, M and O, which summarize amphorae evidence from the 1st to 3rd centuries (FIG. 7). Gaza amphorae clearly predominate among imported amphorae, with Egypt a significant but distant second. Most of the remainder derives from the Aegean, with practically none attested from the

Imported Amphorae from Aila: Areas B, M, and O (1st to 3rd century AD)		
Type	# of Sherd	% of All Sherds
Gaza	310	46.97%
Egyptian	182	27.58%
Class 10 ("Koan")	31	4.70%
Class 9 ("Rhodian")	18	2.73%
Class 47 (Aegean?)	14	2.12%
Class 27 (S Gaul)	9	1.36%
Class 45 (Anatolian?)	4	0.61%
Other	4	0.61%
Unidentified	88	13.33%
Total	660	100.00%

7. Table of imported amphorae recovered at Ayla from excavation areas B, M and O (mostly 1st to 3rd centuries AD).

central or western Mediterranean. This is in stark contrast with the evidence from Egyptian Red Sea ports, such as Myos Hormos and Berenike, which yielded huge numbers of imported amphorae, including many from the central and western Mediterranean, in the Roman period (Tomber 2008, with detailed references).

At the end of the 3rd century, however, there was a dramatic change, with Egyptian amphorae far exceeding those from Gaza. This is best illustrated in the putative church in Area J at Ayla, which was erected near the end of the 3rd century and occupied until destroyed in the late 4th century. The table shows a remarkable change from the Roman period, with Egyptian amphorae accounting for the vast majority and Gaza now representing less than 10 % of the total imported amphorae (FIG. 8). What might explain this dramatic shift at the end of the 3rd century?

One must consider historical circumstances at Ayla itself as well as broader regional developments during this period. The late 3rd century witnessed dramatic changes in the Levant, including plague, rampant inflation and major warfare with Persia, as well as the Palmyrene invasion and ephemeral occupation of most of the region. There is much archaeological evidence from the Negev for a major disruption in the Petra - Gaza trade route, including the destruction and abandonment of a number of sites (Erickson-Gini 2010: 51-64). There also seems to have been a sharp if temporary contraction in Red Sea commerce (Tomber 2008). All this

Imported Amphorae from Late Roman Church at Aila (mostly 4th century)		
Type	# of Sherds	% of All Sherds
Egyptian	2,066	62.1%
Gaza	309	9.3%
Class 44 (NE Med)	140	4.2%
Class 45 (Anatolian?)	134	4.0%
Class 46 (Palestinian)	95	2.9%
Class 47 (Aegean?)	64	1.9%
Class 9 ("Rhodian")	5	0.2%
Class 10 ("Koan")	4	0.1%
Class 27 (S Gaul)	0	0.0%
Other	189	5.7%
Unidentified	322	9.7%
Total	3,328	100.0%

8. Imported amphorae from the Late Roman church at Aila; these derive almost entirely from fourth century contexts.

might explain the decline in Gaza amphorae. But what can account for the explosion of amphorae from Egypt?

I suggest that two factors are paramount, one regional and the other local. Locally, the transfer of *Legio X Fretensis* from Jerusalem to Aila at the end of the 3rd century must have had a profound economic impact on Aila. Measuring this impact in quantitative terms is hindered by our ignorance of the size of both the urban population and the legionary garrison. Although Aila is repeatedly called a 'city' (*'polis'*) from the Nabataean period onwards, there is much evidence to suggest that it was never very large, probably not more than a few thousand inhabitants. We are on somewhat firmer ground in estimating the size of *Legio X Fretensis*. The size of Tetrarchic legionary fortresses elsewhere in Jordan, such as at al-Lajjūn and Udhruh, suggests a legionary garrison of 1,000 - 2,000 men (Parker 2006a: 558-60, 2009a). It is reasonable to suppose that *Legio X Fretensis* was of similar size, certainly swollen further by the dependents who surely accompanied the legionaries. In other words, the arrival of the legion and its dependents represented by any measure a dramatic increase in Aila's population. Because Aila itself could provide little more than dates and marine resources from local sources, the increased demand for agricultural commodities was met by imports from Egypt. The increase in Egyptian Red Slip

Ware in the 4th century at Aila probably represents occasional 'cargoes of opportunity', slipped in amongst the Egyptian amphorae. The relative paucity of both Egyptian amphorae and Egyptian Red Slip farther north in both Palestine and Jordan in this period suggests that these Egyptian goods were not intended for transit further north but rather for consumption at Aila itself.

The evidence of the amphorae also suggests some additional sources of supply beyond Egypt for Aila in the 4th century. Gaza remained as a small secondary supplier, with smaller contributions from elsewhere in the eastern Mediterranean, such as Anatolia (Class 45), the north-east Mediterranean (Class 44) and the Aegean (Class 47). The paucity of Palestinian amphorae (Class 46) is especially notable, since these are otherwise ubiquitous throughout the region and a much closer source than other amphorae. Also notable for their absence are North African amphorae, common throughout the Mediterranean in the 4th century but almost invisible at Aila. This absence is even more notable when one remembers that African Red Slip Ware (particularly of the 4th century) is by far the most common imported fine ware of this period. It seems that the ARS was imported for its own sake and, unlike the Egyptian Red Slip, did not 'piggy-back' its way to Aila with African amphorae.

In addition to trade, Aila's economy also rested on several local industries, about which the documentary sources are silent and only some of which are preserved in the archaeological record. There is evidence for local bone- and ivory-working, although its scale remains unknown. Likewise, there is evidence for metal-working, especially in copper and copper alloys, as illustrated by fragments of copper ore, copper slag and over 1600 copper and copper alloy artifacts recovered at Aila. Much of the raw material was presumably imported from the mines of Wādī 'Araba (Parker 2006b). Identification of high quality fish sauce in a local jar at Aila raises the possibility of a local *garum* industry (van Neer and Parker 2008).

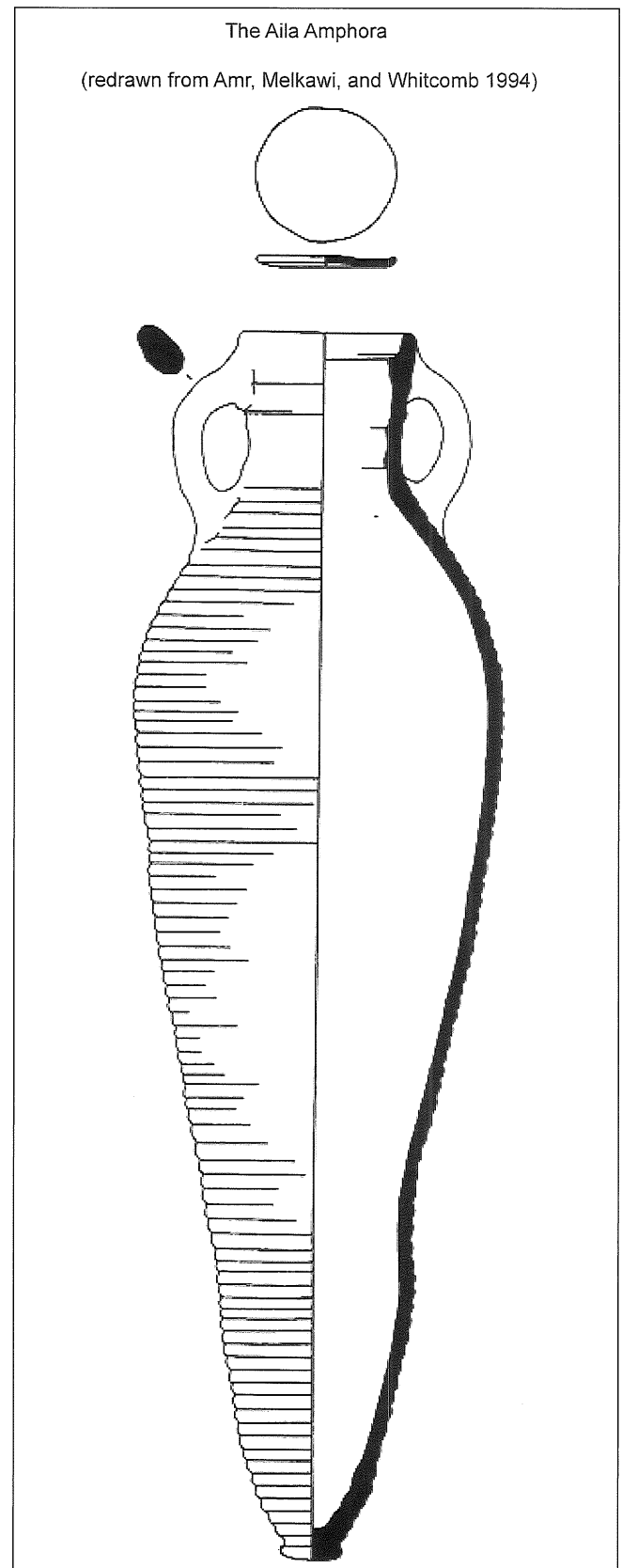
The most extensive evidence for local industry is ceramic. Ceramic slag and kiln wasters appear in stratified contexts from the Early Roman to Early Islamic periods, suggesting production throughout the site's history. There is evidence of clay mining in the 2nd century in Area N, north-west of the main settlement (Parker 1998: 378). A small dump that included ceramic slag, wasters and charcoal

was excavated in Area O (Parker 2002: 422). The distinctive 'Ayla ware' has now been identified at a number of sites in both southern Jordan and the Negev (Dolinka 2003; Parker forthcoming). Many of these vessels appear to be so-called 'ribbed-neck jars', a common form of the 1st to 3rd centuries. The University of Chicago / Department of Antiquities team excavated two 7th century kilns at Ayla that produced various types of vessel, including the Ayla amphorae (Melkawi, 'Amr and Whitcomb 1994), whose origin can now be securely dated to the turn of the 5th century by stratified sequences excavated by the Roman 'Aqaba Project (FIG. 9).

Both the geographic distribution and quantitative evidence for Ayla amphorae are impressive. Although these amphorae are attested at some sites in northern Jordan, such as Humaymah and Petra, the main distribution was by sea to the south. Here they are attested along the entire length of the Red Sea littoral, in south Arabia and even at Axum inland in east Africa (Parker 2009b). Particularly significant is the recently published survey of Adulis, the port of Axum on the coast of Eritrea. The Anglo - Eritrean team reports that the surface of Adulis is littered with pottery and that most of this is Ayla ware, especially Ayla amphorae (Peacock 2007: 85-96).

The key question is what was transported in these Ayla amphorae. Was it some local product, perhaps derived from fish and / or dates? Several sites in southern Jordan and the Negev have yielded evidence of Red Sea fish, presumably imported from Ayla (Lernau 1986; Studer 1994, 1996, 2001, 2002). Or, as Donald Whitcomb has suggested, were these jars used primarily to carry agricultural products imported overland from the north in other containers (e.g. skins, baskets or bags) and then repackaged in the Ayla amphorae for sea transport farther south (Melkawi, 'Amr and Whitcomb 1994)? Unfortunately, residue analysis conducted by the Adulis team proved inconclusive (Romanus 2007: 104-08). Although I personally believe that these Ayla amphorae likely carried a variety of products, both imported and local, this key question requires more research.

In conclusion, it appears that the economy of Ayla was both rich and varied. It was far more than a mere transshipment point between ships and caravans. It also boasted several industries, some of significant size. It was a consumer of many products, mostly imported. It was a major military base



9. The Ayla amphora, produced at Aqaba from the 5th through 7th centuries.



at least from the turn of the 4th century. It was also an ecclesiastical center, with its own bishop from the early 4th century onwards. Documentary sources mention its role in the pilgrim traffic to Mount Sinai in the Byzantine period, although this is naturally difficult to evaluate in economic terms (Parker 1997: 20-21). After a seemingly smooth transition to Islamic rule, Ayla continued to flourish well into the early Islamic period.

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