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GLASS FROM QUSEIR AL-QADIM
AND THE INDIAN OCEAN TRADE

by

Carol Meyer

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to

all Quseiris

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CHAPTER 1

INTRODUCTION

A final report on glass or any other archaeological data faces both the obligation to be as thorough and concise as possible, and the opportunity of using the data for the first time. We have here a challenge to make the material useful not only for those in the rather restricted field of glass studies but also for those concerned with other sites and broader issues in the ancient Near East. This report therefore operates on three levels. The first is a straightforward description and illustration of the glass artifacts recovered at Quseir al-Qadim; these data are contained mainly in the plates and plate labels. The second level brings in comparanda from other sites to support the dating as needed and to document the geographical distribution of types, especially in the Near East and around the Indian Ocean. This leads into the third level, the concern with archaeological questions that glass finds might be able to answer or begin to answer. Quseir al-Qadim was a port town that lived and died by the fortunes of the Red Sea trade. Therefore the questions that we ask of the glass corpus deal with trade and distribution of glass. Quseir al-Qadim happens to consist of two occupational components separated by over a thousand years. Thus we have the opportunity of comparing and contrasting patterns of trade in the two periods. Other questions such as technique of glass manufacture or functions of the vessels are but lightly treated, though it is to be hoped that the data provided are sufficient for those pursuing these and other concerns.

The Quseir al-Qadim glass corpus basically dates to the Roman and Mamluk periods, or the first through second centuries and thirteenth through fourteenth centuries A.D. respectively. Given a millennium between occupations at the site, this amounts to almost two one-period sites, and most of the glass is in fact readily separated into either Roman or Mamluk. It is a sizable corpus; some 373 Roman and 221 Mamluk sherds are illustrated (pls. 1–21) out of thousands of less informative fragments. The narrow dating, the careful excavation, and the size of the corpus make it valuable in its own right. There are few large, excavated, and published Roman corpora from Egypt, Karanis being the most distinguished exception, and none from the Mamluk period.

Inasmuch as the final report on the stratigraphy, ceramics, architecture, and literary remains have not yet been published, more background information on the site will be given than is perhaps normal for a glass report. Quseir al-Qadim was excavated in three three-month seasons in 1978, 1980, and 1982. Preliminary reports on the first two seasons

have been published (Whitcomb and Johnson 1979 and 1982) as well as an article on the Islamic glass (Whitcomb 1983). Specialists' reports on the resist-dyed textiles (Vogelsang-Eastwood 1990) and the wooden artifacts (Hiebert, in press) have appeared or should appear soon.

Quseir al-Qadim is located a few kilometers to the north of modern Quseir on the Red Sea coast where the track through the Eastern Desert via the Wadi Hammamat reaches the sea (fig. 1). The road from Quft, ancient Coptos, that once required five or six days of desert travel can now be traversed in about two and a half hours. The famous Wadi Hammamat route is marked by ancient graffiti and remains of many periods: predynastic, pharaonic, Roman, and later. Many other routes pass through the Eastern Desert mountains and wadi systems as well, including the Wadi Qena to Hurgada, Quft to Berenice, Qus via the Wadi Qash to Quseir, and Qus southwards to Aidhab. Quseir al-Qadim was a small, special purpose site, a port serving one of the shortest overland routes from the Nile through the Eastern Desert to the Red Sea and the shipping southwards to Arabia, East Africa, India, and beyond.[1] There is no water at Quseir al-Qadim, no good drinking water less than a day's journey away, no food resources except fish, little fuel, and only sparse desert vegetation for animals. Thus the port had to be supplied from the Nile Valley, an operation that could be undertaken only when the political and economic powers in Egypt were organized enough to handle the logistics, militarily strong enough to protect the caravans and shipping, and economically capable of supporting long-range trade for exotic luxuries. This is not to say that trade was absent at other periods or through other ports, but that during the Roman Empire and under the late Ayyubid and Bahri Mamluk rulers all the tenuous factors permitting the existence of Quseir al-Qadim fell into place. It was never in fact the major Red Sea port, as it was eclipsed variously by Myos Hormos to the north and Berenice or Aidhab to the south, but Quseir al-Qadim is the best-excavated and hence best-known to date.[2]

The result of the site's isolation is that it was almost untouched when the excavators began. The lack of any water but sea water meant that the remains were extremely dry and salty and hence exceptionally well preserved—not only stone, ceramics, and glass but also wood, paper, rope, leather, textiles, pillow stuffing, carpets, horn, shell, matting, peppercorns, seeds, henna, bone, fur, insect cases, and even half a shark. The only exception was metals, as the salt generally ate iron and bronze down to red and green lumps.

For purposes of excavation and recording, Quseir al-Qadim was marked off with a grid system of twenty meter squares running A to S from the north to the south and 1 to 23 from

1. The amount of trade goods recovered from the excavations at Quseir al-Qadim does not support Raschke's statement, "There is no evidence that Leucos Limen [Quseir al-Qadim] and Philoteras were used for trade with the East in the Roman period" (Raschke 1978: 901, fn. 993).
2. The University of Delaware's recent excavations at 'Abu Sha'ar, however, may soon modify this statement. Note also that Myos Hormos is not yet definitely located and its position on figure 1 is only an approximation.

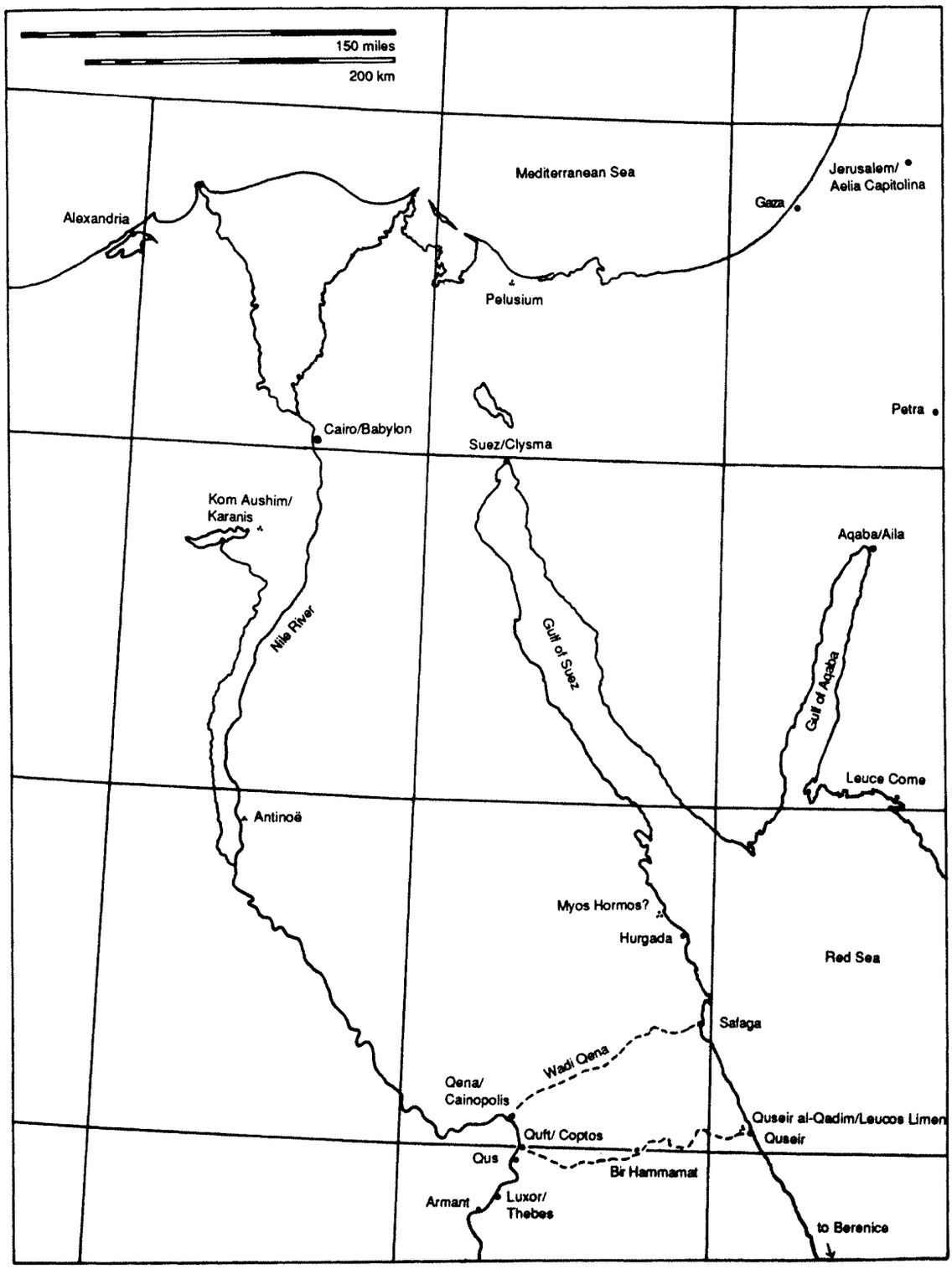


Figure 1. Map of Egypt

the west to the east. Each square was subdivided into four ten-meter squares labeled "a" (northwest), "b" (northeast), "c" (southwest), and "d." Units were excavated stratigraphically and each locus assigned a number such as F9c-8 or K9b-25. All sherds and other artifacts were collected and labeled by locus number and date. Most, though not all, loci were screened. All finds were sorted, counted, and tabulated each day; the discards were returned to a designated dump at the edge of the site and the retained finds were registered, e.g., RN-375. All drawings of artifacts were completed in the field before division, though they were inked in Chicago and if possible checked against the study collections.

ROMAN QUSEIR AL-QADIM

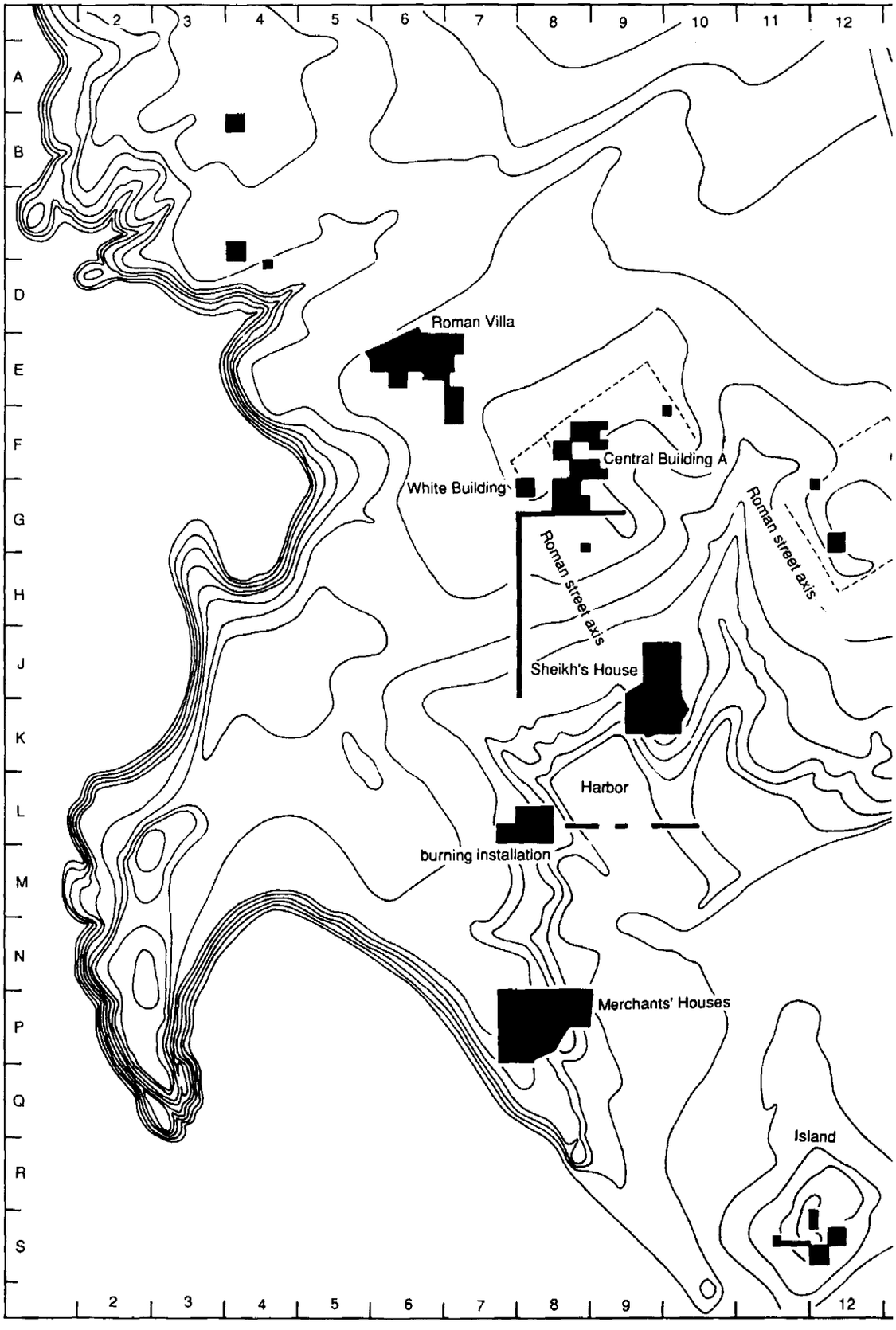
Egypt became a Roman province after the Battle of Actium in 41 B.C., and Quseir al-Qadim, or Leucos Limen or Portus Albus, was probably built up in the early first century A.D. There are a few Ptolemaic fragments at the site, however, and some inscribed blocks were reported from Quseir town early in the century (Weigall 1909: 81), suggesting that the Ptolemaic port lay in the vicinity of modern Quseir. The Roman emperors continued the Ptolemies' interest in the Red Sea trade, and greatly expanded it.[3] About 25 B.C. Augustus sent an expedition under Aelius Gallus to reconnoiter the Red Sea and Arabian Gulf coasts and to win control of the Bab el-Mandeb. Aelius Gallus spent considerable time building a fleet at Clysma,[4] but despite a large force of ships and soldiers, the expedition was defeated on land and sea (Desanges 1978: 308). Meanwhile, the Thebaid having been stripped of troops for the Red Sea campaign, the Ethiopians promptly invaded Egypt. They were repelled (ibid., pp. 309–10), but neither Nubia or Arabia or the southern Red Sea coast was conquered. Thereafter contact was channeled into commerce, which flourished. Given the abundance of Tiberian graffiti on the Coptos-Quseir road (Bernand 1972: 15), Sidebotham (1986: 55) tentatively suggests that the port was founded during the reign of Tiberius (A.D. 14–37). Strabo, of the Augustan period, does not mention Leucos Limen; Ptolemy in the second century A.D. is the first to do so, and he says nothing about the foundation of the port (ibid., p. 53). Strabo's often cited account remarks that before Augustus only twenty ships per year sailed past Bab el-Mandeb, whereas after him, 120 per year set out from Myos Hormos alone. There is no definite evidence of a Roman military Red Sea fleet, but one might have been needed for supplying Leuce Come, for guarding the imperial mines on St. John's Island and the pearl fisheries, and for the control of official ports (Raschke 1978: 648–49). The boom in trade was furthered not only by the *pax Romana* but also by advances in seafaring, notably the mid-first century B.C. exploitation of the mon-

3. Both Berenice, named for a queen, and Myos Hormos were Ptolemaic foundations (Toussaint 1961: 34).

4. If he physically built a fleet, Aelius Gallus may have used Nile ships dismantled, carried overland, and reassembled on the coast, a practice known from earlier and later periods. Sidebotham (1986: 122) suggests that wood might have been more readily available at Clysma than farther down the coast, not to mention supplies for 10,000 men. If, however, the canal to the Nile was open (Charlesworth 1924: 18–20; Toussaint 1961: 34), shipping bulk goods to Clysma and from there southwards would have been much easier (Sidebotham 1991: 16–17).

soon winds that permitted direct sailing to India rather than coasting along Arabia and Persia. The capacious and sturdy Roman ships may also have been able to sail farther with more goods. The captains' handbook, the *Periplus Maris Erythraei*, written about the middle of the first century A.D., describes a well-developed trade with Africa and India. The Egyptian Red Sea trade may have been enhanced when Trajan conquered the Nabateans in 106 and thereby reduced that source of competition. Hadrian's *via nova Hadriana* was completed about A.D. 137 and would have linked Antinoë on the Nile to Myos Hormos and then points southwards down the coast to Leucos Limen and Berenice. How much the road was actually used is another question, as the Roman trade to the East declined after about A.D. 180, the death of Marcus Aurelius. Problems elsewhere in the empire made the luxury trade, and remote ports like Quseir al-Qadim, increasingly difficult to support. Closer to home, the financial situation in Egypt had been deteriorating steadily under heavy taxation, and ruined peasant farmers began to abandon their land in favor of banditry (Sidebotham 1986: 164). Septimius Severus' tour in A.D. 199–200 was made partly to inspect and overhaul Egypt's finances. Leucos Limen itself may have survived into the early third century, but the evidence is scanty.

The excavations showed that Roman Quseir al-Qadim was laid out on a classical grid system, centering on the two large Central Buildings in E–G 8–10 and F–H 11–13 whose outlines are still visible on the surface (fig. 2). Part of the western Central Building was investigated by trenches F–G 8–9. Its massive mudbrick walls define a series of rooms around an open court, with stairs leading to utilized roof space or a second story. A western annex was soon added; the excavators called it the White Building for the light color of its bricks. Here and in the adjacent dumps, thousands of amphorae sherds were heaped up. The approximate line of the streets can be traced northwest to a residential quarter, tested by trenches in B4 and C4, and more broadly exposed in E–F 6–7. The latter area included a possible industrial quarter, as suggested by iron slag (Whitcomb and Johnson 1979: 17–18), and a large house, labeled the "Roman Villa." The walls here, of mud bricks and soft stone, are thinner and less carefully constructed than those of the Central Building. The area on the northwestern edge of the site at C4 and B4 soon came to be used as a dump, though not without interest as it did yield, among other artifacts, Greek ostraca, a South Arabic ostracon, a fragment of a Demotic tax receipt, scraps of Latin and Greek papyri, and a Latin ostracon mentioning a *chiliarch* or military tribune (ibid., p. 17). Streets running to the southeast from the Central Buildings would have reached the harbor, which at that time reached further inland over what is now *sabkha*. The "island" in S 11–12 seems to be spoil from dredging the harbor. Clearly it required some strong authority, presumably the government, to support the construction of the port on a unified plan. The military tribune suggests a military presence, and the harbor dredging, an effort to maintain the port. Its contraction at an early date may be seen, however, in the accumulation of dumps in the northwestern section (ibid., p. 15) and in the presence of a second century Roman burial cut into the stub of a cross wall of the White Building.



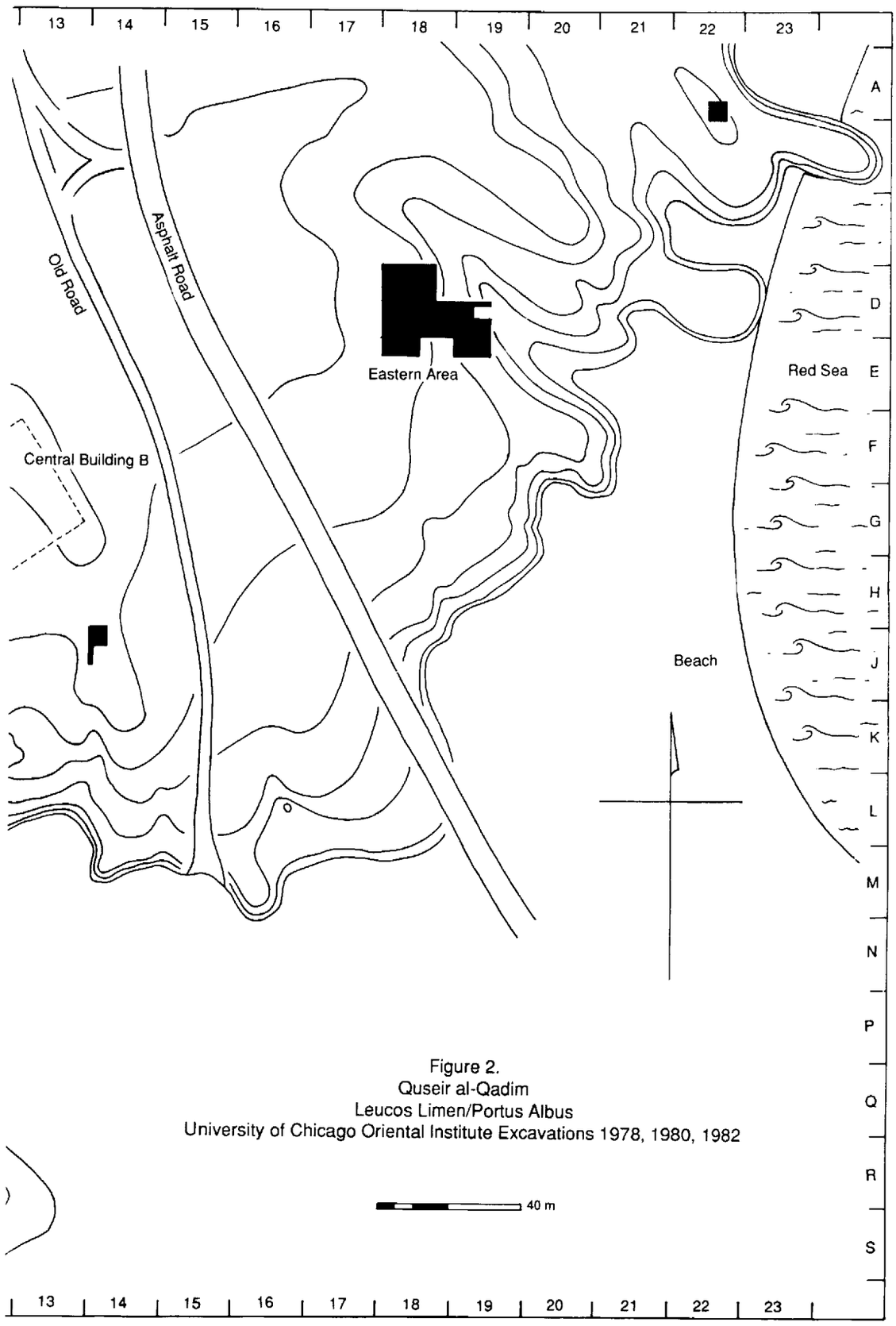


Figure 2.
Quseir al-Qadim
Leucos Limen/Portus Albus
University of Chicago Oriental Institute Excavations 1978, 1980, 1982

ISLAMIC QUSEIR AL-QADIM

The Islamic settlement at Quseir al-Qadim may have been primarily thirteenth–fourteenth century, but it is necessary to consider a little earlier history of Egypt and the Indian Ocean trade to understand Quseir's position. By the eleventh and twelfth centuries, the Mediterranean trade was once again largely in the hands of Europeans, and Islamic merchants looked mainly to the Indian Ocean and the Far East for trading ventures. In 1171 Salah al-Din established the Ayyubid dynasty, which lasted until the Mamluk conquest in 1250. The bulk of the Cairo geniza documents, which are frequently cited in *Chapter 5*, come from roughly the same period. Thus, while we refer generally to the Islamic occupation of Quseir as "Mamluk," it is actually late Ayyubid to early Mamluk. In the latter half of the thirteenth century, the Mongols controlled the trade all the way from the Black Sea to China; this is when Marco Polo made his famous journey. Moreover, the Mongol conquest of Baghdad in 1258 debilitated the caliphate there and damaged the Persian Gulf and overland Iranian trade. Instead, the Red Sea carried as much as eighty percent of the eastbound trade, and that trade was apparently in the hands of the group of Karimi merchants. The Mamluk government initially encouraged foreign trade by issuing safe-conducts, policing the Red Sea, and otherwise not meddling too much. The main ports were Aidhab and Aden; Jidda and Tor became prominent a little later. The power of the Mamluk government, however, faltered in the late fourteenth century. The desert route to Aidhab could no longer be policed against Bedouin tribes, and in 1426 Aidhab was finally destroyed, at least as far as important trade was concerned. Suez became the major Red Sea port for Cairo, and when the government assumed monopolies of many commodities, including the lucrative spice trade, commerce to small ports like Quseir al-Qadim dwindled. Quseir itself seems to have survived to support the pilgrimage trade and the grain shipments to the Hijaz, though at some point the town was relocated a little to the south, at modern Quseir.

The Islamic town at Quseir al-Qadim was not strictly superimposed on the Roman one. The old harbor had silted up by the thirteenth century, the coast and reefs advanced eastwards, and the medieval town consequently was built more towards the south and east, towards the former harbor and the modern coast. The Islamic town did not follow a classical street grid, though the Merchants' Houses in P 7–8 are laid out side by side along a street or lane (fig. 2; Whitcomb and Johnson 1979: 38). These are small but carefully arranged houses with courtyards, storerooms, and living rooms equipped with mastabas and mats (ibid., p. 39). The large exposure in J–K 9–10 uncovered the Sheikh's House, so named because of letters found there addressed to a certain sheikh. This spacious house was modified several times and seems to have been used throughout most of the medieval occupation at Quseir al-Qadim (Whitcomb 1983: 102). The large number of letters and other written material from the Merchants' and Sheikh's Houses may someday illuminate the activities of the inhabitants. The eastern area of Quseir al-Qadim, across the modern road that now splits the site, was exposed in squares D–F 17–19 immediately above the beach. The broad but shallow excavations there revealed numerous flimsy houses or huts, which nonetheless yielded a wide variety of artifacts. The eastern area buildings may have been

erected towards the end of the medieval occupation at the site. We note also a building in L 7–8 with much evidence of burning and scattered Islamic debris and buildings over much of the Roman site. A few graves were located in A 22, but no mosque was found; and apart from the burning installation in L 7–8, no special purpose buildings such as warehouses were detected.

THE GLASS

Glass sherds still litter the surface of Quseir al-Qadim, and a very large corpus was collected from the trenches. The sherds were treated like the other artifacts, labeled, counted, tabulated, and discarded or registered. The locus numbers and registration numbers are listed with the plate labels. No statistical counts were attempted in the field, nor could be readily done now. On the one hand, the understanding of the glass corpus improved so dramatically from one season to the next that many of the 1978 and 1980 categories were reinterpreted in a later season. On the other hand, the glass of the two periods, Roman and Mamluk, is so different in appearance and so separated in time that a statistical sorting would seem pointless. Both the glass fabrics and forms are quite dissimilar, and only a few body sherds and the plainest rims are not easily distinguished visually. A study of shifts in glass fabrics and forms within a period might be possible, though the occupation of Quseir al-Qadim in neither period is likely to have lasted longer than 200 years. Still, such a statistical study of changing styles might be linked to stratigraphic, ceramic, and architectural results from the site at some later date. For the moment we note only that more Roman than Mamluk glass was recovered and drawn, and this despite excavation of less Roman building fill than Islamic (Hiebert, in press).

Not all of the glass sherds drawn in the field are included in the illustrations on plates 1 to 20. Many drawings became redundant as better examples were found in later seasons, but the unused drawings are counted in the commentary on the glass types in *Chapters 2* and *4*. An attempt is made, however, to include the full range of forms and variants of the vessels, even the simplest and least diagnostic. Most of the raw data on color, weathering, locus number, registration number, and the like are listed on the plate labels. *Chapters 2* and *4* discuss the types of Roman and Mamluk glass, e.g., ribbed bowls or bubble-neck bottles, with comparanda to support the date, if needed, and to show the geographical distribution of the types. Because Quseir al-Qadim was a port whose inhabitants made their living by the Red Sea and Indian Ocean trade, we emphasize Near Eastern, African, and Indian comparanda over Mediterranean and European. We also try to use only excavated glass for comparanda because reference to unexcavated glass can lead to serious problems. Purchased glass always has problems with provenience, date of manufacture, and even authenticity and can rarely be used to study excavated material. An excavated corpus such as that from Quseir al-Qadim, however, can help both to identify purchased glass and to study excavated material. *Chapters 2* and *4* are intended for those engaged in both kinds of research, for glass specialists and for excavators dealing with similar glass finds.

GLASS TRADE

The plates, plate labels, type descriptions, and comparanda are the basis for the discussions of long-range Roman and Mamluk trade in *Chapters 3* and *5*. Although preservation was, apart from the metals, exceptionally good at Quseir al-Qadim, such is not true at most archaeological sites. The bulk of the foreign trade in both Roman and Islamic periods was perishable goods such as textiles, woods, spices, drugs, slaves, or else precious metals too valuable to abandon lightly. For archaeological evidence of long-range Indian Ocean trade, then, we have to look to artifacts like glass and pottery that do survive. The study of glass trade presented here will have to be augmented by studies of the amphorae, ceramics, and other less abundant artifacts such as the Kisi money. Given different points of origin, demands, and shipping constraints, the distribution patterns of other artifacts may be expected to be different but complementary.

Chapter 3 on Roman glass trade begins with possible places of glass manufacture in Italy, Syria, Alexandria, or other centers, and follows it to its final destination. A trading journey to Africa or India could take as much as two years and the financial and organizational resources required were considerable. Therefore some attention is given to the initial organization of trade ventures, beginning with Alexandria, Roman Egypt's capital and economic center. We then follow the merchants up the Nile to Coptos and across the desert to Berenice or Quseir al-Qadim. Considerable emphasis is given to the mechanics of trade because the means of transport by donkey, camel, ship, or large ship have a major effect on what can be transported at all, how much, and how far. The topic of transport mechanisms is often neglected, and trade goods thus seem to transport themselves almost magically. Even saying "ships" or "camels" is inadequate if there is no notion of the carrying capacity, range, and other limits. Supply and demand are useful theoretical starting points for a trade study, but the merchants actively assembling their goods, coins, and supplies would need much practical information about what was wanted where and when, as well as knowledge about tonnage, packing, scheduling, and myriad other problems if they were to succeed. Thus some discussion of the ships that might have sailed the Red Sea is included, with the important proviso that most of the data have to come from the Mediterranean. We then follow the merchants and their ships down the Egyptian coast towards Bab el-Mandeb and Aden and thence either across the Indian Ocean to India or else around the horn of Africa and southwards to Rhapta. The major source for the routes is the first century A.D. handbook, the *Periplus Maris Erythraei*.[5] Some attention is given to the problems of what local polities may have existed in Africa and India, whether there were Roman trading colonies, and what languages may have been spoken. The local culture and level of technology affected the demand for glass and other Roman products, and a resident colony also affected the amount of information exchanged between representatives of two cultures, including perhaps the technology of glass manufacture. Attention is also given to sailing schedules, which in the Indian Ocean depend primarily on the monsoons. They determined the depar-

5. All references to the *Periplus Maris Erythraei* come from the Casson 1989 edition.

ture dates from Quseir al-Qadim, the return dates, the activities leading up to and following the sailings, and hence the seasons of peak activity and occupation at Quseir al-Qadim.

Chapter 5 on the Mamluk trade follows a similar pattern, but obviously important differences may be expected in the manner of carrying out the trade. Instead of Alexandria, Cairo was the capital, economic center, and the goal of much of the long-range trade. Again, there is some discussion of where the glass may have been manufactured, and of the organization of an overseas venture. Earlier, in the Ayyubid period (1171–1250), trade seems to have been organized by partnerships, each merchant trying to split up his investments and risks. Later, the group of wealthy Karimi merchants gained ascendancy in the Indian Ocean trade. The documentation for the thirteenth and fourteenth centuries is also quite different. There is nothing like the *Periplus Maris Erythraei*, but there is a rich assortment of information in travelers' accounts, histories, letters, business records, and other sources. We again trace the traders from Cairo upriver to Qus and across the desert to Aidhab or Quseir al-Qadim. Whatever can be gleaned about thirteenth and fourteenth century ships and shipping will be presented, though this is even more scrappy than for the Roman period. Aden by this time is an important port in its own right, and a probable point of manufacture for some of the glass bracelets, so it is treated separately. The trade down the East African coast is discussed, along with the history of the Arab cities founded there. Finally, the trade to India and beyond is described, as well as the sailing schedules and the problems of the return to Cairo.

QUESTIONS ADDRESSED

Although no theories about ancient long-range trade are advanced or investigated here and no hypotheses are stated or tested, we are interested in exploring what kinds of questions glass corpora can be used to address. We do want to ask some specific questions of the data, and we wish to list the questions and background assumptions as explicitly as possible. Glass reports are sometimes tendered in the hopes that they may be used for "further questions." Assuming the descriptive data are thorough, this is an honest statement, but the present report also intends to go on to address some of the "further questions." Quseir al-Qadim was a port in the Roman and Mamluk periods, and glass (if reported) is suitable for discussions of trade because it survives at archaeological sites better than many other trade goods. Thus, the questions asked have to do with long-range trade, and they use glass as a body of data to answer them. As a category of artifact that has generally been underutilized, glass has the added advantage of permitting a fresh look at the distribution pattern of a trade good. Although ceramics and porcelains have been studied with regard to the Indian Ocean trade, glass has not. Clearly, other questions could be asked of the Quseir al-Qadim glass corpus, and hopefully will be in due course, but for the moment we limit ourselves to the queries listed below.

The first major assumption is that all or virtually all of the glass recovered at Quseir al-Qadim was made in Egypt or the Mediterranean area and exported to the countries around the Indian Ocean. For Roman Leucos Limen the question seems fairly clear, especially as

regards certain glasses like the ribbed bowls, mosaic glass, and the blown glass, a technique known to have been invented in the Mediterranean region in the late first century B.C. By the Mamluk period large-scale glass production was a technology over a thousand years old and, despite the known, major glass industries of Egypt and the Syro-Palestinian region, the possibility of glass imports *into* Egypt is somewhat more lively and should be investigated. For the moment, however, the assumption is that most of the Quseir al-Qadim Mamluk glass is related to the export trade.

The first question we wish to raise about the glass trade is what we can, on the basis of the quality and quantity of the glass, say about the importance of the trade. Was the glass recovered from the various sites the finest and most costly luxury wares, items that would have had considerable sumptuary value? Is it a matter of luxury wares or simpler, more rapidly produced tablewares? Does the glass, out of all the known types in Egypt in the Roman and Mamluk periods, seem to have been selected with an eye to the overseas market? Are there any clues as to the quantity of glass shipped? Given only some preliminary counts at Kilwa and Quseir al-Qadim and even less quantitative information from other sites, the answer to this question is probably suggestive rather than conclusive.

Assuming that the glass was in fact being exported from the Red Sea ports including Quseir al-Qadim, was the technology of glass production also exported? If not, why not? The assumption here is that technology is always exported into an environment capable of supporting it; embargoes on technology transfer never work be it silk production or computers. On the other hand, if an environment will not support a given industry, be it glass or aluminum or computer chips, attempts to establish such an industry cannot succeed and the item(s) will have to be imported, if used at all. There is a difference between the users of celadons or transistor radios or pocket calculators and those capable of producing them economically. Glass, especially given a time contrast like that separating the Roman and Mamluk corpora at Quseir al-Qadim, is well suited to the study of the transfer of technology. It is both a late technology—second millennium B.C. for glass intentionally produced from a recipe, first century B.C. for mass production—yet one with enough time depth to be useful for exploring cases where the technology was adopted and where it was not.

At this point we must enter into the question of exactly where glass was manufactured and when. This is largely a matter of whatever literary references may be found for glassworkers or glass vessels, whatever chemical evidence exists for special, local glass formulae, and whatever archaeological evidence there may be for glass furnaces, wasters, ingots, cullet, or distinctive vessel styles characteristic of a region and uncommon elsewhere. It is also important to distinguish between glass production from raw ingredients, and hence presumably through finished artifacts, versus glass processing from ingots or cullet manufactured elsewhere and imported.

To study the question of the export of glass technology we may contrast the Roman and Mamluk examples. Glass as a mass production item was an innovation of the Roman imperial period that spread rapidly all around the Mediterranean basin. It was firmly established even in Gaul by the mid-first century A.D., and although production may have flagged

thereafter it never failed completely. What evidence is there for this brand-new industry, glass production, in Africa or India in the first and second centuries A.D.? If the evidence is lacking, is it a question of recovery or reporting, or a dearth of skilled glassworkers or raw ingredients, or weak local demand for glass? It is known that after the decline of Roman trade with India, ca. A.D. 180, glass became quite rare in India (Dikshit 1969). By the time Quseir al-Qadim was reoccupied in the thirteenth century, however, trade on the Indian Ocean had not only resumed but reached an impressive volume under the Abbasid caliphs of the ninth and tenth centuries. Thus the possibility of transfer of glass and glass technology existed for several hundred years before Islamic Quseir al-Qadim. Again, what evidence is there for glass manufacture in Africa or India? If lacking, to what may we attribute it?

Finally, we wish to contrast the very different situation of Quseir al-Qadim in the Roman and Mamluk periods. Quseir al-Qadim or Leucos Limen in the first and second centuries A.D. lay at the far eastern edge of the Egyptian province, and moreover at the end of a difficult-to-maintain route to the Red Sea. Beyond that point, Arabia, Africa, and India were never conquered or even visited by the Roman legions. At best there might be a few Greek-speaking trading settlements and a veneer of Mediterranean culture. What sorts of goods appealed to the barbaric (in the Roman sense) rulers and peoples overseas? By the thirteenth century the political and economic picture had changed drastically. The Mediterranean trade, or much of it, was in European hands; Alexandria functioned as a juncture between Western and Eastern merchants. The focus of Islamic trade was the Indian Ocean, specifically the Red Sea after the destruction of Baghdad (1258) and Siraf (ca. 1000). The most lucrative routes ran from Cairo to Aidhab, Jidda, Aden, Mogadishu, Kilwa, Daibul, Broach, and Canton. Quseir al-Qadim may not have been one of the first ranking ports, but it was close to the main artery. The lands beyond may not have been part of a polity like the Roman Empire, but large numbers of people there did share a common religion in Islam, a lingua franca in Arabic, and elements of a common culture. The Indian Ocean rim certainly had more uniformity than in the Roman period. What sort of goods, including glass, appealed to settlers and inhabitants of Africa and India, who were hardly barbaric, many in fact being reasonably similar to the incoming traders? Can we see a difference in the two patterns of trade, specifically as reflected in the glittering bits of glass from ancient sites?

The answers to these three questions—the importance of the glass trade, the transfer of technology, and the contrasting trade patterns—are likely to be partial and to call for further inquiry in other directions, a usual result in an archaeological investigation. Nevertheless, it still seems useful to carry this inquiry as far as possible, to present the data and whatever tentative conclusions may be arrived at with those data, and to look for future work bearing on the questions asked.

CHAPTER 2

THE ROMAN GLASS

The Roman glass illustrated on plates 1 through 14 (numbers 1–373) is discussed here by types. The type names are either generally accepted labels such as "ribbed bowls" or else the shortest possible descriptive label. By no means all the glass recorded in the field, nor even all that drawn, is included here. Rather, the emphasis is on presenting as fully as possible the range of vessels recovered from Quseir al-Qadim, and where possible an estimate of frequency.[1] Citations of parallels are restricted to the special problems addressed by this report, and almost all comparanda are excavated material. In most instances there is no difficulty in assigning a glass sherd from Quseir al-Qadim to either the Roman or Mamluk period, but a certain number of surface, top layer, or mixed locus finds are problematic, and in these cases parallels are adduced to help assign a date. Most of the parallels included, however, are intended to show the geographical range of the vessels, primarily within the Near East, East Africa, and India. These data are fundamental to the following discussion of Roman period trade passing through Quseir al-Qadim. A complete citation of all available parallels, including the European glass, would be quite bulky and would add little to the questions addressed in this report.

At the beginning of the period discussed here (first through second centuries A.D.), glass was still something of a novelty. The mold-formed grooved bowls began in the mid-second century B.C. (Grose 1986: 68), and the ribbed and linear-cut bowls (1–27) somewhat later, continuing into the first century A.D. The mold-formed bowls were the first mass produced and widely distributed types of glass vessels. Glass blowing was invented about 50 B.C. and the technology spread rapidly throughout the Roman Empire. By the middle of the first century A.D., then, blown glass was relatively abundant. The third major technique for producing glass vessels, mold casting, remains less well defined both as to the exact

1. Unfortunately, compiling statistics on the vessels is not possible. The problem arises at the stage of the daily tabulations. Each worker simply listed the glass finds by color and rough description, sometimes with a sketch but more often without, and none of the notes are the same from worker to worker. It is difficult to see how they could have been with no glass specialist on site and no body of comparanda for reference, both of which are in short supply anywhere. In selecting glass for drawing, an attempt was made to take all the best pieces from each locus, though in hindsight, many small but informative sherds must have been overlooked. Glass drawn in the field but not illustrated with the plates is listed with the plate labels in the same format.

manufacturing stages and the dates and place(s) of production. In the West at least, strong colors or mosaic glasses were favored at first, in the Augustan period (Isings 1957: 163). At Quseir al-Qadim the mold-cast vessels form a large and distinctive category. All but a few pieces are transparent or slightly tinted glass with few if any bubbles, no impurities, and little if any weathering. Many of the vessel forms seem to be imitations of Arretine pottery, though from the scattered findspots at Quseir al-Qadim it is hard to evaluate Clairmont's (1963: 146) prediction that they should be found in eating sets of plate, deep bowl, and shallow bowl.

Colorless glass is generally considered to have replaced the strongly colored fabrics in the late first century A.D. By about 200, most luxury glasses were transparent, plus some dark blues and yellows, whereas the natural greenish glass was used for the ordinary vessels (Harden 1969: 62), mostly blown. Glass was decolorized with antimony or manganese, and many of the pale lavender or purple shades were originally colorless fabrics, now tinted by the manganese. Such information as can be gathered about the place of manufacture of the mold-formed, mold-cast, and blown vessels is presented in *Chapter 3*.

As for the preparation of the drawings themselves, the whole excavation staff of all three seasons deserves thanks. All artifacts registered and liable to division were drawn in the field before the close of the season, which meant that all able staff members were involved. The penciled drawings were inked in Chicago and many are published in the preliminary reports. For the present work, all the glass sherds in the Oriental Institute were rechecked against their drawings and a large number were redrawn in order to bring them into line with current standards, and a few were drastically reinterpreted. The sherds retained in the division by the Egyptian Antiquities Organization for the Egyptian Museum or the Islamic Museum could not be checked. Virtually none of the vessels are intact or even complete from rim to base; most have been reconstructed from diameter and angle of rest of the sherd. If the sherd represents less than a quarter of the diameter of the vessel, the sherd outline is drawn on the vessel as reconstructed. Unfortunately this practice could not be carried out from beginning to end; not all the field drawings were so standardized, and we could not recheck the sherds in Cairo. Thus, if the outline of the sherd is drawn, then only that much of the vessel exists, but if a vessel has no such outline, then either a large portion survives, or we could not review the drawing. To the extent possible, unchecked drawings were excluded and represent only a small portion of the vessels illustrated here. Everything was drawn at 1:1 except the beads, which were drawn at 2:1. A scale is included on each plate to give the dimensions as needed. Measurements for each item are time-consuming, probably misleading for a corpus consisting almost entirely of sherds, and possibly even wasteful of text space and editorial time.

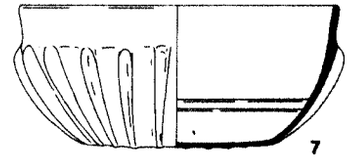
In addition to the drawings—and few categories of artifacts improve more in clarity by drawing—some twenty sherds have been photographed, primarily mosaic and cut glass (pl. 21). As the glass is so fragmentary, six examples of complete vessels from other sites have been added and are labeled A to F. Five vessels are from the site closest in geography and

date, Karanis, and the sixth, from the Römisch-Germanische Museum in Cologne, is the closest match for the "hero cup."

Individual vessels may or may not be discussed in the text, but the basic information about each is given in the plate descriptions. A definition of what is meant by each term is given at the beginning of the *Corpus of Glass Sherds* (p. 139).

MOLD-FORMED VESSELS

Ribbed Bowls (1–25)


7

If plate 1 were shown in color, it would be almost gaudy. The colors of the vessels range from amber and white marvered to yellow-green, amber, blue-green, green, purple, dark blue, and transparent. Ribbed bowls were among the first kinds of glass vessels to be mass-produced and widely available. Grose (1984) has described the method of manufacture, sagging a round blank pre-stamped with the ribs, over a former mold in a furnace.[2] The exterior would thereby be fire polished and only the interior and rim would need lathe polishing. Many of the Quseir al-Qadim vessels have grooves cut on the inside, and a number of the rims, which may have been quite thick initially, have been ground back on the outside. The ribbed bowls are well dated to the last half of the first century B.C. into the first half of the first century A.D. (Harden 1969: 47; Grose 1979: 56; Grose 1986: 68). All but one of the Quseir al-Qadim ribbed bowls are monochrome. The exception, bowl 1, is transparent amber with white threads marvered in, and it has a close parallel at Corinth in a first century A.D. ribbed bowl of light yellow with white marvered-in threads (Davidson 1952: 96–97). Marbled ribbed bowls are known from other sites, including Dura Europos (Clairmont 1963: 26). Grose states that most of the mosaic ribbed bowls are of Italian manufacture, and certainly most examples have been recovered from western Mediterranean sites rather than eastern ones. Whether Italian or not, bowl 1 is different from the other Quseir al-Qadim bowls, which are monochrome like those usually thought to have come from the Syro-Palestinian region.

This is supported to a certain extent by finds. Few ribbed bowls have hitherto been reported from Egypt, one at Karanis (Harden 1936: 118–19), another from Armant (Harden 1940: 99–100), and one without provenience (Cooney 1976: 107). One dark blue ribbed bowl was excavated at the Meroë West Cemetery (W 166) (Dunham 1963: 238–39). On the other hand, they are quite common in the Palestinian region, and one possible manufacturing site has been identified at Hagoshrim in upper Galilee (Weinberg 1973: 38–39). A number of ribbed bowls are published from Tel Michal (Kertesz 1989: 366–67), and a few from Nessana (Harden 1962: 76, 78–79) and Ashdod (Barag 1967: 71–73). More examples are reported from the Southern Ghors and Northeast 'Araba Survey (Meyer 1992); Hesban, of clear, "amethyst," amber, green, and light green glass (Goldstein 1976: 128–29); Araq el-Emir (Lapp 1983: 44–45); and Jerash (Dussart 1986: 75; Kehrberg 1986: 368,

2. Sagging down *into* a former mold is another possibility, especially for the smooth, linear-cut bowls.

377; Meyer 1987: 184–86). Although Syria is frequently stated to be a center of glass manufacturing, relatively little is published from there, primarily the vessels from Dura Europos (Clairmont 1963: 26–27). This may be supplemented by a small but carefully excavated corpus from Tell Nebi Mend near Homs.[3] As this, Quseir al-Qadim and Hagoshrim are the only sites from which enough sherds are available for a rough tabulation; they are presented here without any claims to representing all the ribbed bowls recovered from all three sites.

	Quseir al-Qadim		*Hagoshrim*		*Tell Nebi Mend*
Light Blue-Green	4	6.3%	5	21.7%	2
Blue-Green	13	20.6	1	4.3	—
Light Blue	—	—	—	—	3
Blue (Cobalt)	1	1.5	1	4.3	—
Dark Blue	4	6.3	—	—	—
Light Yellow-Green	7	11.1	—	—	—
Yellow-Green	2	3.0	—	—	—
Pale Green	—	—	2	8.6	—
Light Green	2	3.0	2	8.6	—
Green	1	1.5	—	—	—
Yellow-Olive	4	6.3	—	—	1
Olive	—	—	4	17.4	1
Light Brown	—	—	2	8.6	—
Yellow-Brown	—	—	1	4.3	—
Amber	7	11.1	—	—	1
Dark Amber	4	6.3	1	4.3	
Light Purple	—	—	—	—	1
Dark Purple	5	7.9	1	4.3	—
Clear	7	11.1	3	13.0	2
Marvered	1	1.5	—	—	—
Color?	1	1.5	—	—	1
Totals	63	99.0%	23	99.4%	12

Of Mediterranean sites we note here only the large number and wide variety of ribbed bowls from Corinth (Davidson 1952: 94–97) and those from the Rhodes bead factory site (Weinberg 1969: 148).

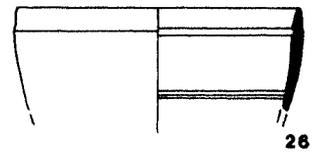
More likely to be connected with trade outside the Roman Empire, specifically via the Red Sea trade, are sherds from Timna', Arabia (Bowen and Albright 1958: 207),[4] Heis on the northern Somali coast (Stern 1987: 25–29), Begram, Afghanistan (Hackin 1939, pl. 9), Taxila, India (Marshall 1951, pl. 209), Dharnikota on the eastern coast of India (Dikshit

3. Finds from Tell Nebi Mend, ancient Qadesh, are cited here by courtesy of Professor Peter Parr, director of the University of London excavations at Tell Nebi Mend, but the corpus is not yet published.

4. In addition to the glass, eastern Mediterranean Roman period ceramics and bronze statues of "Ptolemaic provenience" have been recovered at Timna' (Sidebotham 1986: 16).

1969: 51), and Arikamedu, also on the eastern coast of India (Wheeler, Ghosh, and Deva 1946: 102).

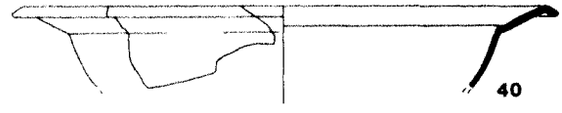
Linear-Cut Bowls (26 and 27)


26

Only two examples of linear-cut bowls, versus more than sixty ribbed bowls, were recovered from Quseir al-Qadim. They were made by the same technique as the ribbed bowls (sagging a round blank over a simple forming mold), have similar dates, ca. 40 B.C. to ca. 50 A.D., and are thought to have been manufactured in the same regions if not the same workshops (Grose 1979: 56, 65). Linear-cut bowls and ribbed bowls have similar distributions in the Near East, including Ashdod (Barag 1967: 71–73), Tel Michal (Kertesz 1989: 366–67), Nessana (Harden 1962: 76–78), Jerash (Dussart 1986: 75; Meyer 1987: 185–86), Tell Nebi Mend (at least twenty-nine), Dura Europos (Clairmont 1963: 27–28), Corinth (Davidson 1952: 93–94), and the Rhodes bead factory site (Weinberg 1969: 148), and sites throughout the Hellenistic and Roman world. Molded bowls, such as ribbed bowls, are reported in numbers at Hagoshrim (Weinberg 1973), yet they are rare in Egypt. Apart from the two at Quseir al-Qadim, one sherd is published from Pelusium (Fontaine 1952: 79). To date none are known from East African or Indian sites.

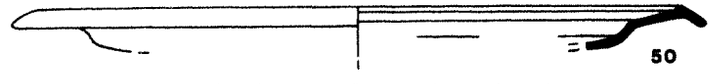
MOLD-CAST VESSELS

Bowls with Overhung Rims (28–48)


40

In addition to the examples illustrated here, at least another thirteen sherds were recovered (listed in below in the section *Glass Sherds Not Illustrated*). Bowl 48 may or may not belong with the rest of the bowls with profiled rims, but it is cast and does have an overhung rim. All are of good quality transparent glass with little or no weathering. The vessels were cast and some received elaborate cut decoration. Harden (1969: 62) observes that colorless glass started to replace the strongly colored fancy glasses in the first century A.D., and by ca. A.D. 200 most of the best glass was colorless. It is especially suitable for cutting, painting, and trailed-on decoration. Parallels for cast bowls with overhung rims are surprisingly sparse. Harden (1936: 83) lists one bowl from Karanis, a few more are noted at Dura Europos (Clairmont 1963: 24–25), at least three of which are mosaic or multi-colored glass (ibid., p. 11). A magnificent specimen from the Cave of Letters at En-Gedi has a rim and base decorated with cut circles and lines (Barag 1963: 41, 101, 108). The most similar Quseir al-Qadim vessel would be bowl 38 with a notched rim and cut lines; the others use cut ovals.

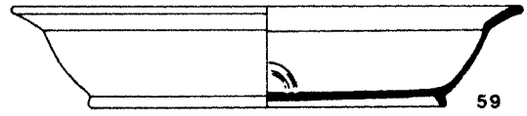
Plates with Overhung Rims (49–51)


50

The plates are similar to the bowls with overhung rims in mode of manufacture and quality of glass but are shallower. One other sherd was drawn

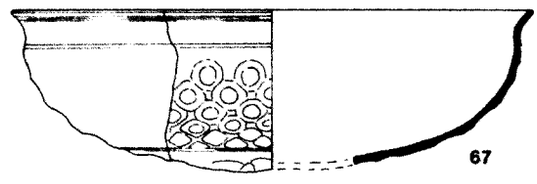
but is not illustrated here. According to Harden, circular plates, never common, were made in Egypt in the first and second centuries A.D., falling out of fashion in the third century in favor of oval dishes (Harden 1936: 49, 51). He illustrates one example only of a plate with overhung rim from Karanis (ibid., pp. 60–61, pl. 11). Two other fine examples come from the Cave of Letters at En-Gedi (Barag 1963: 41, 106). Also noteworthy is a sherd from Axum (Morrison 1989b: 196–97).

Bowls with Broad Rims (52–63)



All of these cast bowls are transparent or slightly tinted except bowl 59, a translucent gray-brown. The glass is consistently of good quality, and weathering is slight or absent. The base of bowl 60 with raised circles could have come from a bowl or plate with overhung rim but is included here because of bowl 59, which has cut circles. At least six more fragments of bowls with broad rims were found. Harden describes a few plates and bowls with broad rims from Karanis (Harden 1936: 61, 84) but observes that in general deep bowls are not as common as shallow ones (ibid., p. 95). This seems not to be the case at Dura Europos where there is a series of deep bowls, some on high pedestal bases, some with elaborately molded rims like bowl 57 (Clairmont 1963: 20–24). There are also some plates with broad, sometimes ridge-molded rims (ibid., pp. 19–21). A molded and polished bowl from Corinth has a fairly broad rim and a raised circle on the base like bowl 60 (Davidson 1952: 97–99). A possible bowl with broad rim or a patella cup, also dark green, was recovered at Timna' in Arabia (Bowen and Albright 1958: 207). Notably, a "double convex bowl" with a broad rim, dated to 0–40 A.D., was found at Heis on the northern Somali coast. It however is mosaic glass described as yellow or white hollow circular canes in a blue-green matrix (Stern 1987: 26–29). What might be a bowl with a broad rim or a patella cup is illustrated by Dikshit (1969: 42–43) from Nevasa, a Deccan site, dated to ca. 150–200 A.D., though it is difficult to be certain about the shape from the drawing. The vessel is green, but twelve or so others are mentioned in emerald, blue, and yellow glass. Grose (1986: 76) illustrates some common shapes of cast monochrome vessels, including emerald, dark blue, aqua, and purple, that were produced by Italian or western glass houses. Almost all the mold-cast vessels from Quseir al-Qadim are transparent. Are they a product of Alexandrine rather than western workshops or are they slightly later in date, after the rich colors had gone out of fashion?

Large Bowls with Cut Decoration (64–67)



The distinction between "large" and "small" bowls with cut decoration is somewhat arbitrary, but so far as the present limited sample would suggest, the large bowls tend to be shallow and may have more elaborate cut ornamentation. Bowls 64–67 are all mold-cast transparent glass and bear fine cut decoration of ridges, circles, or floral(?) elements. Bowls 65 and 66 may have parallels of

sorts at Dura Europos (Clairmont 1963: 27–29, pl. 4), but otherwise the type seems uncommon in the Near East. The shape and decoration of bowl 67 may have been copied from silver vessels; it bears a striking resemblance to a silver bowl in the Chaourse hoard found in northeastern France and dated to the third century (British Museum display).

Small Bowls with Cut Decoration (68–71)


70

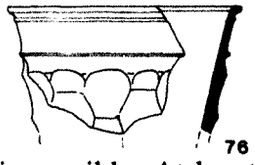
Two other vessels in this category were noted but not illustrated; all but bowl 71 are transparent. The last is a rich blue that might indicate an earlier date or western origin, or both. The raised, cut ridges are fairly common on Roman period vessels from Quseir al-Qadim but seem to be rare elsewhere. The small bowls from Jerash (Kehrberg 1986: 368, 375), Jalame (Weinberg 1988: 96–97), and Corinth (Davidson 1952: 93–94) all have cut grooves.

Large Bowls with Flaring Rims (72–75)


73

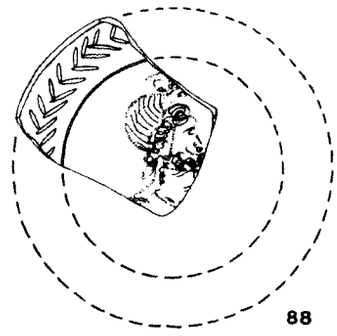
How these rims continued to the sides of the bowls is not clear. At least two more sherds are known, two of which closely resemble bowl 73. All are molded of good quality transparent or slightly tinted glass with little or no weathering.

Faceted Beakers (76–86)


76

The distinctive faceted beakers are all made of transparent or greenish tinted glass and are generally dated to the late first and the second centuries A.D. (Isings 1957: 37–38). The rim of beaker 78 and base of beaker 86 may or may not pertain to faceted beakers, but judging from complete vessels found elsewhere the assignment is possible. At least three more faceted sherds were recovered at Quseir al-Qadim. Faceted beakers are either very widespread or generally reported if found. Eleven are known from Karanis, including two intact beakers found in a sealed niche (Harden 1936: 137, 149–51). Harden (ibid., p. 100) also notes a deep bowl from Hawara with a honeycomb body and base. Several fragments of beakers and at least one deep bowl with cut honeycomb decoration come from Dura Europos (Clairmont 1963: 60–62). A sherd is reported from Sardis (von Saldern 1980: 17, pl. 3); a nearly intact beaker, from Corinth (Davidson 1952: 100–01), and one beaker from as far away as Sweden (Kisa 1908: 905–06). More important for this study are a facet-cut beaker, three cups, a mug, and perhaps a shallow bowl from Begram (Hackin 1939, pls. 9, 18; Hackin 1954, figs. 252, 253, 364). The Quseir al-Qadim sherds vary considerably in thickness, but all seem to come from the tall beakers rather than bowls or the shorter, wider cups such as the two from Cambridgeshire and Cyprus, now in London (British Museum 1968: 79–80).

Mythological Cups (87–88)


88

One exceptionally fine piece of glass, cup 88, came to light during the 1982 season, and was dubbed the "hero cup." With the identification of the cup and its comparanda, a badly eroded sherd from the 1978 season, number 87, could be picked out as another example. The "hero cup" is part of the base of a small cup or bowl of crystal clear glass. Two lines are incised inside but the rest of the design is on the exterior, meant to be viewed through the glass. The bust of a man is carved on the bottom; judging from the restored diameter there would have been no room for a full figure. He is shown bearded and wearing what seems to be a helmet. The broad lines such as the outline of the helmet are shallow cut facets; the details like the eyes, nose, hair and beard curls, and wrinkles have been scratched on with a sharp tool. Around the bust a circle of narrow herringbone facets like a wreath has been cut.

The piece was labeled the "hero cup" because the scenes on the closely-allied series of vessels discussed below usually depict heroes or lovers of classical mythology. Although known examples are not numerous, they are well published. The main design is as a rule facet-cut and details added with a fine graver, possibly a piece of rock crystal or quartz (Harden 1960: 67). The mythological bowls are small vessels with plain, ground rims, vertical sides, and almost always some curvilinear engraving just below the rim (ibid., pp. 45–46), though that of course is not preserved on the "hero cup." Fremersdorf, who wrote a monograph on these engraved vessels, dated them to the third century A.D. and traced their point of manufacture to Cologne because of the concentration of examples found in the vicinity (Fremersdorf 1951: 22–25). Harden, on the basis of the Karanis finds, suggested that they dated from the early second to early third century and came from the Alexandria workshops. He also pointed out that the Greek inscriptions were more likely to be of Eastern origin than Western (Harden 1960: 46). The Quseir al-Qadim "hero cup" would certainly support the earlier date and probably the idea of Egyptian manufacture.

The mythological bowls are important because they were:

> ... the last glasses which were exported in any quantity from Egypt to the west; but they were more than that, namely the parent group from which all late-Roman cut and engraved glasses with figured scenes are descended (Harden 1960: 46–47).

The bowls are also of interest because they are so distinctive that they suggest the product of one glass house, if not one glass master. Unlike the molded Ennion cups, however, none are signed.

Fremersdorf published twenty-three examples, though Harden does not believe all are actually mythological cups (Harden 1960: 45). We tend to agree. Even with new pieces published since Fremersdorf's work, the number of known examples of mythological bowls is quite small. It seems worthwhile to list the pieces here in order to demonstrate the paral-

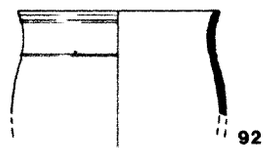
lels for the "hero cup," to illustrate the designs characteristic of the series, and to present their geographical range.

1. Shallow bowl with bust of a man in a pointed hat, found in a grave in Cologne (Fremersdorf 1951: 13–14, pl. 13). This is the best single parallel for the "hero cup" and is shown here as A on plate 5 and is listed between objects 88 and 89 in the plate description. Instead of a wreath, however, the Cologne cup has a circle of fruit, fruit bowls, and a bird around the central design. The bird is almost identical to one sherd from Karanis, apparently from a somewhat differently shaped bowl.
2. Bowl rim fragment of transparent glass showing a duck, from Karanis. The facets are cut and the details are added with scratched lines (Harden 1936: 119, pl. 14; Harden 1969: 53).
3. Shallow bowl with bust of a woman, from a grave in Bakar on the Croatian coast (Fremersdorf 1951: 15, pl. 13). If it had not been found so far away, the bowl could be a companion piece to #1 above. Instead of fruits and birds, this bowl has a circle of fishes.
4. Bowl with Artemis, Actaeon, hound, and stag, found in a grave at Leuna, Merseburg, Germany, in the middle of the nineteenth century (Fremersdorf 1951: 5, pls. 2, 3). Among the other grave goods was a facet-cut or honeycomb bowl (British Museum 1968: 70–71). The Leuna vessel is one of the best preserved of the mythological bowls. It shows the moment at which Artemis, surprised at her bath, changed Actaeon into a stag, who was then pursued and killed by his own hounds.
5. Fragment of a vessel inscribed with Actaeon's name, from Castlesteads, England, near Hadrian's Wall (Fremersdorf 1951: 5).
6. Fragment showing a dog and a stag, perhaps part of an Actaeon scene, found at Bowcombe Down on the Isle of Wight (Harden 1969: 73, pl. 5).
7. Bowl showing Hypermnestra, Lyncaeus, and Pothos, a god of love, found in Cologne (Fremersdorf 1951: 2, pl. 2; Kisa 1908, II: 551, 555). The figures pertain to the myth of the fifty daughters of King Danaeus, forty-nine of whom killed their husbands on their wedding night.
8. Bowl showing Prometheus creating man from clay, with Hypometheus (= Epimetheus?) at the side and Mother Earth below, found in Cologne in the middle of the nineteenth century (Fremersdorf 1951: 4, pl. 5). This is one of the largest and most elaborate of the mythological bowls.
9. Bowl with Atalanta (spelled ΑΛΑΤΑ) and Hippomedon from Fosse-Pierre-La-Longe, Marne, near Reims (Fremersdorf 1951: 6–7, pl. 11). The scene depicts the race between Atalanta and Hippomedon or Hippomenes, who won when he tossed golden apples before Atalanta to make her slow down to pick them up.
10. Fragment with a man's torso and inscription reading "Orestes," bought in Egypt (Fremersdorf 1951: 13; Harden 1969: 54, pl. 5).
11. Fragment with lower part of a body in "Knielauf" and an inscription ΤΡΟΦΟΣ, "nurse," purchased in Cairo (Fremersdorf 1951: 13; Harden 1969: 54, pl. 5).
12. Fragment showing the head and shoulders of a person, an unidentified oval above, and the name Hippolytos (Fremersdorf 1951: 12–13; Harden 1969: 54, pl. 5).

13. Bowl with engraving of a person with what appears to be a cape blowing out behind, and the name Phaidra, from the vicinity of Cologne (Fremersdorf 1951: 6, pl. 8).
14. Fragment with a face and the name Pyrros, found at Regensburg, Germany (Fremersdorf 1951: 8, pl. 12).
15. Fragment with the name of Theseus, findspot unknown (Fremersdorf 1951: 7, pl. 11). It is impossible to determine from the drawing what the cut design represents.
16. Bowl with inscription reading "Achilles" and "Patrocles," from Germany (Fremersdorf 1951: 3, pl. 9).
17. Round bowl showing a gladiator in a helmet holding a rectangular shield and a sword, from Aquincum near Budapest (Fremersdorf 1951: 3, pl. 8).
18. Shallow bowl with a hare, hound, and spray of foliage, found in a late Roman cemetery at Strasbourg (Fremersdorf 1951: 7, pl. 2).
19. Fragment with what may be the torso and cape of a figure, findspot unknown (Fremersdorf 1951: 10, pl. 12).
20. Fragment showing the back of a head, neck, and shoulders of a person, purchased, possibly from Cologne (Fremersdorf 1951: 12, pl. 12).
21. Fragment showing an arm in a long-sleeved garment and a leg in trousers with many folds, perhaps a barbarian costume, now in the Benaki Museum, Athens (Clairmont 1977: 14, #46).
22. Fragment with the name of Achilles, a man in a helmet, chiton, and corselet, and perhaps a figure of Nike on the right; Benaki Museum (Clairmont 1977: 14, #47). Clairmont suggests an eastern Mediterranean, possibly Alexandrine, origin for this and #21 above, and a second to third century date.
23. Fragment of a bowl from Dura Europos, colorless greenish, inscribed with the name of Actaeon, scene of a man being attacked by a dog (Clairmont 1963: 57–59, pl. 24).
24. Large fragment from Caerleon, Wales, showing a seated female with a palm, a striding male, a reclining male with a fish-like tail (Triton?), and a leaping quadruped (Boon 1967: 99–100).

A few other pieces have been compared to the mythological bowls but do not seem as close in style. In any case, parallels for the "hero cup" may be found in England, France, Germany, Hungary, and Egypt, though the Quseir al-Qadim example is one of the best dated. It is striking that these elegant vessels were carried from their point of manufacture, Alexandria or wherever it may have been, to the edges of the empire, as far as Hadrian's Wall.

Jar or Beaker with Cut Decoration (89–94)


92

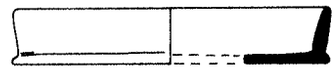
Exactly how these vessels were made is uncertain. They are listed here with the mold-cast vessels partly because of the quality of the glass—very clear and little weathered—and the cut decoration. If molded, the necks would have had to be worked inwards. Alternatively, the vessels could have been carved down from thick blown blanks. Jars 91 and 93 are exceptionally thin, but the ridges are cut, not applied. Two more possible ex-

amples of jars or beakers like 93 and perhaps 90 are known. All but sherd 89, which is blue, are transparent.

Bowl(?) Rims (95–97)

These three rims have nothing in common except that they seem to have been made by molding. Bowl 95, cobalt blue, has a parallel in a second century deep blue beaker from Corinth that has cut ribs and grooves on the exterior (Davidson 1952: 100–01). The molded interior groove on bowl(?) 97 makes it similar to the broad, flaring rim of bowl 73 and the opaque orange rim sherd 302. Bowl 96 is quite like a transparent one from the Meroë North Cemetery (Beg. N. 5), first century A.D. (Dunham 1957: 125–26).

Plate (98)


98

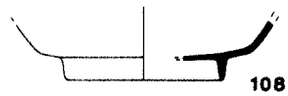
The rim and flange are well enough preserved to indicate that the item does end this way. It appears to be a plate similar to the shape of an Arretine vessel type (Whitcomb 1982: 64–65, pl. 29 i). A number of the molded vessels do in fact seem to have been copied from fine Arretine shapes (see ibid., pls. 29, 30).

Ring Base (99–107)


107

Ring bases, whether molded as here or applied as on the blown vessels, are an ordinary means of finishing a variety of forms, from small bowls or beakers to broad plates. Eight more ring bases were drawn but are not shown here. All but bases 99, 102, and 103 are transparent. Base 99 is emerald green with a sharply cut base ring. Base 103 is a dark blue-green, not cobalt blue and not the ordinary blue-green; it is further unusual in having a cut groove on the exterior just over the base ring. Given that base rings are common on molded vessels, we note only an example from Heis on the northern Somali coast, dated to the first half of the first century A.D. The sherd seems to have a flat interior like a plate or a large bowl; the color is not noted (Stern 1987: 25–26).

High Bases (108–15)


108

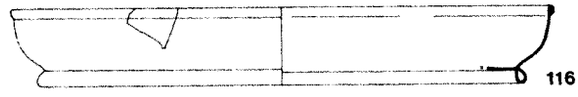
In addition to the high bases shown on plate 6, seven others were drawn. All are transparent except base 111 which is light green. Like ring bases, high bases are common on a variety of vessel shapes. Bowl B from Karanis, listed between sherds 108 and 109 in the plate description, illustrates a complete bowl with a flaring rim and a high base. Similar bowls are well attested at Dura Europos (Clairmont 1963: 25, pls. 2, 3), as are plates on high bases (ibid., pp. 18–20).

BLOWN GLASS

Glass blowing is considered to have been invented about 50 B.C. (Harden 1969: 46–47; Auth 1976: 21, fn. 40; von Saldern 1980: 6). The technique spread rapidly but it was not until after the reign of Augustus (27 B.C. to A.D. 14) that blown tableware began to appear in some abundance (Isings 1957: 163–64; Auth 1976: 17). Where exactly glass blowing was invented is an old problem. Syria has long been considered a likely candidate, and certainly an important glass industry there dates to Hellenistic times and earlier.

Mold-cast vessels continued to be produced as luxury wares into the second century A.D., but blown glass came to be used more and more for ordinary tableware and containers such as unguentaria and flagons. The Quseir al-Qadim blown vessels are mostly utilitarian and decorated if at all with cut lines or applied decoration. Molded decoration of any sort is conspicuously rare.

Bowls with Looped Rim and Base (116–22)


116

The excavations recovered a sizable group of blown, shallow bowls with a looped-out rim and a looped or tubular base, and at least two more base sherds were drawn. Bowl 116 consisted of a large number of base sherds and one rim sherd, hence the odd drawing. The form is well dated to the first century A.D. by a sealed deposit from Cosa, Italy, 40–45 A.D., and by some vessels from a drain in the Roman Forum (Grose 1977: 16–20). Another light blue, first century A.D. bowl from Corinth is compared to terra sigillata vessels (Davidson 1952: 99–100). Isings (1957: 62–63) discusses both a blown variety of the cylindrical dish, form 48, and a "mold-pressed" variety, form 22 (ibid., p. 38), both dated to the first century A.D.[5]

Bowls with Looped Rims (123–26)

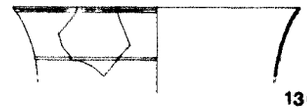

123

All of these are blown and seem to come from broad bowls or dishes. They have been grouped with the Roman vessels because of the quality of the glass and the date of the findspots. Comparable pieces from other sites are sparse indeed, though a light blue, first century rim like 125 may be noted from Corinth (Davidson 1952: 99–100). Small, thin, fragile sherds are all too often not saved during excavations; thus, entire categories of vessels may be under-represented or missed entirely. Rim 124 looks disconcertingly like a crown or bull's-eye window pane but is too thin and too early for such (Meyer 1989a).

5. At first glance it is possible to confuse the bowls with looped rims and bases with a Byzantine form in which the entire side of the dish is looped over at the rim, doubled down the side, and looped out again to form a base ring. These are fourth–fifth century and perhaps later (Kehrberg 1986: 368, 381; Meyer 1987: 190–91; Dussart 1989: 106). Harden (1949: 151–52) and Isings (1957: 148) illustrate some double-sided bowls on pedestal feet, probably fourth century as well.

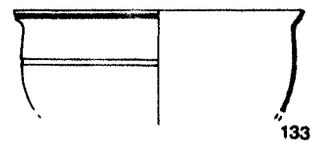
Even in later periods when crown panes were in general use, it can be difficult to distinguish between a shallow dish, a plate, and a round window pane.

Beakers with Slightly Flaring Rims (127–30)


130

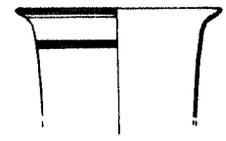
These beakers are not common at Quseir al-Qadim, but the cut grooves and ribs of 127 and 130 are in Roman style, and beaker 128 has both a Roman provenience and a parallel of sorts at Dura Europos (Clairmont 1963: 55, pls. 6, 24). Beakers with flaring rims seem to be much more popular in the fourth century and later (cf. Harden 1936: 143; Harden 1949: 151–53; Harden 1964: 23; Lapp 1983: 54–55, fig. 23; Dussart 1986: 76).

Bowls with Everted Rims (131–40)


133

A number of these bowls were recovered, and at least four more were noted. All are of transparent or slightly tinted, thin glass and many are decorated with fine cut lines. Bowl 131 would have been included with beakers on the basis of its small diameter, but the curve of the base is clearly preserved. Bowl 140 may be smaller; the diameter was remeasured but it is a small sherd. Judging from vessels such as C, listed between objects 139 and 140 in the plate description, the bowls would have had round bases, though Davidson (1952: 102–03) illustrates a cylindrical vessel with a kick-up base and everted, unworked rim from Corinth, first century A.D. Some of the bowls, such as 135, have squared or beveled rims that seem related to the series of Byzantine cups with knocked-off rims (Meyer 1987: 189–90, 192, 197). The thin bowls with everted rims are reported from Karanis (Harden 1936: 122–23, pl. 15); Jalame, ca. 275–350 (Weinberg 1988: 96–97), and Dura Europos (Clairmont 1963: 96, pl. 10).

Beakers with Everted Rims (141–48)

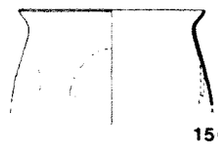

144

At least four more rims in this series are known from Quseir al-Qadim. All are very thin and most are transparent except for beaker 143 and two unpublished pale blue and light green sherds. The beaker rims are similar to bowl rims 131–40 above, but the diameters are smaller and the sides tend to be cylindrical or conical. The beakers could have had bases like D (listed between sherds 146 and 147 in the plate description) or bases 293–94, or could have had looped bases like 278, as illustrated by Isings (1957: 48–49). Some of the everted rims such as the rim of beaker 142 could have come from the indented beakers, but without evidence of indents they are left with the plain beakers. Like the bowls with everted rims, parallels may be noted at Karanis (Harden 1936: 149, pl. 15), Jalame (Weinberg 1988: 92–94), Dura Europos (Clairmont 1963: 24–25, pl. 3), and Corinth (Davidson 1952: 100–01).

Indented Beakers (149–67)

The indented beakers were quite common at Quseir al-Qadim—ten others were drawn but are not illustrated here—in a variety of shapes from squat (151, 154) to cylindrical (155), extremely thin (164) to heavy (160). All of the bases are flat or kicked up, except

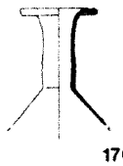
the base of beaker 165, and most vessels have four indents. The beakers from Karanis show similar variety (Harden 1936: 145, 147, pl. 15). The rarer fluted beakers like 166 and perhaps 167 are also attested at Karanis (ibid., pp. 147–48, pl. 15), Dura Europos (Clairmont 1963: 98, pl. 10), and Carthage, though from a sixth century context (Tatton-Brown 1984: 205, fig. 67). The usual four-sided beakers are known from Karanòg (Woolley and Randall-MacIver 1910: 73, pl. 39), Dura Europos (Clairmont 1963: 98, pl. 10) and Jerash, though mostly from later contexts (Dussart 1986: 75; Kehrberg 1986: 368, 383; Meyer 1987: 185–86). The indented beakers are generally dated to the second half of the first century A.D. into the first half of the third century (Isings 1957: 46–47; von Saldern 1968: 93; Hayes 1975: 41). The beakers are considered an Eastern form, either Egyptian or Syrian (Harden 1936: 44, von Saldern 1968: 93), but they are widespread indeed, from the sites noted above to Cyprus, Germany, and Italy (Isings 1957: 46–47; von Saldern 1968: 93), including Pompeii, i.e., before A.D. 79 (Isings 1957: 46–47).


150


153

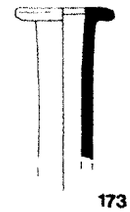
Unguentaria with Rims Folded Out or Up (168–71)

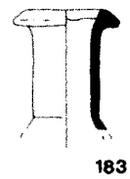
Perfume flask 168 is one of few vessels found intact at Quseir al-Qadim, and it came from the floor of the Small Storeroom in the Roman Villa (Meyer 1982a: 203). Judging from the field drawing the rim folds out, but it could not be checked and might actually have been folded in and smoothed down, as were the majority of the unguentaria rims (172–89). The long-necked flask 169 has a parallel in a bottle rim from Corinth, second century (Davidson 1952: 105–06), and the delicate flask 170 is similar to one from Dura Europos (Clairmont 1963: 107, pl. 12). The rim of unguentarium 171 may have been drawn too thick and may be more like 170; at least two other folded-out or folded-up unguentaria rims are noted from Quseir al-Qadim.


170

Unguentaria with Folded In Rims (172–89)

The majority of the unguentaria rims at Quseir al-Qadim are folded in, but beyond this the diversity of profiles, finishing, and presumably the attached bodies is remarkable. A wide variety is apparent in the Karanis corpus as well (Harden 1936, pl. 20). Unguentaria are one of the more common types at Quseir al-Qadim; some thirty-six folded-in rims alone were drawn. Tens of thousands are known throughout the Roman Empire (von Saldern 1980: 23), though many have no provenience and were probably looted from tombs. Although perfume flasks are among the earliest blown vessels (Grose 1982: 28), they are said to have become especially prevalent in the second century A.D. (Harden 1936: 38). Most of the Quseir al-Qadim flasks are dark natural greens, blue-greens, and olives, sometimes appearing opaque black, but a few are light blue-green (176, 179, one not illustrated), green with opaque white marbled coils (182, one not illustrated), light green (185, three not illustrated), and clear (three not illustrated).

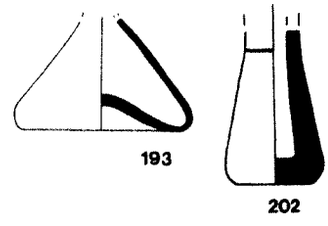

173


183

Given a range of fabrics, rims, and bodies, and no coherent classification scheme (but see Harden 1936: 265 ff.; Hayes 1975: 42–45), we note only general parallels for the folded-in unguentaria rims at Jerash (Baur 1938: 538; Kehrberg 1986: 368, 377; Meyer 1987: 186–87), Aqaba,[6] Southern Ghors and Northeast 'Araba Survey (Meyer 1992), Araq el-Emir (Lapp 1983: 45–46, 52–53), and Nahal David (Avigad 1962: 178). At Samaria the dating of the unguentaria and other glass (Crowfoot 1957: 411–12) may need to be reassessed. A variety of unguentaria are published from Dura Europos (Clairmont 1963: 107–08, 130–39), including two piriform unguentaria body sherds of green or light blue-green with white marbled coils (ibid., pp. 130–33, pl. 35), and several kinds are known from Kurcoğlu, Syria, thought to be second century A.D. (Matheson 1980: 30, 67–68), Corinth (Davidson 1952: 105), and Samothrace (Dusenbery 1967: 42).

Of especial importance are three flasks (= unguentaria) recovered from Saka-Parthian levels at Taxila-Sirkap. They are of "sea green" and "jade green" glass and bear pontil scars (Marshall 1951: 687–88). The folded-in rims, if the drawing is accurate, are very similar to Quseir al-Qadim unguentaria rims 174 or 176; there are constrictions at the joins of the necks and bodies, like 183; and the bodies are piriform with flat bases something like 190. The Taxila-Sirkap piriform unguentaria, however, are not like the majority of the Quseir al-Qadim vessels, which tend to have triangular or solid bases, but rather resemble the well-preserved piriform flasks from Karanòg near the Sudan border (Woolley and Randall-MacIver 1910: 72–73, pl. 37), Jerash (Baur 1938: 534), Dura Europos (Clairmont 1963: 130–34, 136–37, pls. 16, 35), Kurcoğlu (Matheson 1980: 30), Corinth (Davidson 1952: 104–05), and Samothrace (Dusenbery 1967: 42). Two other bottles from Taxila, unstratified, are given as import glass. They are brown and white marbled (Marshall 1951: 688–89), akin to the Dura Europos perfume flask noted above. Another Indian find, an unguentarium from Ter, a Deccan site, is dated to ca. 150–200 A.D. It is piriform, blue-green and white marbled (Dikshit 1969: 45).

Unguentaria with Hollow Bases (190–202)



The variety of bases is shown with numbers 190–96 and 201–02; some of the better preserved necks with 197–200. The thin rim of unguentarium 170 may have had a neck like 200 and a base like 192. "Hollow bases" include shapes from the piriform 190 to the triangular 193, nearly solid 196 to candlestick bases 201–02. At least eight more examples are known. Parallels for piriform unguentaria were noted above with the discussion of the Taxila-Sirkap vessels. Triangular bases like 193 may be found at Karanis (Harden 1936: 271, pl. 20), and in the Sudan at Seidinga (Leclant 1973: 53), Karanòg (Woolley and Randall-MacIver 1910: 72–73, pl. 37), and Meroë North Cemetery (Beg. N. 18). At the latter site four complete unguentaria and fragments of perhaps five others were found in a wooden

6. Objects from the Aqaba corpus are not yet published but are cited through the courtesy of Donald Whitcomb; this corpus will be published by the author in a future volume.

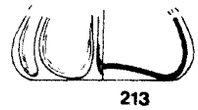
chest (Dunham 1957: 149, 151–53). An unguentarium from En-Gedi (Barag 1963: 103–04) resembles 196 but is not so thick. At Dura Europos several unguentaria are good parallels for 190, 191, 194, and 196 (Clairmont 1963: 130–33, 135–36, 138, pl. 16). The distinctive candlestick unguentaria 201–02 may be found also at Karanis (see E, listed between sherds 200 and 201 in the plate description; Harden 1936: 277, pl. 20), Wadi ed-Daliyeh (Weinberg and Barag 1974: 104, pl. 38), Corinth (Davidson 1952: 104–05), and especially Dura Europos (Clairmont 1963: 130–33, 138–39, pls. 16, 36).[7]

Unguentaria with Solid Bases (203–11)


210

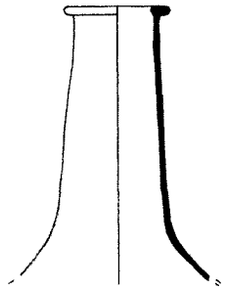
Some eleven solid base unguentaria (plus vessel 168) from Quseir al-Qadim were drawn. These vessels are extraordinary. The Quseir al-Qadim solid base flasks are not in line with Hayes' corpus of Egyptian and Syrian unguentaria that are mostly hollow and mostly thin-walled (Hayes 1975: 133). If anyone were trading perfumes in such thick flasks, then the buyer would have been cheated. Comparable pieces are not common, but several were found at Karanis (Harden 1936: 272, 276–77, pl. 20), one in the Cave of Letters at En-Gedi (Barag 1963: 35, 102), and one squatty example at Dura Europos (Clairmont 1963: 130–33, 136, pl. 16).

Flasks with Ribs (212–13)


213

Only two sherds of this kind of vessel were retrieved, but the similarity of flask 213 to a vessel from Karanis, F (listed between sherds 213 and 214 in the plate description), is striking. Six fragments in all were reported from that site (Harden 1936: 200–01, pl. 17), and one from Debira West, if with a suggestion of a later date (Harden 1978: 86, 91). A fragment from Nahal David might provide a second century parallel (Avigad 1962: 178).

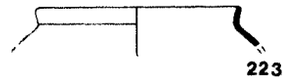
Bottles (214–19)


214

Bottles, as defined by having necks longer than the mouths are wide, are not numerous at Roman Quseir al-Qadim. Only eight examples were noted in all, nor are they common elsewhere. A bottle neck from En-Gedi (Barag 1963: 30, 104) resembles 216, and an unusually large unguentarium at Karanis (Harden 1936: 273, pl. 20) could be compared to 217 and 218. Some of the large kick-up bases such as 272–74 might have come from bottles.

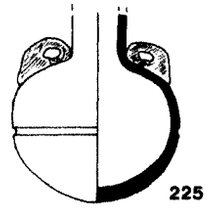
7. An unusual unguentarium base from Taxila-Sirkap is of "sea green" glass and has a deep fold above the base. Although given a Parthian date (Marshall 1951: 688), it is difficult to find anything similar from Roman period sites.

Jars (220–24)


223

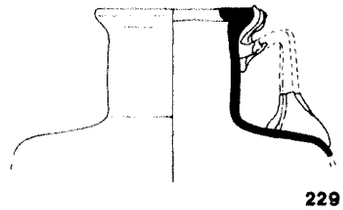
Jars are defined as having necks shorter than the mouths are wide, which means that some, such as 220–21, can have a fairly high neck, whereas others, such as 224, have very short necks. Jars are not common at Quseir al-Qadim nor elsewhere, though one is reported from Dura Europos (Clairmont 1963: 102–03, p. 11).

Aryballos (225–28)


225

The handles are unusual in that they form complete loops, as does one other sherd (not illustrated). Aryballoi were used to carry oil for bathing, facilities for which at Leucos Limen must have been meager. A suspension chain through the two handles might also carry the bottle stopper, as seen on an example from Corinth (Davidson 1952: 82, 105–06). Several sherds of oil flasks are reported from Karanis, including some with full round handles (Harden 1936: 259–61, pl. 20). Eight well preserved aryballoi are published from Karanòg, but the rims seem different, tightly joined to the tops of the handles (Woolley and Randall-MacIver 1910: 72, pl. 38). An amber-colored flask was excavated from Tomb 40 at Dura Europos (Clairmont 1963: 112–13, 115, pl. 34), and a number of aryballoi without provenience are published from Cyprus (Vessberg 1952: 144–45, pl. 9), though the author also observes that the type is more common in the West than in the East. Isings (1957: 78–81) cites examples from Germany, England, Italy, and France, mostly first and second century.

Flagons and Ewers (229–46)

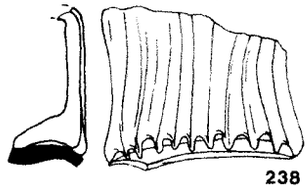

229

Flagons and ewers are distinguished roughly on the basis of size; ewers (245–46) and ewer handles (244) are smaller than the thicker flagons. Given the fragmentary and diverse corpus little more subdivision was possible. As far as can be determined from the sherds, the flagons would have been square-bodied (239–43) with one handle, often a broad strap or reeded handle. At least three flagons were mold blown (242–43, one not illustrated). Fragments of six more flagons were recorded. Most of the vessels are of naturally colored greenish or blue-green glass, bubbly and impure more often than not. The flagons were probably utilitarian shipping vessels for preserves, pickles, or liquids (Auth 1976: 137); the square shape is easier to pack than cylindrical bottles. Kisa (1908, I: 35) illustrates a pair of flagons from Pompeii still sitting in a handled carrying container.

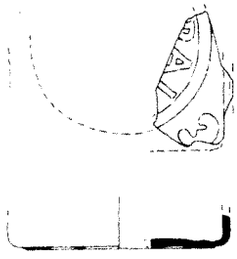
Harden (1936: 238) reports that rectangular bottles are one of the more common forms in Egypt and the Roman Empire. At Karanis, they are stated to be "exceedingly common," but no complete examples were found and only twelve sherds are published, both the type blown into a square mold and the free blown kind, flattened on a slab (ibid., pp. 248–50).

The ridged or reeded handles (e.g., 234, 236) are typically Eastern according to Hayes (1975: 45). Only a few are published from Karanis (Harden 1936: 241, 246–47, pl. 19), but

others are known from Axum (Morrison 1989b: 198–99), Aqaba, Jerash (Meyer 1987: 192, 194), the Cave of Letters at En-Gedi (Barag 1963: 35, 102), Tell Nebi Mend, Dura Europos (Clairmont 1963: 117–19, pls. 13, 34), Sardis (von Saldern 1980: 28, pl. 22), and Pompeii (Isings 1957: 68–69). The flat strap handles (235) seem to have similar distribution, at least within the Near East. Examples are published from el-Lejjun (Jones 1987: 623, 631), Wadi ed-Daliyeh (Weinberg and Barag 1974: 103, pl. 38), and Dura Europos (Clairmont 1963: 117–18, pl. 13). At Corinth rectangular jugs with broad handles are common (Davidson 1952: 81, 102–04).


238

Three of the flagon bases (242, 243, one not illustrated) were mold blown. A large number of mold blown bases are published from Dura Europos, including many with dots in the corners (Clairmont 1963: 121–23, pls. 14, 15). No close parallel for 243 has yet been found that could help clarify the three remaining letters of the inscription. The third Quseir al-Qadim mold blown base still shows the part of a circle, though it cannot be determined whether there was ever any more to the design.


243

The slenderer ewer handles like 244 are well attested at Karanis (Harden 1936, pl. 19), at el-Lejjun (Jones 1987: 623–24, 633), and at Wadi ed-Daliyeh (Weinberg and Barag 1974: 103, pl. 38).

Particularly noteworthy is a greenish-blue flagon from Taxila-Sirkap, Saka-Parthian levels (Marshall 1951, pl. 210). It has a reeded handle but it is not clear whether the body is cylindrical or square.

Miscellaneous Rims (247–50)

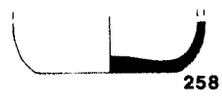
Rim 247 is somewhat similar to 95 but is thinner and has a squared or knocked-off everted rim and so has been listed with blown glass. Like bowl 95, it may generally be compared to the flaring beaker from Corinth that was in turn compared to a terra sigillata form (Davidson 1952: 100–01). Rim 248 with a cut-out loop could have come from a bottle (e.g., Tel Michal; Kertesz 1989: 366–68) or even a flagon (e.g., En-Gedi; Barag 1963: 35, 102–03). Bowl 250 was placed with Roman glass on the basis of its similarity to 249 and the quality of the glass, transparent and fairly free of bubbles.

Two Indian sherds are noted in relation to the "Miscellaneous" category because of some uncertainty about their drawings. One, a rolled-out rim of good quality cobalt blue glass, comes from the Deccan site of Paithan and is dated to the Satavahana period, before A.D. 200 (Dikshit 1969: 41–42). The rim shape and angle may be similar to an opaque black(?) bowl from the Meroë North Cemetery (Beg. N. 5), first century A.D. (Dunham 1957: 125–26). The other Indian sherd is one of two cups "with flat vertical rims," perhaps ground or knocked-off. They are also from a Deccan site, Ter, which yielded the marbled unguentarium, and are thought to be first century B.C. to first century A.D. (Dikshit 1969: 44).

Handles (251–53)

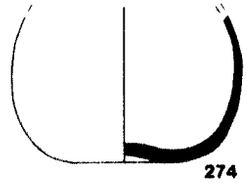
A few handles apart from the common flagon and ewer handles were recovered. Sherd 251 is a surface find but has a good parallel in a jar handle from Jalame, ca. 275 to 350 A.D. (Weinberg 1988: 84–85). Handle 251, then, may be one of the latest Roman glass sherds at Quseir al-Qadim. Although lacking a good locus date, the tiny handle 252 is placed with Roman sherds along with all the other opaque glass, but it may actually be Hellenistic (cf. Hayes 1975: 11, 187). A few other Hellenistic sherds are listed in the next section, *Decorative Techniques*. The other small handle fragment, 253, may be a piece of a thumb rest.

Flat Bases (254–59)


258

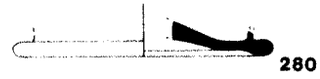
Some of the flat bases, e.g., 255, may have been cast. Three other thin, flat bases were drawn but are not illustrated here. Base 254 is of most careful manufacture, with sharply cut base and ridge. Flat bases are such an obvious way to finish a vessel that only one outside example is noted, a cup base from the Deccan site of Ter, probably first century B.C. to first century A.D. (Dikshit 1969: 42, 44). It actually looks more like one of the thick, indented beaker bases such as 160, but without enough of the sides to show the indents it could not be grouped there. The Ter base also resembles a "disk-shaped projecting foot" beaker base from Dura Europos, estimated at 100–56 A.D. (Clairmont 1963: 97–98, pl. 10). Given the similarity to the popular pad base beakers in the Byzantine period (Meyer 1989b: 241), the Ter base might be later than the suggested date.

Kick-up Bases (260–74)


274

Kick-up bases are one of the more common methods of finishing vessels, so comparanda would not be useful except for very special types. Some of the bases probably came from beakers (260), unguentaria (268, 271), or bottles (272–74).

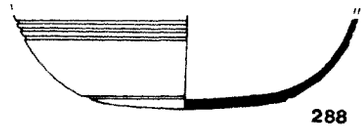
Looped Bases (275–85)


280

To make the looped bases, the glass was cut out and closed to make a tubular or, in cross-section, looped base. As for the kick-up bases, cut-out loops are one of the more common means of providing a base for a vessel. Base 275 seems to have been cut out, and then the vessel wall folded down again, making a double loop. Bases 276 and 281 probably came from shallow dishes or plates. Bases 282–84 are not fully closed loops but are included here because they were begun in a similar manner, cutting-out of the base. Base 282 has parallels in a deep bowl from Karanis (Harden 1936: 113, pl. 14) and a beaker from Meroë North Cemetery (Beg. N. 5), first century A.D. (Dunham 1957: 125–26). The folded bases 283 and 284 are found also in bases from Araq el-Emir, first to third century (Lapp 1983: 52–53), and Dura Europos (Clairmont 1963: 94–95, pl. 10). Base 285 has parallels at Wadi ed-Daliyeh, Cave II

(Weinberg and Barag 1974: 104, pl. 39), and perhaps Corinth, first century A.D. (Davidson 1952: 101–02).

Round Bases (286–88)


288

The round bases could have come from several types of vessels including the mold-cast bowls with cut decoration (pl. 4), or the bowls with everted rims (pl. 5). We note here only a "mold-formed" bowl from Heis on the northern Somali coast, dated stylistically to 0–40 A.D. It has a simple, flaring rim and probably a round base; two external grooves are cut near the bottom (Stern 1987: 25–26).

Miscellaneous Bases (289–97)

Again, some of these bases, especially 289, might be mold-cast. Base 290 is somewhat similar to 284, but even more lightly cut-out. Base 291 is crystal clear and as crisply cut as 254 or 99. Trailed threads like those on base 292 are not as common in the Roman period as later, but some thread decoration is noted at Karanis, including a dark green base with opaque yellow threads (Harden 1936: 202, pl. 17). Bases 294 and 295 could have come from tall beakers, faceted or otherwise. Base 296 however is remarkably close to an extremely long-necked and squat-bodied bottle from Sardis, ca. A.D. 100 (von Saldern 1980: 23–26, pl. 21).

DECORATIVE TECHNIQUES

To the extent possible, sherds were assigned to a vessel category—or at least to rim or base categories—irrespective of decoration. Thus, in discussing decorative techniques, reference will be made to already cited pieces. It also means that the sherds (298–359) discussed in this section are almost all body sherds.

Marvered and Dragged (298)


298

The sherd is the base of a small vessel of dark blue opaque glass with trailed on threads of yellow and turquoise, dragged up into festoons and the whole marvered smooth. The interior is so smooth that no traces of grinding or polishing were observed. Harden (1936: 266, 274, pl. 20) lists an unguentarium base from Karanis, probably first or second century, that is dark purple with yellow and opaque white threads, the upper ones dragged into festoon design. A number of marvered and dragged sherds are reported from Dura Europos, stylistically dated to the first century A.D. One is a neck(?) of blue glass with white festoons (Clairmont 1963: 17, pl. 19), and others are purple with red and yellow lines and festoons (ibid., pp. 15–16, pls. 1, 19). Hellenistic core formed vessels of blue with white, yellow, or white and yellow herringbone patterns are also illustrated (ibid., p. 7, pl. 17). Hayes (1975: 13–14, 188) lists several Hellenistic (second to first century B.C.) alabastra of blue or blue-black glass with yellow and white festoons or herringbones. Unfortunately these and many others in mu-

seum collections have no provenience. Marvered and dragged decoration may have lasted into the first century A.D., but it is much more characteristic of Hellenistic glass, so the Quseir al-Qadim sherd, along with a few others noted below, is tentatively labeled Hellenistic.

Inlaid Decoration (299)


299

This is different from the mosaic glass in that the design does not go through the glass but seems to have been dropped on or inlaid into the interior of the vessel, possibly an open bowl. Sherd 299 is transparent glass with an opaque white band and alternating red, white, and red dots with yellow centers. A more elaborate inlaid decoration on the base of a large bowl is published from Karanis (Harden 1936: 85–86, pl. 13). Oliver (1968: 64) mentions clear bowls with inlaid garlands, one of which may be Augustan in date. The Quseir al-Qadim sherd then would be Hellenistic or very early Roman.

Lace Mosaic (300–01)


300


301

These two tiny sherds pertain to very elegant bowls variously termed lace(d) mosaic, lace-work, lace glass, network, or reticella. The canes used to construct the bowls were made first by wrapping threads of opaque glass, white or yellow in this case, around canes of transparent glass and heating until the threads were fused in. The canes were then heated and coiled into a blank or mold and then further heated to fuse them solidly. Rims were generally added separately and the whole polished smooth. An early group of lace mosaic bowls is attributed to Canosa in Italy and is variously dated to the early third century B.C. (Harden 1968: 27, 41–43) or the first half of the second century B.C. (Oliver 1968: 54). Another important find of lace mosaic glass comes from the Antikythera shipwreck, ca. 80–50 B.C. (Weinberg et al. 1965: 38). A third group, characterized by yet different shapes may be dated to the Augustan period. That lace mosaic bowls are said to be rare outside Italy (Grose 1986: 73–74) makes the Quseir al-Qadim sherds the more interesting. Moreover, two pieces of lace glass were recovered at Taxila-Sirkap. One is part of a white and transparent bowl, first century B.C., and the other is blue and white and black and white, thought to be first century A.D. (Marshall 1951: 688).

Opaque (302–05)

The opaque sherds are all listed with the Roman glass because opaque glass is attested elsewhere at that period, though the Quseir al-Qadim locus dates are not as helpful as one might wish. The broad tangerine orange bowl with an interior groove is similar to rim 73. An opaque orange vessel is reported from the Meroë North Cemetery (Beg. N. 21), possibly dated to ca. 116–99 B.C. (Dunham 1957: 84–85). The lone opaque red sherd (304) does bear grinding marks that suggest it came from the bottom of a plate or flat dish, a Roman form and means of finishing. The Meroë North Cemetery and Barkal have yielded a surprising number of opaque red vessels ranging in date from the latter half of the third

century B.C. (Beg. N. 7) to the first century A.D. (Beg. N. 5) and into the third century A.D. (Beg. N. 36) (Dunham 1957: 64–65, 126–27, 183–84). Although locus C4c-2 is mixed, most of the glass is Roman, so sherd 305, dark magenta, is listed here. Purple glass was used in the Roman period, and the simple rim shape is possible.

Mosaic Glass (306–18)

These are also sometimes called millefiori. Mosaic glass is exceptionally tricky to draw, and unfortunately sherds 306–08 could not be checked. Sherd 307 has yellow splashes in a blue matrix and resembles a sherd from Karanis, white spots on blue (Harden 1936: 89–90, pl. 13). Many marbled bowls are known from Dura Europos, mostly white in purple, but we note only one with a profile similar to 307 (Clairmont 1963: 11, pls. 1, 17). The marbled unguentarium 182 has already been discussed, but these perfume flasks do not seem to have been luxury wares of the same quality as the mosaic glass bowls. Sherd 306 is yellowish green with yellow dots and dark red with white dots and black lines. It may have parallels at Karanis in some mosaic glass fragments with "no settled pattern" (Harden 1936: 89, pl. 13) and a bowl sherd from Meroë North Cemetery (Beg. N. 20), ca. 133–16 B.C. (Dunham 1957: 79–80). Sherd 308 may be similar to 306; it is described as opaque yellow, red, white, and translucent black. It is unusually thick and apparently molded.

Sherds 309 and 310 have coils in a translucent matrix; intact vessels of this sort of glass were among the most elegant of Roman glassware. Sherd 309 has opaque yellow spirals around a purple center with a white dot in the heart. The matrix is translucent yellow-amber. Dishes made up of spirals are known as early as the Canosa glass vessels of the early third century B.C. (Harden 1968: 25–26) but apparently last into the first century B.C. (Oliver 1968: 64). Sherd 310 has two colors for matrices. The two lower left coils and the one at the upper right are translucent green, the coils being opaque yellow with red dots in the centers. The remaining three coil matrices are translucent amber, with coils in opaque yellow around white centers. The Antikythera mosaic glasses, ca. 80–50 B.C., do include canes of several color schemes (Weinberg et al. 1965: 35–37; Oliver 1968: 55).

Sherds 311 and 312 have simpler yellow circles in a green matrix, or in the case of 312 a turquoise matrix that looks green over the yellow circles. Mosaic glass with green and yellow circles and streaks is reported from Dura Europos, first century A.D. (Clairmont 1963: 11–12, pl. 18), and from Axum (Morrison 1989b: 196–97).


315

Sherds 313 to 318 are the flower type of millefiori. Vessels 313 to 316 show sharply defined flowers, sometimes in cells. Sherd 313 has an opaque light blue background with dark red flower centers, beige petals and white outlines. Sherd 314 has a translucent dark purple matrix, opaque white flower centers surrounded by opaque dark red petals in white cells. The yellow flower outlines on sherd 315 are very thin. The cell dividers are white, the upper left cell matrix is blue, the other cells light olive. Judging from the curve and the cut groove, this would be the bottom of a bowl. The wide base 316 has an applied base ring made from one of the millefiori canes, which

is not evident unless the ring is broken across to show the interior pattern. The design on the body is divided into cells by white lines. Some of the cells are translucent green with opaque yellow petal outlines; the remaining cells are dark purple with yellow petals around a red center. Sherd 317 has a somewhat blurred design of a yellow flower with a red center, plus yellow dots in a translucent green matrix. Similarly, 318 has a translucent green matrix and a blurred yellow, black, red, and white flower design.

Millefiori glass of this tradition—Hellenistic and Roman—was manufactured by the third century B.C. or perhaps earlier (Harden 1968: 41–43) and is said to be relatively common by the first half of the first century A.D. (Hayes 1975: 23). Mosaic glass fragments from Alexandria include one with a flower pattern, recovered from sixth–seventh century context but almost certainly earlier (Rodziewicz 1984: 241). At Dura Europos a shallow bowl, matrix color not given, has yellow-rimmed dark brown petals and painted-on red centers. It is estimated to date between 100 and 256 A.D. (Clairmont 1963: 32–34, pls. 5, 20); the painted centers in any case are unusual.

Of special interest are millefiori fragments from East Africa and India. A bowl from Heis on the northern Somali coast has red flower disks on a green background and is dated to ca. 0–40 A.D. (Stern 1987: 26, 28). Note also the "double convex" millefiori bowl from Heis discussed with bowls with broad rims and two millefiori sherds from Axum (Morrison 1989b: 196–97). Hackin (1939, pl. 5) illustrates a millefiori bowl from Begram, Afghanistan. Finally, at Ratta Pind near Taxila one sherd was collected that is described as millefiori (Marshall 1951: 689).

Transparent with White (319–20)

The vessel shape of neither sherd can be determined. They may be similar to a sherd from Karanis described as greenish colorless with opaque white threads marvered in before the final blowing of the vessel (Harden 1936: 90, pl. 13; also Hayes 1975: 133, 220).

320

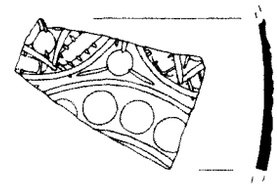
Cut Lines (321–25)

Fine cut lines are one of the more popular decorations on the Roman period vessels from Quseir al-Qadim (note especially the bowls and beakers with everted rims, pl. 7). Sherds 321 and 322 probably come from beakers, and 323 and 324 from round bottomed bowls, aryballoi, or bottles.

Cut Ridges (326–29)

Cut ridges are obviously far more labor intensive than cut lines, given that the surface has to be cut back. The technique is used on vessels of good quality glass, usually transparent, though 326 is blue and 328 is dark turquoise. Vessels such as the mold-cast bowls with cut decoration (pl. 4), faceted beakers, most of the cast jars or beakers (pl. 5), and some of the bases (254, 291) have cut ridges.

Cut Decoration (330–40)


337

Elaborate cut decoration may also be seen on the overhung bowls (pl. 2), bowls with cut decoration (pl. 4), and cut jars or beakers (pl. 5); the faceted beakers and the mythological cups are treated separately. The Quseir al-Qadim vessels are usually of good quality transparent glass and most are quite thick. Cut ovals and circles (330–33) are widespread decorative elements; we note only some very similar pieces from Karanis (Harden 1936: 152–53, pl. 16), Mezad Tamar, late third century or later (Erdmann 1977: 109–10, 142–43, pl. 8), Dura Europos (Clairmont 1963: 60–64, pls. 7, 25), Sardis (von Saldern 1980: 16–17, pl. 20), and a fine second century bowl from Corinth (Davidson 1952: 93–95). Base sherd 331 is quite similar to a beaker from Dura Europos; its style date is given as late first century A.D. (Clairmont 1963: 60–62, pls. 7, 25).

One elaborately cut bowl base (32) is noted above; 334 and 335 are also from large bowls and plates. A comparable cut base is reported from Karanis (Harden 1936: 124, pl. 15). The two elaborate body sherds 337 and 338 were found in different trenches in different seasons but are so similar that the question was raised as to whether they came from the same bowl. The sherds have parallels of sorts at Jerash (Meyer 1987: 186–88) and Sardis (von Saldern 1980: 17, pl. 20). The rim angle of 339 is unusual but it was remeasured and is correct. The design of ovals with a polygonal surround is fairly common and is reported from Sardis (von Saldern 1980: 17, pl. 20) and especially in the "gabled facet" decoration at Dura Europos (Clairmont 1963: 73–76, pl. 27). The scratched-on "J" on sherd 340 is old but may nonetheless be accidental. The rice grain decoration is also widespread and may be noted at Karanis (Harden 1936: 153, pl. 16) and Dura Europos (Clairmont 1963: 63–64, pls. 25, 27).

An "engraved cup" is listed from Begram (Hackin 1954: 264, fig. 254) but no further information is available.

Painted (341–46)


342

Two kinds of painted decoration are included here: transparent vessels with naturalistic designs (341–44, plus one not illustrated) and very thick paint in blobs and lines. Sherd 341 is transparent and seems to have a pinkish leaf with a purple-red vein and dots at the lower left. All five curving lines are yellow, the leafy element is light green, and the blob is pinkish red with a purple-red dot. Sherd 342 shows the forepaws of an animal, perhaps a dog. The animal is yellow with red-brown and purple lines, yellow-green floral matter below, and a yellow and red-brown ground line. Sherd 343 seems to be another floral pattern in purple, yellow, brown, red, and light blue-green. Sherd 344 has two base stripes of orange (lower) and yellow, three green slashes on the left, and yellow splashes on the right with thin brown stripes on top. Harden (1969: 58–59) discusses painted glass in the East and Italy in the first century A.D., and into the second and third centuries. He mentions numerous fragments

with human, plant, and animal designs from Kharga, Oxyrhynchus, and Karanis. The Karanis fragments have floral designs (Harden 1936: 122, pl. 14), and the pieces of the Oxyrhynchus bowl show the forelegs of an animal (ibid., p. 100). In addition, painted glass with naturalistic designs is published from Meroë North Cemetery (Beg. N. 5), first century A.D. (Dunham 1957: 126–27). A well-preserved deep bowl from Greece, no provenience, has a bird, a basket, and leafy elements in red, red-brown, light blue, white, and green paint (Harden 1987: 269). Finally, some handsome painted beakers are reported from Begram, Afghanistan (Hackin 1939, pls. 12–15; Hackin 1954, figs. 257–69, 371–72).


345

The two sherds with very thick paint (345–46) are quite different but are listed with Roman glass because almost all of the glass from their locus, C4c-4, is Roman.

Mold Blown (347–50)

Mold blown glass is conspicuously rare at Quseir al-Qadim. The molded jar neck 221 and the molded flagon bases 242 and 243 have been noted, but there are no blown polygonal flasks, nothing like the Ennion cups and their descendants, no grape flasks (348 has dimples, not bulges), and no head flasks. Bowl 347 may be an imitation of a bowl like 67, but the facets are soft and blurred rather than sharply cut. The paucity of mold decorated or even plain molded glass at Quseir al-Qadim does not support Hayes' (1975: 132) statement that Egyptian blown glass of the first century A.D. was mostly molded, apart from the unguentaria. Was the molded glass deliberately not selected for long range trade, or was it in fact not popular in Egypt, or not manufactured there, or not produced in quantity until a period later than Quseir al-Qadim?


348

Tooled Decoration (351–58)

Tooled decoration is somewhat more common at Quseir al-Qadim, and at least three more sherds are known but not illustrated. Sherd 351 is similar in outline to 350, if anything, though it is difficult to determine the original vessel shape. Sherds 352 and 353 may come from bowls with ribs tooled to an arch, something like a molded bowl from Corinth (Davidson 1952: 96–97). Sherd 354, dark blue, might be a tooled version of the typical mold-formed ribbed bowls (pl. 1). Note also the ribbed flasks (212, 213) already discussed.

The pinched nips (356, 358) are found on flasks from Karanis (Harden 1936: 201, pl. 17) and Dura Europos (Clairmont 1963: 48–49, pl. 23). Pinched nips however were also a relatively common decorative technique in the Late Byzantine period at Jerash (Meyer 1987: 204, 206). Tooled loops and pinched ribs such as 355 and 357 are found on goblets and bottles from Karanis (Harden 1936: 151, 208, pls. 15, 17), Jalame, late first to early second century A.D. (Weinberg 1988: 81); and Kish, Sassanian period (Harden 1934: 135).


355

Prunts (359)


359

Applied decoration of any sort is rare at Quseir al-Qadim. There is no snake-thread decoration, no heavy applied coils or loops, and little thread decoration (129, 224, 292). Prunted decoration was also used in the Mamluk period (530, 531) but tends to be much thicker. Sherd 359 is transparent glass with three blue blobs; one similar sherd is known but not illustrated. Blue blobs, often in triangular arrangement, are generally lamp or bowl decoration and are usually dated to the third century or later. A number of conical lamps are reported from Karanis, all late in the Karanis sequence (Harden 1936: 156–57, 160, 162–64, pl. 16). Many conical beakers or lamps are also published from Jalame, late third and fourth century contexts (Weinberg 1988: 87–91). Bowls with prunts are reported from Corinth, fourth century (Davidson 1952: 97–98), and Cyprus, no provenience (Harden 1987: 113), and as indicated prunts were used in later periods and in widely separated regions; it is a very easy type of decoration to apply.

Game Piece (360)


360

The little round game pieces could be made by simply dropping hot glass on a flat surface; they are found throughout the Roman Empire. The Quseir al-Qadim example is now opaque black but a wide variety of colors is known, and even some that are striped, spotted, or include gold foil (Rhodes bead factory site, Weinberg 1969: 146). Although the Rhodes game pieces are third to early second century B.C., game counters were certainly made in the first century A.D. and later. In addition to the large numbers of game pieces at Karanis (Harden 1936: 291–94), we note only four disks, perhaps inlays or game pieces, from Taxila-Sirkap in a Saka-Parthian level (Marshall 1951: 690).

Stirring Rod (361)


361

Rods of glass, usually twisted, are found in abundance at Roman sites in the Near East and Europe. Some are pointed at one end, or blunted at both ends, or end in a loop, or even a spoon shape or tipped with a little bird effigy (von Saldern 1980: 33–34). Sometimes called kohl sticks, they are rather thick for applying cosmetics and much too thick for eyeliner. What the looped or ornamented rods could have been used for is uncertain, but sometimes straight segments were set in panels as architectural ornaments (Goldstein 1979: 263).

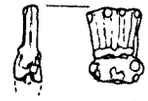
Architectural Fragments (362–64)

The shaped piece 362 might be an inlay or piece of opus sectile. The glass is so bubbly it appears opaque. One very bubbly tessera (not illustrated) was recovered, but this by no means makes a mosaic. Sherd 363 is unidentified. It is finished on one edge but what it may be is unclear. Sherd 364 is finished on the two short, curving sides, but the ends(?) are broken. It might be a piece of inlay.

Manufacturing Debris (365)

There is no reason to think that glass was produced at Quseir al-Qadim or that it was a good place for manufacturing glass, if only for lack of fuel. Nevertheless, raw glass is listed as an export from Egypt to India, and one slab of cast(?) glass was found at Quseir al-Qadim (not illustrated). It is translucent bubbly glass with a dull and pitted surface. The maximum dimensions of the chunk are 0.6 × 5.1 × 4.9 centimeters, fairly large. Sherd 365 may or may not be Roman, but it seems to be a waster from an unguentarium or vial.

Amulet (366)


366

The sole fragment of a glass amulet recovered from Quseir al-Qadim is the headdress of a Bes figure or head. It is opaque turquoise with opaque yellow-green blobs. Glass amulets are rarely reported from other Roman sites, though faience ones are abundant. Only three glass amulets are mentioned from Karanis, one second century and two third–fourth century (Harden 1936: 284–85). A few pendants shaped like small bottles, amphorae, oinochoai, birds, or human heads are published from the Rhodes bead factory site, but they are third–second century B.C. (Weinberg 1969: 146).

Beads (367–73)


368 370

Like the amulet, all beads were drawn at 2:1. Only a small sample of the beads is shown here. Unfortunately most beads were retrieved from mixed or Islamic loci rather than Roman, so beads are discussed more fully in *Chapter 4*. Bead 367 is a widespread polychrome type. The core is green with white and black concentric circles dropped on. Numbers 368 and 369 are "eye beads," and in this case the eyes have not been marvered flush. Hundreds of eye beads were tallied from the Rhodes bead factory site (Weinberg 1969: 145), and a number were also recovered from the Meroë North Cemetery (Beg. N. 15, Beg. N. 16) (Dunham 1957: 135–36, 141). The much more elaborate Meroitic mosaic glass beads (Beg. N. 1, Beg. N. 56, Beg. N. 15, Beg. N. 18) (Dunham 1957: 121–22, 128, 130–31, 133, 135–36, 147, 153) do not appear at Quseir al-Qadim. Melon-shaped or gadrooned beads like 370 are reported in hundreds from the Rhodes bead factory site, mostly in blue glass (Weinberg 1969: 144), and from Jalame, of faience, but said to be a common type (Weinberg 1988: 229–30). Gadrooned beads—among many other kinds—are so abundant in Indian sites dating from about 100 B.C. to A.D. 200 (Dikshit 1969: 39–46) that they are often presumed to have been manufactured there. The orange-brown collared bead 371 may be allied to first century B.C. and first century A.D. collared beads from the Meroë North Cemetery (Beg. N. 6, Beg. N. 16) (Dunham 1957: 110–11, 139–41), and perhaps to groove-collared beads from India, roughly 100 B.C. to A.D. 200 (Dikshit 1969: 39–41, 45–46).

Engle (1976: 120–21) notes some "Indian red" trade beads colored with small copper crystals to make a dull red, or occasionally orange. Found in East Africa, they may date as early as second century A.D. Coiled beads from Zanzibar in opaque red, green, yellow, blue, and black have been typologically dated within a second century B.C. to second cen-

tury A.D. range, and it has been suggested that they may have come from India (Engle 1976: 121).

One final comment may be made on this corpus of Roman glass. If only the intact vessels or very large fragments had been saved, then the corpus would have consisted of one or two bowls with overhung rims and cut decoration, two or three bowls with broad rims, a large bowl with cut decoration, the "hero cup," one bowl with looped rim and base, perhaps three indented beaker bases but no rims, the one complete unguentarium, and one arybal-los, thirteen or so pieces. The very heavy but not necessarily informative kick-up bases, solid or near-solid unguentarium bottoms, and some of the mold-cast ring and high bases might have been collected. If recognized as important, the ribbed bowls, faceted beakers, flagon handles, and millefiori might also have been saved. Without at least some effort to look at the sherds as they came out of the ground each day, all the other categories would probably have been lost, including all the Hellenistic evidence.

CHAPTER 3

QUSEIR AL-QADIM AND THE ROMAN GLASS TRADE

Glass vessels were only one of many goods exported through Quseir al-Qadim, but they, or rather the sherds, are one of the most durable items. Much of the Africa and India trade involved perishable items such as ivory, hides, tortoise shell, slaves, and above all incense, spices, and cottons and silks, few of which leave any trace at most sites. Preservation at Quseir al-Qadim itself being exceptionally good, studies of textiles, amphorae, ceramics, and floral and faunal remains will complement this report on the glass, though their ancient trade networks and modern recovery patterns may be expected to differ.

Here we follow the glass from its places of manufacture, to Alexandria and Coptos, across the Eastern Desert to Quseir al-Qadim, along the coast to Bab el-Mandeb, and then either around the horn of Africa or across to India. Much of the information is based on the *Periplus Maris Erythraei*, a unique handbook written about A.D. 60. Especial attention is given to the mechanisms of trade because the mode of transport—donkey, camel, cart, large or small ship—directly affects the quantity and quality of trade goods. The mechanics of trade are often ignored in studies of long range trade, and yet the carrying capacity of a human, a donkey, a camel, or a ship varies enormously.

The people whom the Roman traders met are also discussed in this chapter, whether the traders dealt with a king's court directly, or with a port of trade serving a more or less remote court, or with a chiefdom ruling a more limited area. What was the medium of exchange? Were there any permanent trading colonies? In most trade situations (ancient or modern), more than goods are exchanged. Information, gossip, geography, and technology and other foreign ideas may also be communicated. The frequency of contact, restrictions on trade, the similarity or dissimilarity of the social and economic systems can make a great difference in how much information (as well as goods) can be transmitted. The Africans at Rhapta may have been uninterested in Roman arches, hydraulic cements, or water wheels, but they readily accepted beads and metal tools. In India, on the other hand, architects and craftsmen (and their ideas and techniques) were employed for some purposes, and raw materials such as glass and metals were imported, indicating that local craftsmen could finish at least some products.

These observations can help answer two of our questions: how important (or unimportant) was the trade in glass vessels and other items, and whether or not glass production technology was exported as well. The glass was selected at two points, in Egypt by the

merchants of Alexandria and Coptos, and by the recipients. The Egyptian merchants could select glass items they guessed would be in demand, or better, ones they knew were wanted at their destinations. The answer to the question of selection of certain types is severely affected by the spottiness of the recovered glass; when only whole vessels are published one suspects that the excavators discarded thousands of sherds. Quseir al-Qadim is a case in point; sherds and partially reconstructed forms vastly outnumber the whole or completely reconstructible vessels. In regard to the question of acquisition of glass manufacturing skills, some preliminary observations may be made. The manufacture of glass was adopted rapidly within the Roman Empire. The Gaulish industry was established in the first century A.D. at centers such as Cologne; although glass production slackened, it never failed thereafter, even in the Dark Ages and medieval period. Outside the empire, however, the technology was very slow to establish itself. Was this a problem of materials, skills and craftsmen, or local demand?

PLACES OF MANUFACTURE

We know nothing definite about the point of manufacture of any of the Quseir al-Qadim vessels. None have been chemically tested, and indeed few Roman vessel types can be pinpointed as to origin by this method. We have to rely on archaeological reports and to a lesser extent on ancient literary sources. Nevertheless, there is some general evidence for given types being manufactured in Palestine or Italy or some other place. What is clear is that the Quseir al-Qadim vessels were made in widely scattered factories.

Of the Hellenistic sherds, number 298 might have been made in Egypt where marvered and dragged festoons had a long history. Sherds 299 (inlaid) and 309 and 310 (mosaic glass with coils) could have come from Greece or Italy.

The bulk of the finds, however, is first–second century Roman and seems to have originated in a number of centers in the Mediterranean sphere. Two important early categories, the ribbed bowls (2–25) and linear-cut bowls (26–27), were most likely made in the Syro-Palestinian region, and a probable manufacturing site is known at Hagoshrim in the upper Galilee (Weinberg 1973: 38–39). The mold-formed grooved, linear-cut, and ribbed bowls were the first mass-produced glass vessels, and they have an extraordinarily far-flung distribution from northern Europe to the Sudan, to eastern India, and beyond. The exception to the Palestinian origin is the marbled ribbed bowl (1) which has closest parallels at Corinth and Dura Europos (Davidson 1952: 96–97; Clairmont 1963: 26) and may have come from the eastern Mediterranean. The mold-formed vessels would most economically have been shipped along the coast to Alexandria on consignment or for sale there. The route from Gaza to Leuce Come to Quseir al-Qadim is possible, but the return northwards might have been difficult due to contrary winds.

All or most of the mosaic glass vessels, or sherds rather (306–08, 311–18), were probably made in Italy. The ribbed and linear-cut bowls, the mosaic glass sherds, and the Hellenistic vessels were all made by mold forming or casting. They are all more or less labor-intensive and all are luxury goods.

The blown vessels are another problem in that the technique spread far and fast. Glass blowing was invented late in the first century B.C., perhaps on the Syrian coast. Some of the early glass masters such as Ennion and Artas apparently emigrated from there to Italy (Isings 1957: 3; Harden 1969: 49–50).[1] Blown glass was first used extensively in the first century A.D. (Auth 1976: 17; Isings 1957: 163–64). Glass houses had been established in Gaul and Spain by about A.D. 50/60 (Harden 1958: 54–56; Grose 1986: 74–76), and every area in the eastern Mediterranean had its glassworks, including Egypt.

Alexandria remains a puzzle. It is always said to have been a most important glass-making center (Harden 1936: 45; Bowman 1986: 222), but archaeological evidence is still meager. The glass furnace fragments found by the Polish excavators at Kom el-Dikka are later, fifth–seventh century (Rodziewicz 1984: 241–43). In the first and second centuries A.D. the Alexandrine workshops seem to have favored luxury wares such as mold-cast, ground and polished, or engraved vessels, or else thin, colorless, plain blown bowls, beakers, and flasks (Harden 1936: 40; Harden 1969: 47–48). Utilitarian green glass items such as unguentaria were also produced (Charlesworth 1924: 29; Harden 1936: 40), and if perfumes were made in Alexandria it would be logical to manufacture the containers as well. Thus the mold-cast vessels so abundant at Quseir al-Qadim (28–75, 89–115) may have been made in Alexandria, and perhaps even the elegant mythological cups (87–88) (Harden 1960: 46, contra Fremersdorf 1951: 22–25). The thin bowls and beakers (e.g., 135–66) may also be Alexandrine. If they were manufactured outside Egypt, they would have had to survive another sea voyage before starting on the Nile and Red Sea trips. They are also sufficiently common at Quseir al-Qadim to suggest a relatively close place of origin. Mold blown glass seems to have been adopted fairly late in Egypt (Harden 1969: 47–48), perhaps in the second century A.D., despite its early popularity in Italy and the Syro-Palestinian area. What is clear is that mold blown glass is not abundant at Quseir al-Qadim.

The only other possible glass centers in Egypt are Diospolis (Charlesworth 1924: 31; Bromehead 1952: 68; Isings 1957: 2), Oxyrhynchus, known from mention of a second century guild of glassworkers (Bowman 1986: 222), and perhaps two furnaces at Athribis/Benha (American Research Center in Egypt 1958: 2, no later confirmation). Other Roman sites or regions for which there is some archaeological or literary evidence are Dura Europos (Clairmont 1963: 148), Dalmatia, Athens, Lyons, and perhaps Cyprus (Isings 1957: 2, 4).

One place where glass was not manufactured is Quseir al-Qadim itself. The shore is completely barren, without fresh water or plants. Fuel is scarce, and commercial glass furnaces do require much fuel. Nor does it seem practical to transport basic ingredients such as natron, colorants, and perhaps even glass sand to Quseir al-Qadim. The personnel required are also quite specialized. Three seasons of excavation yielded no evidence of slag, frit, or wasters (number 365 only), and only one possible slab of cast glass. When a glass-

1. Signed vessels are rare enough, and only one glassmaker added the place of manufacture to her own name, "*Sentia Secunda fecit Aquileiae*" (Raschke 1978: 764; Calvi 1968: 13).

working site is found the sherds and wasters can be a foot deep or more (Weinberg 1988: 18–19), which makes it hard to mistake such an archaeological deposit.

Thus, what evidence there is suggests that most of the Quseir al-Qadim glass came from Egypt, presumably from Alexandria, with some special groups such as the mold-formed bowls and perhaps the very elaborate mosaic glass vessels originating in Palestine and Italy respectively. The place of production of many other types of vessels cannot at this point even be guessed.

MERCHANTS AND FINANCE

In the time of Augustus, a journey to East Africa or India was not lightly undertaken. It was an expensive venture, requiring a year to a year and a half for a round trip. The ships of course were based on the Red Sea, but the goods, money, and probably some of the personnel had to be assembled by merchants in Alexandria (Casson 1984: 184) or at the latest in Coptos.

The trade has been referred to as "Roman," but in this case it means "Roman period." The people who actually organized and carried out the trading voyages were Greeks or Greek-speaking Egyptians.[2] A merchant who wanted to send a ship or ships to Africa or India may well have lacked sufficient funds for the whole venture. He could organize a partnership with one or more other merchants, or he could borrow money, or both.[3] A ship's owner or master might be one of the financial backers as well (Sidebotham 1986: 88). Judging from Greek and Roman contracts, the interest rate on a bottomry loan was usually thirty-three and one-third percent, but if a ship were lost, the lender would bear the cost (Rougé 1981: 185–86). The lender, then, could theoretically afford to lose one ship in four but would not make any money unless at least four out of five returned. The merchant organizer had to assemble the goods for export: coin or bullion, textiles, wine, fine pottery, glass, slaves, metal tools and vessels, or the like, as detailed in the *Periplus Maris Erythraei*. By no means all the export goods were produced in Alexandria, and the mix of trade items must have varied from year to year and decade to decade as availability and tastes changed. Almost all the export goods were luxury items. In addition to trade goods, supplies for the journey may have been partly assembled in Alexandria.

2. In the second century A.D. Palmyrene merchants traveled overland to Egypt and Coptos, and from there engaged in the Red Sea trade (Charlesworth 1951: 133; Raschke 1978: 643; Casson 1989: 34). Far more important for Palmyra, however, was the route to the Euphrates and thence to the Persian Gulf and the Indian Ocean, although at times the Euphrates route may have been obstructed by the Parthians. That Palmyrenes did use the sea route to the Red Sea and Egypt is suggested by an inscription from Coptos (Bernand 1984: 10, 262–63). Adhya (1966: 141), citing Dio Crysostom, notes Indians in Alexandria, but they must have been unusual.

3. A second century B.C. document concerning a trading venture to procure spices, probably from Somalia, involved five borrowers of whom one was a Spartan and another from Marseilles, and five guarantors of whom one was Carthaginian, one from southern Italy, and one from Marseilles. All the names are Greek, and all the other parties are assumed to be Alexandrians (Casson 1989: 31–32).

Another problem facing an Alexandrine merchant was that certain goods such as grain and spices were subject to government control (Charlesworth 1924: 30; Raschke 1978: 650), though there is no evidence for government monopolies on the sale of spices and aromatics such as held during the Ptolemaic period (Sidebotham 1986: 177). A levy was apparently raised on linen, and taxes charged on glass and papyrus (Isings 1957: 2; Raschke 1978: 650). The government regulations do not seem to have hindered the import of spices,[4] and it is by no means clear at what point and how much tax was paid on the manufactured export goods such as glass. Alexandria at least (Raschke 1978: 635) was a tax point and there were probably others. Transit tolls and customs dues were paid at numerous stages along the way.

The merchant himself might not make the long journey to Africa or India but could send a slave or freedman (Sidebotham 1986: 89–90) or hire an agent or shippers for all or part of the route. The ship owner or charterer might go on the trading voyage, especially if he himself had goods on board (Casson 1971: 315). Other personnel and hands might conceivably be hired in Alexandria to help oversee the shipment of goods from Alexandria to Coptos.

ALEXANDRIA TO COPTOS

The journey to Coptos took approximately twelve days (Pliny 6: 102; Charlesworth 1924: 23), winds permitting. Coptos has been called "the major entrepôt directly in touch with the India trade" (Raschke 1978: 644) and was in fact called an *emporium* (Toussaint 1961: 34) like a Red Sea port.[5] In Coptos the last of the export goods had to be assembled and perhaps re-baled for the trip across the Eastern Desert. There must have been large storage spaces for the goods off-loaded from the Nile boats and collected for further transport. The last, vital grain and food supplies had to be taken on, and at least a certain amount of water. Here the requisite hundreds of camels and donkeys must have been herded for loading. From Coptos we have the names of many of the people who shipped goods to Myos Hormos and Berenice, and even the receipts of the transport business of a camel-keeper, Nicanor, and his family (Raschke 1978: 644; Sidebotham 1986: 83). Although most of the merchants were Greeks or Greek-speaking Egyptians, merchants from Aden and Palmyra are also attested in inscriptions at Coptos (Bernand 1984: 7, 10, 189, 193–94, 262–63). A few Minaean graffiti have been recorded in the Eastern Desert (Sidebotham 1986: 99), and a number of Nabateans are known, though they seem to have worked primarily in transport rather than in finance (ibid., pp. 94–95). At Coptos inns and other facilities for a last (or, on return, first) revel must have existed. May, June, and early July would have been the busiest months as both the African and Indian voyages began in

4. The import of pepper was sufficiently bulky that Domitian had a *horrea piperataria* built in Rome in A.D. 92 (Desanges 1978: 325).

5. Coptos was destroyed in A.D. 297 (Raschke 1978: 644), but this was well after the heyday of Roman Quseir al-Qadim.

July. For shorter runs to Adulis on the Ethiopian coast or to Muza or Cane near Bab el-Mandeb the best time for departure was about September (Casson 1989: 15), but these were not major destinations. If the Africa ships returned in November-December and the India ships in March-April, then Coptos and the Red Sea ports would have been busy almost year round, if less so than in June and July.

Surprisingly little excavated glass is reported from Coptos, either from old excavations or more recent ones by the University of Michigan. The "Diospolis" referred to by some of the literary sources as a glass manufacturing center may be Thebes, and if so, the glass from there would have been collected and packed at Coptos.

On exit from Coptos, and presumably at some point on the return trip, the caravan had to pay certain fees, as regulated by the tariff list of Coptos, dated to the ninth year of Domitian, or A.D. 90:

> By order of Mettius Rufus, the Prefect of Egypt, what the tax farmers may collect for the right of passage to Coptos, payable to the customs administration according to the tariff, has been carved on this tablet at the instance of L. Antistius Asiaticus, Prefect of Mons Berenice.
>
> | | | |
> |---|---|---|
> | For a Red Sea pilot | drachmas | 8 |
> | For a Red Sea bowsman | drachmas | 10 |
> | For a guard | drachmas | 10 |
> | For an able seaman | drachmas | 5 |
> | For a caulker/shipyard hand | drachmas | 5 |
> | For a skilled worker | drachmas | 8 |
> | For women for prostitution | drachmas | 108 |
> | For women coming by boat | drachmas | 20 |
> | For wives of soldiers | drachmas | 20 |
> | For a camel ticket | obol | 1 |
> | For sealing of said ticket | obols | 2 |
> | When a caravan sets out, for each ticket for a man, if riding | drachma | 1 |
> | For women of any category, if riding | drachmas | 4 |
> | For a donkey | obols | 2 |
> | For a covered wagon | drachmas | 4 |
> | For a ship's mast | drachmas | 20 |
> | For a ship's yard | drachmas | 4 |
> | For taking up or bringing back a coffin | drachma | 1, |
> | | obols | 4 |
>
> The ninth year of the Emperor Caesar Domitian Augustus Germanicus on the 15th of the month of Pachôn (= 10 May) (Bernand 1984: 200–01; Weigall 1909: 61–63).

This tells us several things. Some of the ship's crew and equipment were or could be picked up in Coptos, as well as craftsmen who could maintain ships and equipment. Camels, donkeys, and wagons are listed, but not oxen as draft animals, or horses. That "women of any category" are mentioned does not necessarily prove that they went on the Red Sea voyages, though they evidently did go to the port at least. The "wives of soldiers"

probably pertains to another sphere of activity, the Roman military that patrolled the Eastern Desert. The "women for prostitution" and their high tariff have provoked much speculation (Weigall 1909: 61–63).[6]

COPTOS TO QUSEIR AL-QADIM

The most important animals for the desert crossing were camels and donkeys. Camels were not much used in Roman Egypt, except in the Fayyum and the Eastern Desert. Camel figurines are reported to be fairly common at Coptos, and there are literary references to camels on the Berenice caravans and at the porphyry quarries (Raschke 1978: 884). One of the Meroë tombs (Beg. N. 5) yielded a bronze figure of a saddled camel, first century A.D. (Dunham 1957: 124, 127). Camel-mounted auxiliaries are known in Egypt from the second century and later, and the Notitia Dignitatum mentions three *alae dromedariorum* stationed in the Thebaid (Raschke 1978: 882). The sturdy donkey may also have been a most valuable pack animal, if less flamboyant and less remarked than the camel. Wagons did supply the mining settlements in the Wadi Hammamat (ibid., p. 884), so a wagon track existed at least that far, half way along the road to the Red Sea. On the Coptos to Leucos Limen route through the Wadi Hammamat, there existed (at most) ten hydreumata[7] or fortified watering stations, though all were not necessarily in use at any given time. They would be important for donkeys, which need water daily, versus camels which do not. On the other hand, there are no animal lines for stabling animals at any of the Wadi Hammamat hydreumata (Meredith 1953: 97). Donkeys, camels, oxen, or horses—none could have been accommodated for long in the desert, given the shortage of fodder. It may have been the case that there was more rainfall in the Eastern Desert in the first century A.D., enough to provide more camel thorn and other grazing. It was a period of high Nile inundations (Butzer 1976: 29, citing Toussoun 1925: 413–18) and even highland Ethiopia around Axum benefited from increased rainfall. Unfortunately, it is by no means clear whether this affected the Eastern Desert as favorably.

How many animals would have been needed? Only the roughest estimate can be proposed. Strabo remarks that only 20 ships per year sailed to India before Augustus, versus 120 from Myos Hormos alone after him (Strabo 17.1.13). There is no way as yet to verify or contradict this statement. The Roman ships were large and stoutly built, and the ships sailing to India would have needed strength and size to weather the monsoon winds.

6. Raschke (1978: 650) refers to passes required for the journey across the desert, but this seems to mean the payment of the tariff.

7. The number of hydreumata counted depends on what one considers evidence of a fortified cistern or tank. Zitterkopf and Sidebotham (1989: 159) list eight: el-Matula, Qasr el-Banat, el-Muweih, el-Hammamat, el-Zerkah, el-Hamrah, Seyala, and el-Iteima, plus settlements at el-Laqeita and el-Fawakhir. The Roman remains at the latter two sites are badly destroyed, but they do in fact have traces of fortifications (Wright, pers. comm.). Murray (1925: 146) enumerates eleven: Wekalat el-Mefarik, Laqeta (ancient Phoenicon), Qasr el-Banat, Umm Mweh, Hammamat, Fawakhir, Wekalat el-Zerqah, Wekalat el-Hamrah, Sayala, Wekalat el-Litema, and perhaps el-Beida.

Known Mediterranean ships ranged from 100 to 300 tons cargo and more, so 100 to 200 tons is taken as a crude approximation for the average Red Sea ship. The vessels themselves are discussed in more detail below. A donkey can carry about 100 pounds (Epstein 1971: 383), more for short distances. Exceptionally strong camels can carry up to 800 pounds (Murray 1935: 106), though less is normal for long-range desert hauling (ibid., p. 113). The Cairo geniza, late tenth to early eleventh century and later, mentions standard bales of about 450 to 600 pounds (Goitein 1967: 215–16, 226). Pepper bales from the Indian trade weighed about 375 pounds. A camel load was roughly equivalent to a ship's bale, or about 500 pounds (ibid., pp. 220–21). There are references to caravans of 500 camels coming from Qulzum (Suez) to Cairo with spices and Eastern goods (ibid., pp. 215, 276). Estimating 500 pounds per camel, a ship of 100 tons burden would require 400 camel loads, or 200 in two trips, plus riding animals, supplies for the desert crossing, and provisions for the voyage and for the inhabitants of Leucos Limen. Conceivably, part of a ship's load could be made up with ballast.

A considerable number of people would have accompanied the animal train as well, traders, shippers, camel-keepers, and as the Coptos tariff informs us, seamen, craftsmen, and women. Most if not all of these people would have been mounted on donkeys, camels, or perhaps even horses, and supplies could have been carted at least as far as the Wadi Hammamat. Judging from graffiti, some of the cameleers were Nabateans, especially after the annexation of Petra in A.D. 106 (Sidebotham 1986: 94–95).

All three of the main routes from Coptos to the Red Sea are well known: the northern one through the Wadi Qena to 'Abu Sha'ar, just to the north of Hurgada, the southern route to Berenice, and the middle road through the Wadi Hammamat to Leucos Limen. Myos Hormos and Berenice are always reported in the literature as the two main ports. The Wadi Qena route took six to seven days, the Wadi Hammamat about six, and the Berenice road eleven to twelve. Despite the distance, shoals at the harbor, and sometimes violent winds (Charlesworth 1924: 21), Berenice had one great advantage, namely that the winds fail to the north of about 20° latitude (Casson 1989: 97) and much time could be lost beating northwards to Leucos Limen or Myos Hormos. Given six or seven days to journey from Coptos to the Red Sea, a return trip would require two weeks minimum, though given the staggered return dates for ships arriving from Africa or India, the animals might not be loaded one way.

All three desert routes are marked by abundant graffiti, frequent hydreumata, and (formerly) wagon and camel tracks. Only the Wadi Hammamat route, however, has intervisible guard posts along the way.[8] It also has eight or more hydreumata, fortified watering stations consisting of large central cisterns or tanks plus rows of small rooms ranged against the insides of the fortification walls. The Eastern Desert hydreumata were guarded by military police, including Arab archers (Charlesworth 1951: 133). An inscription from Coptos

8. The Wadi Qena route is marked by about 125 stone cairns, though they are far less conspicuous than the Wadi Hammamat towers. The northern route has been surveyed recently by the University of Delaware (Sidebotham, Zitterkopf, and Riley 1991).

dated to the time of Augustus lists names of legionaries and refers to the management of the desert cisterns, though it mentions only four by name (Bernand 1984: 182–83). None of the Wadi Hammamat stations have animal lines, which may mean that they were not needed for protection against raiders (but note the intervisible guard posts) or wind (violent sand storms do occur), or that animal traffic was lighter than on the other roads (Meredith 1953: 97). The sixty-five or more intervisible guard posts are single-room dry stone structures set high on hills or mountains from Coptos to the Red Sea. Presumably they could signal by flags, mirrors, or reflectors; there is no evidence of fires (Zitterkopf and Sidebotham 1989: 186). But what were they used for? Calling for military protection against raiders? Signaling the arrival of ships at Leucos Limen and the need to send pack animals to transport goods? The posts seem more military than mercantile; at this time we can only suggest that they were intended to serve both functions.

In addition to the well-defined hydreumata, some sort of settlement existed at Bir Umm Fawakhir, just past the Wadi Hammamat proper.[9] Bir Umm Fawakhir has both permanent wells and the gold mines and granite quarries exploited in Byzantine, Roman, and Ptolemaic[10] times. Carts or wagons did go at least as far as the Wadi Hammamat in order to carry stones from the quarries and could presumably have helped provision the people at Bir Umm Fawakhir. A Roman military settlement is attested by sixty or so ostraca, and military patrols did go out into more remote parts of the desert (Guéraud 1942; Meredith 1953: 97–98). The scores of house ruins in a narrow side wadi, however, seem to be fifth–seventh century, judging from the pottery.

Caravans transporting goods to Leucos Limen in May to early July must have traveled by night. Strabo (17.1.45) described the desert journey from Coptos:

> Now in earlier times the camel-merchants traveled only by night, looking to the stars for guidance, and, like the mariners, also carried water with them when they traveled; but now they have constructed watering-places, having dug down to a great depth, and, although rain-water is scarce, still they have made cisterns for it. The journey takes six or seven days.

According to a modern schedule for desert journeys, one rose before dawn, rode through sunrise and into late morning, then sought shade until late afternoon. Several more hours travel were possible before the final evening camp (Weigall 1909), and this schedule would fit well with the spacing of the hydreumata. In the winter, however, the caravans bringing goods from the Red Sea to the Nile must have proceeded by day. Desert temperatures drop to near-freezing at night, sometimes with high winds.

Once the traders, seamen, and goods arrived at Leucos Limen, they had to be housed somewhere, if briefly. If several desert crossings were needed to complete the cargo of one

9. The 120 or so Greek and Latin inscriptions in the Wadi Hammamat itself are mostly *proscyneumata* and date from the time of Augustus to Titus and Domitian (Meredith 1953: 98).

10. A now-destroyed temple of Min at Bir Umm Fawakhir bore the cartouche of Ptolemy III Euergetes I (Meredith 1953: 98).

ship, then goods would have been more safely stored on land than on the ship.[11] One would expect, then, guards for the storehouses, plus dock workers or porters, and small craft for ferrying to the sea-going ships (Rougé 1981: 181–82). The Roman Central Buildings and the extension, the White Building, might have served as storehouses. Other port personnel could include craftsmen for building and maintaining the ships and equipment, clerk accountants, a harbor master, and fiscal personnel to collect taxes, port fees, and customs duties (ibid., pp. 181–82). A military tribune or *chiliarch* is attested at Leucos Limen (Whitcomb and Johnson 1979: 17). Judging from the Roman Villa and other houses, living quarters were adequate if not lavish.[12]

The main problem then, as now, would have been the lack of fresh water. The nearest sweet springs are at Bir Kareim, a day's journey away. Presumably a steady train of camels or donkeys hauled in water with large pottery kegs (Whitcomb and Johnson 1982: 56, 83) or skins. Two closer springs of more or less brackish water could have served for animals and for washing. Quseir al-Qadim was the last point at which a ship could lay in its water supply, perhaps until it reached Berenice (Casson 1989: 97).

At Quseir al-Qadim if not earlier, the export goods must have been packed and bundled for the sea voyage. Grain would have been transported in baskets, leather sacks, jars, or loose in the hold (Rougé 1981: 70), though the last method may not apply to grain required during the voyage. The amphorae for wine or other foodstuffs were probably stowed horizontally (ibid., pp. 72–73) with necks and toes interlocking. The fresh water supply was stored in the hold, often in a single large receptacle (Casson 1971: 177). Pottery was transported in stacks with straw for padding, or in crates or baskets, as were other fragile items (Rougé 1981: 71). Kisa published some unguentaria, apparently in their original wrapping and straw binding, as well as two square flagons from Pompeii in a handled carrying container (Kisa 1908, I: 25, 35). The Quseir al-Qadim ribbed bowls, mold-cast vessels, indented beakers, flagons, unguentaria, and all the other glass that survived the desert journey would have been carefully packed in straw, wrappings, and containers of some sort.

What of the ships that carried the Red Sea trade in the first and second centuries A.D.? No shipwrecks of so early a date have been verified in the Red Sea or Indian Ocean, much less excavated. Were one found it might hold many surprises, but until then we have to rely on data from the Mediterranean, both literary and archaeological. One item that is recorded is that Augustus' general Aelius Gallus had ships built on the coast for the at-

11. There may have been another means of provisioning the port. If the Nile to Clysma canal was functioning, bulk supplies such as wine and grains could have been shipped to the south by boat, though the return journey northwards against the wind would have been very tedious and time-consuming (Sidebotham 1991: 16–17).

12. Rougé (1981: 197–200) includes a valuable section on religious practices concerning ships. We note here only that no Roman temple is yet known at Quseir al-Qadim, though one exists at Bir Kareim (Whitcomb 1982: 394–95), and a Min shrine with a Ptolemaic cartouche was reported at Bir Umm Fawakhir (Meredith 1953: 98). At the far end of the trade route, a Temple of Augustus is noted in the Peutinger Table at Muziris in southern India.

tempted conquest of the Red Sea. None of the Wadi Hammamat graffiti of the Roman period include a carving of a merchant ship.[13] It is not even known whether the ships sailed singly or in fleets, though the *Periplus Maris Erythraei* seems to be directed at the individual captain.

The Roman ships were strong and they were big. The construction was so solid and so well crafted it has been likened more to carpentry than to shipwright's work. The hull was built first, plank fitted to plank and fastened, and then the frames were inserted as secondary support. Freighters had a least one deck and almost always a deck house at the stern (Casson 1971: 178–79). The hulls were usually protected against marine borers by a layer of lead over a tarred fabric. The seams, or the whole hull, were smeared with pitch or wax and pitch and then painted with an encaustic paint. Purple, white, blue, yellow, brown, green, and red are attested (ibid., pp. 209–11). Ships were steered by two rudders, both almost always handled by one helmsman (ibid., p. 224).

The ancient merchant men were square-rigged (Casson 1971: 229); the yards could be as long as the mast was high (ibid., pp. 231–32), giving a low outline to the vessel (fig. 3). The yards in fact could extend so far beyond the sides of the ship that they could be fitted for dropping weights on enemy vessels (ibid., p. 239). The main sail was sometimes supplemented by a small foresail and topsail (ibid., p. 240). Only the biggest freighters carried a mizzenmast between the mainmast and the sternpost (ibid., pp. 242–43). In ensuring strength, the ancient ships probably sacrificed speed. With a favorable wind they could achieve $4\frac{1}{2}$ to 6 knots an hour (ibid., p. 285), and the India and Africa voyages were calculated to maximize good winds. With unfavorable winds and the unmaneuverable square sails, a ship could manage only 2 to $2\frac{1}{2}$ knots or worse (ibid., p. 291).

Ships usually carried multiple anchors made of stone, lead, iron, and wood, some of them weighing up to 1500 pounds (695 kilograms) (Casson 1971: 252–56). Other equipment, beyond sails and rigging, included a ship's boat towed astern, lead lines, signaling flags and lights, perhaps handbooks such as the *Periplus Maris Erythraei* (ibid., pp. 245–52), boat poles, planks, ropes, cork markers and life preservers (ibid., pp. 257–58), millstones, mortars, oil lamps, storage jars, coarse ware and fine dishes for crew and officers, and ships' stoves of terracotta or lead. Tiles from galley roofs or hearths have been recovered from wrecks (Bass 1972: 77).

A rather large crew was needed for a square-rigged ship, ten at an estimate for the modern *Evangelistaria* of 77+ tons (Bass 1972: 77), more for a vessel of 100 to 200 tons. The seamen may be roughly grouped into *remiges*, oarsmen, who served as crew for the launch and did odd jobs such as pumping, the *mesonautae* whose duties are not definitely known, and the *nautae*, the topmen who handled the sails and anchors (Rougé 1981: 183).

13. One graffito in a shrine called the Paneion in the Wadi Hammamat shows a trireme adorned with circular wreaths. Bernand (1972: 192–93, pl. 60) illustrates but does not comment on the ship. A recently discovered graffito at Bir Umm Fawakhir needs further study. The ship has a high stern and steering rudder, though the square main sail and the foresail(?) seem rather far back in the ship. It also seems to have six to eight oars. Most of the other graffiti in the immediate vicinity are first–second century A.D.

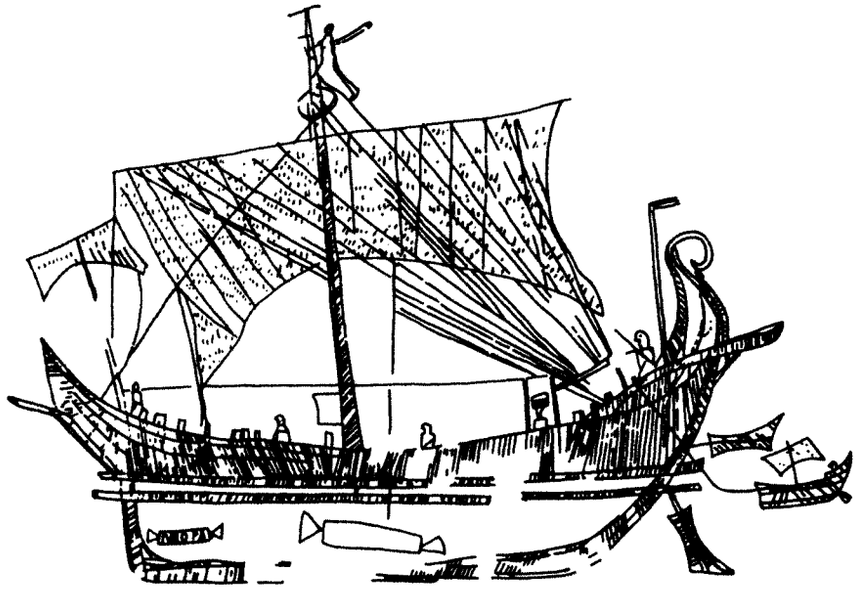


Figure 3a. Roman ship from a graffito at Pompeii (prior to A.D. 79). The main mast and rigging, the small foresail, wales, both rudders, and the ship's boat are carefully depicted. Redrawn from Bass 1972: 72

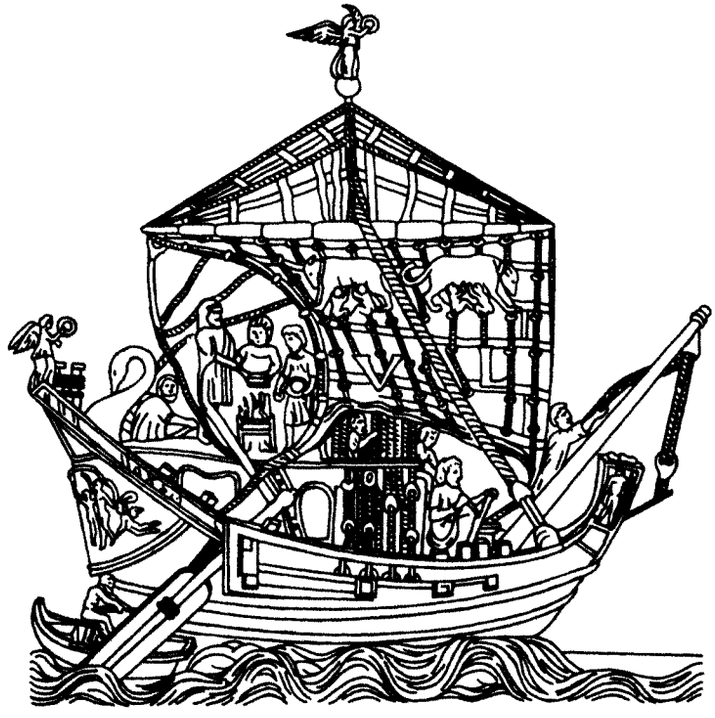


Figure 3b. Roman merchant ship, ca. A.D. 200. From a relief found at Porto near the mouth of the Tiber River. The carving shows the main mast and its elaborate sail, plus the smaller topsail and a foresail. One of the side rudders and the ship's boat may be seen at the rear. Some of the crew or passengers are making a sacrifice upon approaching (or departing from) the harbor. Redrawn from Torr 1964, pl. 6

A large ship might have a quartermaster, carpenters (Casson 1971: 320), a *diaetarius* in charge of accounts (Rougé 1981: 183), and guards, specifically archers for protection on the voyage to India (Pliny 6.101; Casson 1989: 146). There are also references to the boatswain, *keleustes/pausarius* (Rougé 1981: 183), an administrative officer, *toicharchos*, in charge of cargo and passengers, and an operations officer or first mate, the *proreus*, in charge of running the ship (Casson 1971: 318–19). The sailing master seems usually to have been the second in command and had charge of the ship under way. Over him was the captain, the *magister navis* in Roman law, who was responsible for the overall administration of the ship—hiring crew, ship maintenance, cargo, passengers (ibid., pp. 316–17).[14] The captain and the sailing master, however, were both answerable to the ship's owner(s) or charterer(s), who might be on board, and if so might assume the duties of captain (ibid., pp. 315–16). Finally, the captain and sailing master were responsible in some way to the shipper or *exercitor* (Rougé 1981: 184–85). Quite possibly the specific ranking and titles on the merchant men varied from ship to ship according to the size of crew and other constraints. In all, this gives us roughly twenty crew for a 100 ton vessel, not counting the archers.

One vital question for long range trade is how much the ships could carry, after requirements for crew, water, in-voyage supplies, and spare equipment. The Roman ships known from Mediterranean wrecks are surprisingly large. The Mahdia wreck of the first century B.C. was about 30–40 meters long, 10 meters across the beam, and carried at least 230 tons (Casson 1971: 190; Bass 1972: 75–76). The Albenga wreck of approximately the same date and dimensions is nonetheless estimated at 450 tons (Casson 1971: 190). The famous Antikythera wreck, which yielded glass vessels amongst other treasures, is dated to ca. 80 B.C. and carried 100 to 200 tons or more. A number of stone-transport ships dated to the second century A.D. carried burdens of 120 to 350 tons, and this for safety's sake probably represented only two-thirds of the gross tonnage (Bass 1972: 75–76). The Marzamemi I wreck, third century A.D., was about 21–32 meters long, 7–8 meters wide, and carried at least 200 tons cargo (Casson 1971: 190). Far larger ships are known; at least three monsters carrying 1,200 to 1,700 tons are reported in ancient accounts (ibid., pp. 186–89). For the purposes of this report, especially given the lack of any excavated wrecks in the Red Sea or Indian Ocean, the lowest category of vessels is assumed, 100–200 tons only.[15] As seen above, the number of pack animals required to load even a 100 ton vessel is formidable. The ships may have sailed in ballast for at least parts of their runs. The bulk of

14. Apparently both the captain and the sailing master can be called *kybernetes* or *gubernator* (Casson 1971: 316–17; Rougé 1981: 183).

15. Rougé (1981: 75) rightly cautions that "tonnage" of ancient ships could refer to displacement of a ship in water, burden (maximum weight a ship could carry), gross tonnage (total volume capacity), or net tonnage (usable carrying capacity). Further, there are English tons of 2240 pounds, metric tons of 1000 kilograms, long tons of 1016 kilograms, and short tons of 970 kilograms, and nautical tons. The tonnage estimated for all of the wrecks listed here seems to be based on what the ships were in fact carrying, and as the authors cited are American the measurements are taken to mean the U.S. ton of 2000 pounds.

the Red Sea trade—manufactured goods and bullion outbound, silks and spices homeward—would not have required the largest freighters.[16] We note further that the ships required for the easy voyage down the coast of Africa do not have to be so sturdy and as well-maintained as those crossing to India on the monsoon winds.

QUSEIR AL-QADIM TO BAB EL-MANDEB

The next section follows the sea voyages down the western Red Sea coast to Bab el-Mandeb (see fig. 4). Thereafter the ships separated, some rounding the horn of Africa and continuing southwards to Rhapta, the rest following the southern coast of Arabia until they set out over open sea to either the northern or southern coast of India. Most of the discussion of the voyages is based on the *Periplus Maris Erythraei*, ca. A.D. 60.

The author of the *Periplus Maris Erythraei* mentions only Myos Hormos and Berenice and starts most of his travel reckonings from the latter. Usually the ships sailed only by day, roughly 500 stades or 50 nautical miles; day and night runs are explicitly listed as such (Casson 1989: 278). The first port to the south of Berenice was Ptolemais Thêrôn, said to have been founded by Ptolemy Philadelphus. It may perhaps be modern Aqiq (ibid., pp. 100–01).

The most important port along the coast, however, was Adulis, which served Axum inland, the capital of the Axumite kingdom. Adulis is some 530 miles to the south of Berenice, roughly eleven days' sail (Casson 1989: 279). It too is said to be a Ptolemaic foundation (Toussaint 1961: 34). Adulis is almost certainly to be located at Massawa, with the note that in emergencies the port may have been moved to Dissei Island for safety (Casson 1984: 199–210), and later to Zula (Butzer 1981: 472; Casson 1989: 103). Archaeological excavation here, however, has been sparse. Adulis was a market for certain kinds of textiles and clothing, brass, copper pans and drinking vessels, iron, axes, adzes, knives, wine, olive oil, and "numerous types of glass stones and also of millefiori glass of the type produced in Diospolis" (λιθίας ὑ<α>λῆς πλείονα γένη καὶ ἄλλης μορρίνης τῆς γινομένης εν Διοσπόλει, *Periplus Maris Erythraei* 6).[17] Goods from India, perhaps carried by Indian or perhaps by Roman ships as cargo space permitted (Casson 1989: 18–19), included cottons, lac dye, and Indian iron and steel. Also noteworthy is mention of "a little Roman money for the resident foreigners" (*Periplus Maris Erythraei* 6), apparently a permanent settlement of Egyptian-Greek traders. Their presence has implications for expanded trading time, storage, and collection of export goods. Zoscales, the ruler of Adulis, also spoke Greek. Adulis was the main emporium for ivory but also exported hippopotamus

16. Toussaint (1961: 42) believes that cargoes from India were modest, at least before the discovery of the monsoon, but adduces no support for the statement.

17. The phrase "*lithias hyales*" is often translated "flint glass." In light of the archaeological evidence for glass it is by no means clear what "flint glass" might be. Certainly flint is a poor silicate to use for making glass. What does occur in the archaeological record are various glass beads, inlays, game pieces, and the like that might be considered fake stones.

hides, rhinoceros horn, tortoise shell, and slaves (*Periplus Maris Erythraei* 6; Charlesworth 1924: 64; Butzer 1981: 472).

Axum may have had contact with the Mediterranean as early as the third century B.C. through Adulis (Butzer 1981: 472). Its power, however, was based both on a favorable climate shift in the first century A.D. that permitted a longer growing season and perhaps two crops per year and on a wide exchange network (ibid., p. 491).

> The rise to power of the Axumite kingdom after A.D. 100 was intimately linked with the role of Adulis, and later Axum, as a gateway city ... that funneled diverse resources from the continental hinterland of the Abyssinian Plateau and the Sudanese plains into a maritime exchange network which netted commodities from as far afield as India, China, the Black Sea, and Spain ... (Butzer 1981: 472).

Axum was at its height during the fourth through sixth centuries, and most of its monumental structures date to that period (Casson 1989: 107). Thus, already in the first century A.D., the Roman traders were dealing with a kingdom with organized trade (and conquest) to the coast and into the Ethiopian hinterland.[18]

For the king at Axum, Roman traders to Adulis brought gold and silverware and certain kinds of garments (*Periplus Maris Erythraei* 6), though what sort of trade or tax or tribute is implied is not clear. The imported iron may have been a metal recently introduced into the Axumite realm (Raschke 1978: 671). The iron spears are stated to have been used for hunting elephants (*Periplus Maris Erythraei* 6), and ivory in turn was the prime export good. Roman luxury glass has also been recovered at Axum (Morrison 1989b). Although the foreign residents at Adulis desired some Roman coins, most of the trade was carried out by exchange of goods rather than money. Within the Axumite realm, the traders encountered a kingship level of organization, which implies a certain hierarchy and degree of centralization, a capacity for status goods and luxuries, and the power to regulate ports and trade.

The next three ports, Avalites, Muza, and Ocelis, are close to Bab el-Mandeb, and commerce by raft passed between them (*Periplus Maris Erythraei* 7). Avalites may be modern Assab, but Obock, Deire (Ras Siyan), and even Zeila have also been nominated (Casson 1989: 116). Ancient Muza is somewhere near Mocha, and Ocelis may be Sheikh Sa'id. Among other goods, Avalites is reported to be a market for assorted glass stones (λιθία σύμμικτος, *Periplus Maris Erythraei* 7). Pliny notes that the Trogodytes, inhabitants of the western Red Sea coast, carried cinnamon to Ocelis in the straits with boats and took back "glassware (vitrea), brass, clothing and personal ornaments" (Stern 1987: 31–33). This was presumably re-export of Roman glass.[19]

18. About the year 520 Cosmas Indicopleustes copied a Greek inscription on a stone throne at Adulis. It records the conquests of an unknown Axumite king in the second or third century, including the Rhausi of the "land of Barbaroi." The Rhausi have been identified as the Arusi, a Galla tribal name, and hence early evidence for the presence of the pastoral Galla (Grottanelli 1975: 52).

19. Stern (1987: 31) suggests that Muza produced glass; if so it would have been the sole non-Roman manufacturer in the Arabian and African trade sphere, and perhaps in the Indian sphere as well.

THE AFRICA TRADE

The first of the "far-side" ports past Avalites on the Somali coast was Malao, modern Berbera (Casson 1989: 120). Here, as at Avalites, "assorted glass stones" were in demand as well as a limited amount of Roman money and various manufactured goods (*Periplus Maris Erythraei* 8).

The next port, Mundu, modern Heis (fig. 4), is of exceptional interest as a quantity of Roman glass has actually been recovered there. In 1878 G. Révoil found some burial mounds with Roman pottery and about 100 glass sherds, dated stylistically to ca. A.D. 0–40. The glass included vessels, tiles, and inlays (Stern 1987: 23–25). The tiles are a blue-green matrix, front face polished flat, and some are backed with glass. Some of the inlays are opaque red, orange, or white whereas others are mosaic strips; one even shows a face with an ivy or vine crown (ibid., pp. 29–30). Such elaborate mosaic inlays are also reported from Nubia (Dunham 1957). Although tiles and mosaic inlays are usually interpreted as architectural or furniture embellishments (cf. Stern 1987: 29–30), the lack of evidence for permanent structures or settlements of any sort, except the burial cairns, suggests that other applications should be considered. The identifiable vessels or vessel fragments include a ribbed bowl, a mosaic glass broad rim bowl, a ring base (apparently mold-cast), a "mold-formed" bowl with a simple rim and perhaps a round base, and a round millefiori bowl (ibid., pp. 25–29). Chittick's later survey reports surface sherds of the second to fifth century, some of which are Roman, and a number of cairns, one of which was excavated and found to contain fourth century Roman glass. No habitation sites were found in the survey, and Chittick (1980: 364) suggests that the trade was conducted by nomads with no permanent settlements.

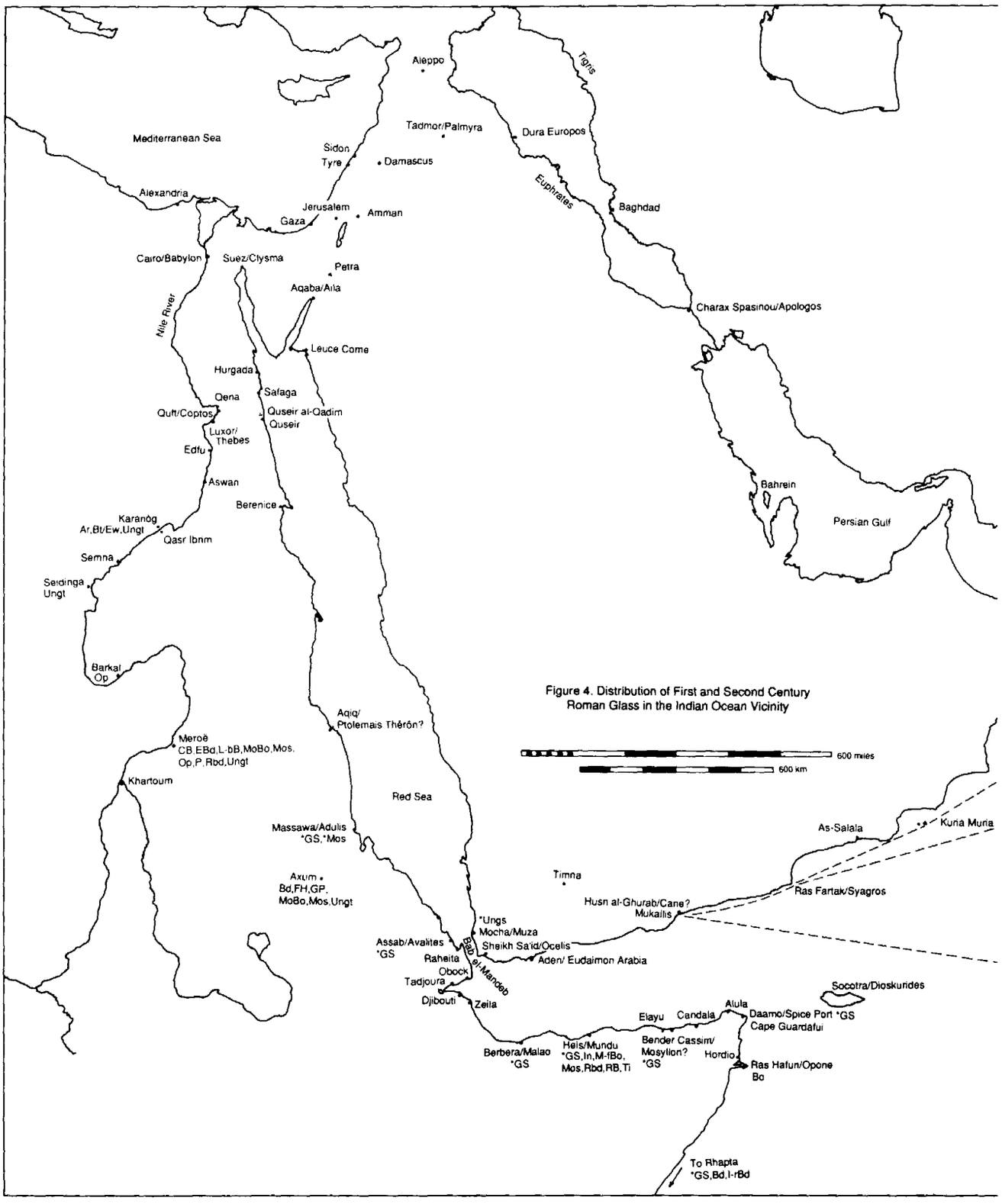
Beyond Mundu/Heis lay Mosyllon, which could be any of several possible ports—Elayu, Bender Cassim, or Candala (Casson 1989: 127). As for Avalites and all the "far-side" ports, imports include "glass stones" and millefiori (*Periplus Maris Erythraei* 10). Further along the coast at Daamo, just to the west of Cape Guardafui, ancient pottery was found, some of which is probably Roman, as well as walls cut out of native rock (Chittick 1980: 364). This may be the "Spice Port" of the *Periplus Maris Erythraei* (Casson 1989: 129).

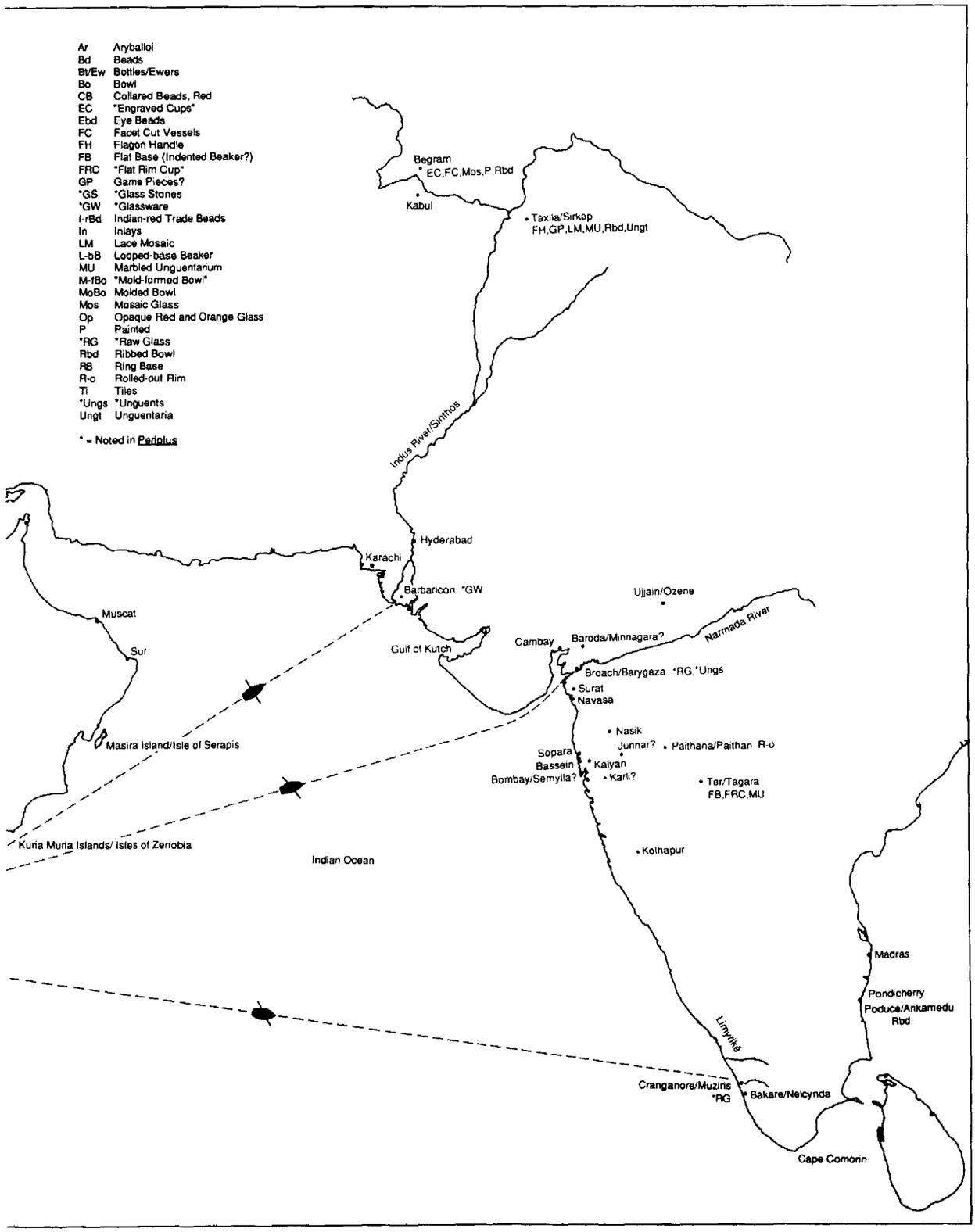
Around the tip of the horn of Africa lay Opone, generally identified with Hafun. There are two ancient sites here, Hafun West and Hafun Main Site. Hafun West yielded a hut built of cut blocks, a variety of basins, jars, amphorae, and some Hellenistic pottery; the assemblage is dated to the first century B.C. or a little later (Smith and Wright 1988: 118, 124–25). Judging from the remains, Hafun West may have been exporting tortoise shell, murex dye, and perhaps salt from the lagoon (Chittick 1980: 364–65). Test excavations at Hafun Main Site on the southern side of the peninsula revealed stratified ash, ovens, and sherds datable to the second to fifth century A.D. (Smith and Wright 1988: 118, 124–25). Chittick (1980: 364–65) mentions post holes, presumably for some sort of shelter. Two out of a number of cairns nearby were excavated; each yielded a glazed jar and one had a glass bowl, probably second to third century A.D. (ibid., p. 365).

All of the "far-side" ports were exporting myrrh, incense, cassia, tortoise shell, frankincense, ivory, and slaves (*Periplus Maris Erythraei* 8–13). Apart from the evidence from Daamo and Hafun, there is little indication of permanent settlement at any of these sites. Inland in Somalia there are no early permanent towns either, and even the series of cairns and platforms are of uncertain date. Chittick (1980: 364–65) suggests that the Somali trade was carried on by nomads, perhaps only during the trading season. The *Periplus Maris Erythraei* (14) states that each port was ruled by its own chief. Whatever sociopolitical or economic organization that may imply, the "far-side" ports were not part of a kingdom like Adulis and Axum. Yet they were capable of gathering the aromatics, ivory, tortoise shell, and slaves, and importing the cassia from somewhere to carry on the trade for exotic foreign goods, most of which are luxury or prestige items—"glass stones," millefiori or mosaic glass vessels, clothing, grain, wine, tin, drinking vessels, pans(?), iron, Roman coins, silverware, and precious stones (*Periplus Maris Erythraei* 8–13). Staples and textiles were also imported from northern India (*Periplus Maris Erythraei* 14).

Southwards from Opone/Hafun the *Periplus Maris Erythraei* (15) notes only a long series of runs and a few geographical locations in Azania until the ultimate port, Rhapta, is reached. This is probably either Dar es-Salaam or the mouth of the Rufiji River (Casson 1989: 141) (see also fig. 5). Exports included ivory, rhinoceros horn, shell, and tortoise shell; imports were mainly metal tools and weapons and "glass stones" of many kinds (λιθίας ὑαλῆς πλείονα γένη, *Periplus Maris Erythraei* 17). The only glass objects recovered from East Africa to the south of Hafun that might conceivably date to the period in question are beads. The coiled, opaque red, green, yellow, blue, and black beads reported from Zanzibar, perhaps only two runs short of Rhapta (Casson 1989: 141), may be as early as second century B.C. to second century A.D. (Engle 1976: 121). Some other East African "Indian red" trade beads drawn from canes might be as early as A.D. 200 (ibid., pp. 120–21). The dates are based on bead types only, and where either the coiled or drawn beads were manufactured is uncertain. There are no reports of Roman pottery, or large, permanent sites, or even trustworthy coin finds to the south of Hafun (Chittick 1980: 364–65). Yet Rhapta itself must have been sizable; Arab merchants from Muza held it, collected taxes, and carried on their own trade (*Periplus Maris Erythraei* 16–17). Furthermore, it must have been capable of accommodating the Egyptian-Roman ships during their eight month layover before the return voyage (Casson 1989: 286).

Rhapta was as far to the south as Roman trade reached directly, and the round trip required a year and a half. The problem was catching the right sequence of winds that would carry a vessel southwards from its Red Sea port, eastwards from Bab el-Mandeb to Cape Guardafui, then southwards again to Rhapta. The ships left Quseir al-Qadim in July and required at least a month, more likely seventy-five to one hundred days, to reach Cape Guardafui. The best time for setting out down the African coast would have been mid-October to mid-November, and with the monsoon wind it could have taken as little as two weeks. Thus, from roughly December to August or September the ship had to stay at Rhapta (Casson 1989: 284–86). The inhabitants were agriculturists and hence food would





have been available, though wine and grain were imported "to certain places" to ensure the good will of the inhabitants. The Muza merchants had some sort of settlement there (*Periplus Maris Erythraei* 16–17), and Ptolemy even calls it a "metropolis" (Casson 1989: 141). The voyage northwards to Cape Guardafui was not so much a problem as the westward leg to Bab el-Mandeb, for which the early northeastern monsoon winds were needed. If the run were made in October, then it would be possible to catch favorable winds northwards to the home port in November or December (ibid., pp. 285–87). Although the *Periplus Maris Erythraei* does not mention the alternative, some traders may have gone only as far as the horn of Africa and returned to their Red Sea port in October-December (Casson 1984: 189).

Once again at Quseir al-Qadim, the incense and spices, ivory, tortoise shell, and other exotic goods would be off-loaded and baled if necessary for the desert crossing. The pack animals, especially donkeys, could not, however, be kept long in the vicinity of Quseir al-Qadim for lack of water and fodder. It has been suggested that the intervisible guard posts were used to send a signal from Quseir al-Qadim to Coptos that the ship or ships had returned and the pack train should be sent out.

This, or Rhapta rather, is logically the end of the glass road, but one further obstacle obtrudes before the journey back to Coptos and Alexandria can be completed—the customs officer. The traders had to pay various fees and levies at the ports of call, but when they returned to Egypt they faced a twenty-five percent duty, and there may have been further charges en route to Alexandria. One reference to the custom dues comes from Leuce Come, where a *hekatontarches* was stationed to collect the twenty-five percent duty (*Periplus Maris Erythraei* 19; Charlesworth 1951: 139). A second source, a second century A.D. contract, specifies that a certain shipper will convey goods from the Red Sea to Alexandria "to the warehouse that receives the duty of one-fourth" (Casson 1989: 14). Finally, we know of one Annius Plocamus "*qui Maris Rubri vectigal a fisco redemerat*" (Raschke 1978: 644). The question arises as to whether the customs dues were collected at the port and transported at the collector's risk through the desert or whether they were paid at Coptos, like the tariff on caravans. Coptos is in fact called an "emporium" or port. Another possible payment point is Alexandria, as specified in the second century contract mentioned above. Another question is twenty-five percent of what? The price of ivory on the African coast (in iron spear heads)? The price in Alexandria or Rome? Virtually none of these goods had passed through a money economy. Twenty-five percent of the goods themselves? One damaged papyrus indicates that certain aromatics were assessed by weight, though the percentage is missing (Sidebotham 1986: 104–05). If taxed by bulk or weight, it would be more favorable to collect the dues at a Nile city than on the coast and save transport costs. As a tax farmer (Raschke 1978: 635; Sidebotham 1986: 103), the collector would be interested in maximizing his returns.

THE SOUTH ARABIA AND INDIA TRADE

Having covered the route from Myos Hormos to Rhapta and the Arabian coast (to be avoided to the south of Leuce Come), the author of the *Periplus Maris Erythraei* returns to Muza, briefly mentioned in the earlier description of Avalites. The rest of the *Periplus Maris Erythraei* concerns southern Arabia, the northern and southern Indian ports, and a little information on points beyond Cape Comorin.

The India trade differed from the Africa trade in several respects. First, it took less time, only a year. The ships, however, had to withstand stronger winds for long open sea voyages and thus had to be sturdier than the Africa ships. An India venture cost more than one to Africa, partly because of the ships, and partly because of the quantity and quality of the merchandise involved (Casson 1989: 35). The India trade was shared in part with the Arabs, at least from Barygaza to Muza (*Periplus Maris Erythraei* 21).[20] The South Arabian kingdoms[21] may in fact have handled all the Africa and India trade until the discovery of the monsoons in the late Ptolemaic period and the subsequent Roman efforts to exploit them.

Muza was an especially busy port. It served not only the Roman commerce but also its own merchants who traded as far as Rhapta and northern India. It dealt with the lively market for local Arabian products such as myrrh and oil of myrrh (*stactê*), and it handled the trade inland to the capitals of the Himyarite and Sabean kingdoms (*Periplus Maris Erythraei* 21, 23–24). Of the many luxury goods imported to Muza, we note only "unguent, moderate amount" (*Periplus Maris Erythraei* 24) because it was probably contained in glass vials. Contact between the kingdoms of Saba and Himyar and Quseir al-Qadim is suggested by some South Arabian pottery and by graffiti on sherds found at the site (Sidebotham 1986: 16, 100).

Beyond Muza lay Ocelis, perhaps Sheikh Sa'id, primarily a watering place at the time of the *Periplus Maris Erythraei* but a trade port by the time of Ptolemy in the second century (Casson 1989: 158). Next along the coast came Eudaimon Arabia or Aden, perhaps suffering a period of decline in the first century A.D. The direct trade from Egypt to India damaged its position as a node for exchange between the Red Sea and Indian Ocean traders, and Muza had evidently taken on much of the remainder of that function. In addition, Eudaimon Arabia is said to have suffered military attack, attributed to "Caesar." What this refers to has generated much debate, but in any case Aden was not the flourishing port it had been earlier and would be later (Casson 1989: 158–60). That it was not completely idle, however, is suggested by some inscriptions from Coptos. One or perhaps two stelae there were dedicated to Isis and Hera by one Hermeros, son of Athenion, an Aden

20. None of the early Indian literature mentions contact with Arabia or Arabs, unless the term "Yavana," usually interpreted as "Westerner," includes Arabs (Adhya 1966: 129).

21. There are several South Arabian graffiti in the Wadi Hammamat. Sources from South Arabia itself, however, are not too informative. Two graffiti mention trade with Egypt but no details (Sidebotham 1986: 99). A Qatabanian king's market decree and the Minaean code both refer only to restrictions on internal trade (ibid., p. 97).

merchant. He occurs again much more prosaically on an ostracon from Berenice, engaged in transporting wine (Bernand 1984: 189, 193–94). Cane, at Husn al-Ghurab (Casson 1989: 161) near Mukalla, was the next port on the South Arabian coast. It was a major collecting point for Hadhramaut frankincense and a jumping off place for the voyage to Barygaza (*Periplus Maris Erythraei* 27–28) (see fig. 4).

Of the next list of ports and harbors from Syagros/Ras Fartak (Casson 1989: 166) to the Persian Gulf[22] and Apologos near Charax Spasinou (to the north of Basra, ibid., p. 179) and Omana (probably Chah Bahar or Tiz, ibid., p. 180), we note only Dioscurides or Socotra Island. It lies to the east of Cape Guardafui and to the south of Syagros/Ras Fartak but is listed with the India run. The island had no agriculture to speak of, and water was mainly limited to the northern and western sides of the island. It did, however, have a settlement of Arabs, Indians, and a few Greeks engaged in trade for tortoise shell and "Indian cinnabar," a vegetable pigment and drug (*Periplus Maris Erythraei* 30–31; Casson 1989: 167–69). The Indian connection is reinforced by some first to third century coins found in India depicting two-masted ships (Sidebotham 1986: 31), indicating that the Indians had at least some fairly large ships. From Cane, or perhaps Cape Guardafui or Socotra, the ships could set sail directly to northern or southern India (Casson 1989: 225).

The first trading port in India was Barbarikon somewhere near the mouth of the Indus or Sinthos River, perhaps at Bhambore. The sea-going ships landed there, but their cargoes were promptly conveyed upriver to Minnagar, the capital of Skythia (*Periplus Maris Erythraei* 38–39). The Skyths were also called Sakas, and the region in question is the Sind, the Indus plain (Casson 1989: 186), though at the time of the *Periplus Maris Erythraei* the Parthians, or better, the Indo-Parthians, had assumed rule of the country (Casson 1989: 186, 189). The imports named are precious stones, frankincense, storax, wine, silverware, money, and glassware, and exports are drugs, nard, precious stones, Chinese pelts and textiles, and indigo.

Concerning the glassware, two sites must be discussed, Taxila and Begram. Taxila, or its successor city, Sirkap, was founded by Bactrian Greeks in the second century B.C. and enlarged by the Indo-Parthian Sakas in the first century A.D. (Dikshit 1969: 25–26). Here a number of Western artifacts were excavated: an amphora neck, metal objects, at least two engraved gems, and some glass (Whitehouse n.d.: 6–7). The glass finds include two ribbed bowls (one amber colored, one white and blue), at least three plain unguentaria, two unstratified marbled unguentaria, a reeded flagon handle, two sherds of lace mosaic glass, and perhaps some game pieces (Marshall 1951; Dikshit 1969: 28–31). Dikshit (1969: 31) considers other glass artifacts to be of local manufacture, namely the beads, bracelets, sealings, rings, intaglios, and "lenses." We will return to the question of Indian glass production later. Begram lies far up the Indus, to the north of Kabul, and yet it is here that the

22. The Red Sea was only one of three routes to India. One ran overland to the Persian Gulf, and the other completely overland through Parthia (Curtin 1984: 96). Given the hostility between the Roman Empire and Parthia, the Red Sea was the most important route. In spite of this, Charax Spasinou appears to have had a Greek trading enclave (Raschke 1978: 645).

richest of all Roman-Indian glass corpora was found, along with some unforgettable Indian ivories, Chinese lacquers, and Mediterranean and Egyptian bronzes and statues (Hackin 1939, 1954; Raschke 1978: 632–34). The finds have been redated to the first and early second centuries A.D., rather than the third century (Whitehouse n.d.: 18–19). Glass finds include a ribbed bowl (Hackin 1939, pl. 9), many facet cut vessels (ibid., pls. 9, 18; Hackin 1954, figs. 252, 253), a millefiori bowl (Hackin 1939, pl. 5), an "engraved cup" (Hackin 1954, fig. 254), and painted beakers (Hackin 1939, pls. 12–15; Hackin 1954: 257–69, 371–72).

After detailing the dangers of the next stretch of coast, the Rann of Kutch, the author of the *Periplus Maris Erythraei* brings the account up to Barygaza, modern Broach. This too is not without hazards, and local fishermen were required to navigate and maneuver the sea-going ships into safe harbors on Barygaza's river, the Narmada (*Periplus Maris Erythraei* 42–46). The capital lay inland at Minnagara, which was still a Saka versus an Indo-Parthian Saka city. It may be modern Baroda,[23] though Indore or Dohad are also possible identifications (Casson 1989: 199). Barygaza was a prime port for all sorts of luxury goods: nard, drugs, ivory, onyx and agate,[24] cottons, silk cloth and yarn, and "long pepper." The *Periplus Maris Erythraei* (49) lists the Roman merchandise as wine, metals, precious stones, clothing, aromatics, realgar, antimony sulfide, raw glass, Roman money, and among special items for the court, fine unguents. Most of the unguents probably came in glass vials. It is the raw glass that has provoked discussion, as it most likely was intended for local craft production. "Roman money" means exactly that, Roman and not Egyptian, and preferably coins of Augustus, Tiberius, and Nero up to his coin reform (Raschke 1978: 668–69). These, like latter-day Maria Theresa thalers, appear to have been preferred for their reliable weight and purity, and they were sent overseas despite imperial restrictions on import of Roman aurei and denarii into Egypt, which had its own coinage for most purposes (Sidebotham 1986: 27). Local coinage also circulated within India (*Periplus Maris Erythraei* 49),[25] although very few Indian coins have been found inside the bounds of the Roman Empire (Sidebotham 1986: 31). In spite of this, few Roman coin hoards are known from northwestern India, versus the large and numerous hoards that are found in southern India (Raschke 1978: 630–31).

Inland from Barygaza lay Ozene, "the former seat of the royal court" (*Periplus Maris Erythraei* 48), and other Deccan trading centers: Paithana/Paithan and Tagara/Ter

23. A first century Roman bronze oinochoe handle and body fragments have been recovered at Akota in the Baroda region (Adhya 1966: 150; de Puma 1991: 101–02), as well as a fine cameo from the site of Karvan near Baroda (Deo 1991: 41).

24. India has been an exporter of agates and carnelian for millennia. Here we note eight agate vessels (two subsequently stolen) found near Quft (Coptos): three bowls, one flaring vase, one simpulum with a leaf carved on one side, and one animal-headed rhyton (Englebach 1931: 126–29; Bromehead 1952: 67). The simpulum looks very Roman and the rhyton, Persian. If they were of Indian manufacture, they must have been designed for export.

25. For coins with the name of a Saka ruler, see Casson 1984: 214.

(*Periplus Maris Erythraei* 51). At Ozene, modern Ujjain (Casson 1989: 206), glass bracelets and a distinctively Indian item, ear plugs, have been recovered (Dikshit 1969: 39). From Paithan a glass vessel with a rolled-out rim is published (ibid., pp. 41–42); and from Ter, a marbled unguentarium, a flat base that may be an indented beaker, and two "flat rim" cups (ibid., pp. 44–45), as well as two bronze mirrors (Deo 1991: 41).

Southwards from Barygaza, the *Periplus Maris Erythraei* lists sites without distances and with little comment. None of them was a trading port, and ships making landfall at the northernmost ones were escorted to Barygaza where they could trade (*Periplus Maris Erythraei* 52; Casson 1984: 214–16). We note here only Semylla, which must have been at or near Bombay (Casson 1989: 215–16). At Nevasa, in the Ahmednagar district of Bombay, Roman amphorae and rouletted pottery have been reported (Adhya 1966: 150). At Kolhapur near Bombay a very large hoard of iron, lead, and bronze items was found. The hoard included at least ten pieces of Western manufacture such as bronze figurines, a wine strainer, vessels and vessel handles, and mirrors (ibid., p. 150; de Puma 1991: 82). Dikshit (1969: 27) mentions some glass.

Thus, in northwestern India we have at least two kingdoms, a Saka Indo-Parthian one at Minnagar with its port at Barbarikon and a Saka kingdom at Minnagara with its port at Barygaza. Southwards in the Deccan, the Andhras were consolidating another kingdom. The political situation in the first century A.D. was volatile. Cities such as Nasik, Junnar,[26] and Karli changed from Andhra control to Saka and back again (Casson 1989: 214). The *Periplus Maris Erythraei* reflects the situation in remarks about the Parthian rulers of Minnagar who were constantly supplanting one another (*Periplus Maris Erythraei* 38), or about the hindrance of trade at Kalliena (modern Kalyan) and the escorting of Greek ships to Barygaza (*Periplus Maris Erythraei* 52). In the late first or early second century A.D., shortly after the *Periplus Maris Erythraei* was written, another power, the Kushanas, established rule over northwestern India and Central Asia (Raschke 1978: 640; Whitehouse n.d.: 3). The data are, to put it mildly, scrappy and hard to interpret; the *Periplus Maris Erythraei* is in fact one of the main sources.

At Barbarikon import goods were taken directly to the king. This may mean that he retained first rights to select goods, or he may have exercised yet more control over the exchange and distribution of exotic luxury items. There is no mention of such control at Barygaza, though fishermen in the king's service did guide foreign ships through treacherous waters into harbor (*Periplus Maris Erythraei* 44), indicating royal interest in furthering the trade. The northwestern Indian cities must have been sizable and were sufficiently Hellenized (Raschke 1978: 671) to appreciate the name of Alexander (*Periplus Maris Erythraei* 47) and items such as Roman bronzes, luxury vessels, clothing, musicians (*Periplus Maris Erythraei* 49), and money. There may even have been a few resident Greeks, or Yavanas; inscriptions at the inland cities of Nasik, Junnar, and Karli record religious gifts by merchants who call themselves Yavanas (Adhya 1966: 141–42). The kingdoms did have a money economy, though specific issues of Roman coins were preferred, at

26. A small white stone vessel with a classical cupid carved inside is reported from Junnar (Deo 1991: 41).

least in some cases, and could command "an exchange at some profit against the local currency" (*Periplus Maris Erythraei* 49).

The manufacture of glass in India is a sticky question. There are several possibilities. The ancient Indians could have imported all glass, and the items that seem distinctively Indian could have been made in the West for export to India. The Indians could have imported finished vessels (cast or blown) plus raw glass to make their own beads, bracelets, and other ornaments, or even a more difficult product, blown glass. They could have made both raw glass and finished products. The trade in glass ingots is at least as ancient as the fourteenth century B.C. shipwreck at Ulu Burun. The *Periplus Maris Erythraei*'s (49, 56) mention of export of raw glass to Barygaza, Nelcynda, and Muziris is virtually the only textual evidence bearing on the problem. At an early date, the Mauryan period, or roughly the equivalent of the Hellenistic period in the West, glass artifacts are attested archaeologically in India. There are some molded seals from Patna, but even more telling are the disks with Brahmi characters. They are usually black with red or yellow canes (Engle 1976: 114–15), a characteristic Hellenistic technique. From Maheshwar there is a glass "tablet" with a molded elephant design, thought to be third century B.C. (Govind 1980: 299). Finally, the *Arthaśastra* of Kautilya mentions that "... a license fee was imposed, which was payable in advance, like modern surety money for starting the glass industry" (ibid., p. 283). What this means is not clear, though it certainly does not prove manufacture of raw glass. Somewhat later, Pliny the Elder (36.66) mentions high-quality Indian glass made from ground rock crystal. This has been questioned by Kisa (1908, I: 105) and others. Marshall's (1951: 685) conclusions concerning the glass excavated at Sirkap/Taxila are that there was no Indian blown glass at that period, only imported vessels and raw glass for producing objects such as bracelets, tiles, and beads. We note also "much glass slag" from Ahar in Rajasthan, to the south of the Indus valley, dated to the Kushan period (second to third century A.D.) (Dikshit 1969: 37). In southern central India at Kondapur in Hyderabad some 700 glass beads made by a variety of methods are dated to the first and second centuries A.D. (ibid., pp. 46–47). Although beads were clearly being manufactured at Arikamedu, there is as yet no evidence for producing raw glass (Stern 1991: 118).[27] Finally, at Kopia near Maidaval in Uttar Pradesh (upper Ganges, northeastern India), a surface collection garnered thousands of lumps of glass, beads, bracelets, and "molten glass on earthenware platters." The site is thought to be third century B.C. to third century A.D. (Dikshit 1969: 39), but if nothing else Uttar Pradesh is remote from the points of contact with Western glass technology. One would expect glass production in the western coastal kingdoms if anywhere.

Some of the best evidence for manufacture of raw glass in India comes from chemical analyses of Indian glasses. Several of the glass rods from Arikamedu seem to have a chemical composition different from typical Roman glasses (Adhya 1966: 79; Govind

27. At Karaikadu just to the south of Arikamedu "terracotta pipes, crucibles, and waste slag used in the manufacture of glass" were recovered (Raman 1991: 131). From this brief description it is impossible to be certain that it was glass and not metal that was being processed.

1980: 293–95). Brill analyzed thirty-eight excavated glass samples, mostly beads and fragments. At least two beads are chemically like Near Eastern glass (Brill 1987: 3–4), but the other samples are high-alumina low-lime glasses believed to be Indian. Some of the glass probably falls into the first–second century A.D. range, but unfortunately all are very broadly or uncertainly dated (ibid., p. 2).

The early history, much less the archaeological sequences, of much of India seems debatable, and probably all the dates noted above should be re-evaluated before firm conclusions are reached. None of the Indian sites listed—and there are many others with beads and bracelets—include any glass vessels apart from Roman types. With the possible exception of Kopia, there is no archaeological evidence for the manufacture of raw glass. Thus, on the basis of present evidence, it appears that the Indians imported finished vessels and raw glass. The latter could be melted and drawn into beads or bracelets or cast into other objects, as metals are cast. The high-alumina low-lime glass may have been produced locally for beads and ornaments.

This leads to one of the earlier questions, why the Indians did not fully exploit the potential of the new glass industry, as the Gauls did at an early date. The ancient glasses use soda-lime formulae requiring clean glass sand, a soda (natron in Egypt), and lime for flux. Colorants and decolorants are another problem, and initially it may have been difficult to identify the proper ingredients in a foreign land. High-alumina low-lime glasses are stiffer and harder to work than the Roman soda-lime glasses (Brill 1987: 5). The skills and recipes for making glass and blown vessels would have required at least one glass master as instructor. We know that some of the early Syrian glassworkers migrated to Italy, and that the Indians admired and utilized the talents of Yavana carpenters, architects, and other craftsmen, but we have no evidence for Yavana glassworkers. Another possibility is that the market for glass was too limited to support glass specialists, though the glass houses did in fact turn out numbers of glass beads, bracelets, and fake stones (Dikshit 1969). It has also been suggested that the local industry in brass supplied the same needs as glass vessels in the West, with much less chance of breakage.[28] After Roman trade dwindled at the end of the second century, we certainly do find a long hiatus in the history of glass in India.

Returning to the trading posts that the Romans visited, only the southernmost two, Muziris and Nelcynda remain to be discussed. The *Periplus Maris Erythraei* treated the coast between them and Barygaza cursorily because the ships generally sailed directly from Cane or the horn of Africa either to the northern Indian ports of Barbarikon or Barygaza or to the southern Indian ports at Muziris and Nelcynda.

Although Muziris and Nelcynda are part of different kingdoms they are only a day's run or 500 stades apart (*Periplus Maris Erythraei* 54). Muziris is modern Cranganore on the Periyar River, and Nelcynda lies on the Pambiyar River (Casson 1989: 296–98). The capi-

28. Without wishing to skip over Africa, it seems clear that the "far-side" ports, Rhapta, and even Adulis/Axum would have had even more problems with ingredients and markets. If the "far-side" ports were in fact utilized mainly by nomads, it is surprising that they acquired as much glass as they did, not that they did not manufacture their own.

tals of both kingdoms lay inland (*Periplus Maris Erythraei* 55). The two ports exported much pepper and malabathron (cinnamon leaf), but also precious stones, ivory, silk, nard, and tortoise shell. They imported textiles, precious stones, raw glass and metals, some wine, minerals such as orpiment and realgar, and grain (*Periplus Maris Erythraei* 56). A recently discovered papyrus throws some direct light on the second century trade from Muziris. The obverse was a loan drawn up in Muziris, whereas the reverse was written in Alexandria. It mentions a shipment of 700 to 1,700 pounds of Gangetic nard, at least 4,700 pounds of ivory, and almost 790 pounds of textiles. The consignment was valued at 131 talents, a large sum of money (Casson 1991: 10; Sidebotham 1991: 30), and weighed between three and three and a half tons, a small part of a ship's load. Although the name of the Red Sea port is lost, the papyrus does note camel transport to Coptos, shipping to Alexandria, and a twenty-five percent tax (Sidebotham 1991: 30).

In this case there are further sources of information about Roman trade with southern India. "Pandion," the king of Pandya in which Nelcynda lay, sent ambassadors and gifts to Augustus (Desanges 1978: 317–19), a high-level exchange that could have furthered communication and trade. There were resident communities of Romans in southern India (Curtin 1984: 99), and the "grain in sufficient amount for those involved with shipping" mentioned by the *Periplus Maris Erythraei* (56) must have been intended for Roman traders who preferred wheat to rice. The Peutinger Map shows a "Templum Augusti" at Muziris (Charlesworth 1951: 142), which suggests a sizable group of worshippers. Finally, Tamil literature mentions Yavanas or Westerners:

> ... the city where the beautiful vessels, the masterpieces of the Yavanas, stir white foam on the Periyar, river of Kerala, arriving with gold and departing with pepper—when that Muçiri, brimming with prosperity, was besieged by the din of war (Casson 1989: 296, citing Meile 90–92).

One source notes "abodes of Yavanas" at Puhar, and another, a royal palace built by Yavana carpenters, smiths, and skilled artisans and lit with lamps held by metal statues, also of Yavana manufacture (Charlesworth 1951: 133). Yavanas were among the palace guards at Madurai, the Pandya capital (Raman 1991: 125). Tamil poets mention the Cola king's customs officers and the Cera king's warehouses for foreign goods (Sidebotham 1986: 101).

Roman ships did not regularly sail past Cape Comorin at the southern tip of India, and even Ceylon was poorly known (Desanges 1978: 317–19). The famous Roman finds at Arikamedu, ancient Poduce just to the south of Pondicherry, were either re-exported by Indians from a southern Indian port or represent the unusual arrival of a Roman ship or ships. The finds included about 150 Arretine or terra sigillata sherds, wine amphorae, terracottas, thousands of glass beads and bead-making waste, and two pieces of glass: a ribbed bowl and a blue bowl with horizontal ridges (Wheeler, Ghosh, and Deva 1946: 95–102; Charlesworth 1951: 131, 135; Stern 1991: 118). Four or five other sherds, apparently ribbed bowls, were recovered earlier (Wheeler, Ghosh, and Deva 1946: 102). All of the finds are mid-first century A.D. (Charlesworth 1951: 135). Beyond Poduce other ports are

listed, as well as the Ganges region,[29] though after this geographical and commercial knowledge became vague.

As for the Africa trade, the India ships left the Red Sea in July in order to sail with the winds southwards to Bab el-Mandeb. Thereafter they could catch the southwestern monsoon directly to northern or southern India. It was a fast trip, some 2000 nautical miles, or 20 days (Casson 1989: 289), but not without danger. The southwestern monsoon is strong and sometimes violent; only the strongest of the merchantmen could make the run. It was furthermore necessary to arrive in September because in August the winds made the coast of India far too dangerous (ibid., p. 290). This left a short trading season of two to three months in which to make repairs if needed, dispose of the entire cargo, and acquire a new one. Here the resident Yavanas may have been indispensable in collecting goods beforehand and disposing of the Roman merchandise once the ships departed. The returning ships set out in December or January on the northeastern monsoon, a much milder wind (ibid., p. 289), though perhaps they took longer to make the crossing. They would, however, have been running more or less with the northern equatorial current (Hawkins 1977: 133); outward bound they would have been sailing against it. The southern wind that blew the ships northwards up the Red Sea lasted through April (Casson 1989: 284). If the ships arrived by then, there would still have been time to refit the ship and take on another cargo for the July departure to India. The intervisible towers along the Wadi Hammamat might have been called upon to signal Coptos to send the pack animals, or if the trains were already coming with export goods, they could have been re-loaded with Indian goods and sent back to the Nile Valley. Thus a round trip took only a year, with luck.

We have, then, Indian kingdoms that appreciated Western luxuries such as wine, manufactured goods, and Western-style palaces but were capable of utilizing raw metals and glass for local specialties.[30] Local as well as foreign merchants were involved in the trade at the ports (except perhaps Barbarikon), and Roman coins were certainly welcomed. Muziris is said to have owed "its prosperity to the shipping from Ariake ... as well as to Greek shipping" (*Periplus Maris Erythraei* 54), Ariake being the hinterland of Barygaza.

We cannot agree entirely with the statement that the Indians had little if any part in the overseas trade (Adhya 1966: 141–42). Goods from Ariake, and possibly Indian merchants as well, reached Adulis. Quseir al-Qadim yielded an amphora with an inscription in a southern Indian Brahmi script and what appears to be southern Indian pottery (Whitcomb and Johnson 1982: 7). Two-masted ships are depicted on a series of Indian coins of first to third century date (Sidebotham 1986: 31). Ships from Barygaza are reported in ancient sources at Apologos and Omana along the Persian Gulf (Whitehouse 1991: 217), and we have encountered Indians at Socotra. Indians at Alexandria are noted (Dio Chrysostom

29. In addition to Arikamedu, Roman amphorae have been recovered from Vasavasamudram to the north and from Karaikadu and Alagankulam to the south of Arikamedu (Raman 1991: 125).

30. It is hard to reconcile the above evidence with the statement that southern India was not very developed economically and socially, and that iron and its related technology were recent introductions (Raschke 1978: 671).

32.40; Adhya 1966: 141), if as rarities. Indian participation in long-range trade does appear to deal in staples (Casson 1989: 18) and, judging from the *Periplus Maris Erythraei*, is less extensive than Roman luxury trade. It has been suggested that Indians had an aversion to mercantile activity or simply no real need for any of the Roman products (Toussaint 1961: 41). Some of the Indian ports such as Barygaza, Nelcynda, and Muziris did have local merchants, and the kings certainly acted to further trade. Although no one, including the ancient Indians and Romans, needs exotic luxury goods, they did in fact want them enough to acquire them. Did the Indians lack the appropriate maritime technology or were the political and economic bases too unsettled or too limited to support major overseas ventures? We know even less about Indian ships in the first and second centuries A.D. than about the Roman Red Sea fleet.[31] As for the other possibility, the *Periplus Maris Erythraei* acidly notes that the rulers of Skythia (at the mouth of the Indus) "... are constantly chasing each other off [the throne]" (*Periplus Maris Erythraei* 38). The ongoing contests between the Sakas, Indo-Parthian Sakas, and the Andhras disrupted foreign trade, not to mention economic conditions within the countries in question. Without knowing the exact size, much less the population, of the Indian kingdoms, it is safe to say that they were smaller than the Roman Empire. It thus seems that the Indian kingdoms did attempt to engage in long-range trade but lacked the resources of the Romans.

One aspect of Indian participation is the embassies sent to Rome. This is clearly high level exchange, though it included bizarre items such as an armless boy and a sage who burned himself at Corinth (Dio Cassius 54.9.8; Charlesworth 1951: 140). The embassies date back to the time of Augustus, after the annexation of Egypt and the raid on the Red Sea, and come from as far away as king "Pandion," i.e., the ruler of Pandya in southern India (Desanges 1978: 317–18). Another embassy from one Porus, probably a king in northwestern India, brought a letter in Greek and an offer of cooperation, right of passage, and friendship (Strabo 15.1.4 and 15.1.73; Casson 1989: 38)—not a trade treaty but something that could further trade. In addition to royal gift exchange, the embassies may have arranged for the legally controlled harbors in India (Charlesworth 1951: 140) and the protection of foreigners who journeyed there.

The ports in question were not ports of trade in the West African sense, as at Whydah—take the slaves, leave the guns, and get out with a minimum of contact. Nor were they large trading colonies, though some had resident foreigners (Adulis, Rhapta, Socotra, Muziris, and perhaps the Saka kingdom), and two (Ptolemais Thêrôn and Adulis) are said to be Ptolemaic foundations. With a resident group of foreigners business could have been transacted more quickly, problems could have been dealt with during the non-trading season, and far more information about lifeways, technology, and the like could have been communicated. Some of the Indian ports lay within kingdoms at least partly on a money economy (Nelcynda, Muziris) or money plus goods designated for the royal court

31. By the Mamluk period (see *Chapter 5*) sewn boats were in use in the Indian Ocean. Although there is as yet no evidence for them in the first or second centuries A.D., both sewn boats and outriggers might have existed.

(Barbarikon, Barygaza), but in some manner worthwhile to the Roman traders. Adulis port seems to have operated mainly on barter plus a little money, and here also goods were designated for the king at Axum. Rhapta, too, had resident foreigners, Arabs from Muza and Romans for much of the year; the simple goods shipped there must have been exchanged by barter. For the African coast between Avalites and Rhapta there is no mention of kingdoms, and what other evidence there is points to smaller political units, perhaps on a chiefdom level. Chittick suggests that trade was carried on by nomads, and limited to a short trading season. Muza on the other hand was a major, if not the major, node in transit trade from the Red Sea, Africa, and India, and it exported its own myrrh and served the trade inland as well. Both money (*Periplus Maris Erythraei* 24) and, presumably, barter were employed in this most lively port.

Such evidence as there is, and the main sources are Greek, indicates that the language of trade, or a language, was Greek. Zoskales, ruler of Adulis, spoke Greek, and Greek-speaking traders lived at Adulis, Socotra, Apologos, Muziris, and perhaps at Barygaza and Arikamedu. Presumably the Muza merchants used a South Arabic language, though at least one South Arabic merchant left a Greek inscription (Sidebotham 1986: 128). There is a little evidence for Tamil at Quseir al-Qadim, but the great Mauryan ruler Asoka (third century B.C.) left inscriptions in India both in his own language and in Greek (ibid., p. 128; Casson 1989: 217).

Little as we know about the traders, means of exchange, and limitations on trade, we can say even less about the physical market places. Some may have been merely beaches off which the ships anchored, others may have had specially constructed market squares or warehouses.

The Greek designations for the ports provide only a little clarification. Casson translates *limen* as "port," *hormos* as "harbor," and *emporion* as "port of trade."[32] Myos Hormos, Berenice, and Moscha Limen are called *hormos apodedeigmenos* or "designated harbors." In the case of the two Red Sea ports, it may mean that they had guards for security (Casson 1989: 271–73).[33] The term of most interest here is *emporion nomimon*, translated as "legally limited port" and applied to Adulis, Muza, and Apologos at the head of the Persian Gulf. Casson suggests that the phrase meant a port "whose ruler insisted that all trade pass through his hands or those of his agents, where there was no free bazaar but only an authorized office of trade" (ibid., p. 276). Certainly the prosperity, and even the existence, of the Axumite and South Arabian kingdoms depended on maintaining and regulating wide exchange networks, but according to the *Periplus Maris Erythraei*, so did Muziris in the kingdom of Keprobotos (Keralaputra, Casson 1989: 217), though here no royal controls are noted.

32. Charlesworth (1951: 14) translates *emporion* as "treaty port," but this seems too specialized a definition.

33. Moscha Limen was a special case that did not need armed soldiers; it was protected rather by the gods themselves (*Periplus Maris Erythraei* 32).

One point that has been debated at least since Pliny the Elder's time is whether the Eastern trade was a serious financial drain on the Roman Empire. Pliny gave a figure of 100 million sesterces of gold spent on the Eastern trade, of which 50 million went to India (Pliny 6.101; Desanges 1978: 323). This for oriental luxuries that an old school Roman could do without. As for the manufactured products exported, Casson (1984: 184) feels that "... the meager exports of the Graeco-Roman world sent to the East ... were of scant value compared with what was imported ... ." One can query who decided what had "scant value." The princes of western India may not have needed Roman wine or singing boys or ribbed bowls, but they were exotic luxury items and status symbols, and people will pay dearly for status. Equally, the Roman ladies could have managed without silk or myrrh, but they did say something about one's wealth and social position. It can be argued on the contrary that the trade was not a suicidal drain on the empire and that it "had no serious adverse financial effect on the Roman Empire" (Raschke 1978: 632). Affordable or not, the trade was expensive. Whatever the cost of an item in China or India or Africa, it increased many times by the time it reached Alexandria. The shipping costs, losses in transit, the twenty-five percent *vectigal Maris Rubri*, the high interest rates, and other expenses would easily have doubled the cost. According to Pliny a camel load of incense, once it reached Roman borders, cost 688 denarii per load because of transport costs, dues, and tolls (Sidebotham 1986: 34), and it would be more costly still by the time it reached Rome. The other thing that is clear is that after the second century A.D., Roman influence was hardly felt in India (Toussaint 1961: 43), despite the resident traders. When the Roman Empire fell on hard times economically and militarily after about A.D. 180, it could no longer afford the expense of far-flung trading ventures or the costs of maintaining the desert police, roads, and remote and specialized settlements such as Leucos Limen. Once Axum and Adulis took over the Indian Ocean trade, Western merchants were excluded for centuries.

Having dealt with the problem of why the Indians did not manufacture much glass on their own—probably a lack of good ingredients and a large enough market—we turn to one final question: why was this particular assortment of glass vessels exported? The items most consistently recovered are ribbed bowls, mosaic glass, unguentaria, and beads. Quseir al-Qadim on the other hand has yielded these types as well as many other kinds of vessels, and especially large numbers of clear, mold-cast plates and bowls and thin, blown beakers. We suggest that it is partly a problem of recovery, especially in India. When only whole or nearly intact vessels are published, thousands of small, thin sherds have probably been discarded. Some kinds of unguentaria, flagon handles, and the rims of ribbed bowls survive because they are thick. Mosaic glass, inlays, and some kinds of beads are saved because they are pretty. The mold-cast vessels may have been selected for export in Roman times partly because they too are fairly thick and might survive transport well. If they were in fact exported to Africa or India, they have not been recovered (except at Axum), perhaps because they are colorless and do not stand out so brilliantly as the colored glasses. Some of the Quseir al-Qadim vessels are in fact still crystal clear and therefore do not necessarily even look ancient. As for the thin blown bowls and beakers, they may have been used only

at Quseir al-Qadim, in which case the Quseiris used a large number of them, or else they were too fragmentary to seem worth saving from the African and Indian sites.

CHAPTER 4

MAMLUK GLASS

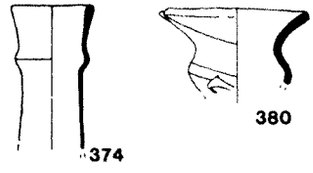
The glass from the late Ayyubid and early Mamluk period occupation of Quseir al-Qadim (late twelfth to early fourteenth century) shown on plates 15 to 20 (374 to 595) constitutes a smaller corpus than the Roman glass discussed in *Chapter 2*. The typology of the Islamic glass is laid out in a manner similar to the Roman typology, the conventions for illustrations are the same, as well as the format of the plate labels and the descriptive terms used.

There are however some differences. Without any exact counts, the Mamluk corpus is something over half the size of the Roman one, or a little over one-third of the entire Quseir al-Qadim glass corpus. All of the Islamic glass is blown whereas the Roman corpus included many mold-cast and mold-formed vessels. The Mamluk glass consists mainly of bottles (uncommon in the Roman period), vials, beakers, and bowls, plus some new items such as lamps and, notably, bracelets. With the modest exception of the perfume or kohl vials and the bracelets, most of the glass is utilitarian tableware, relatively little of which is decorated. The question may be raised as to whether the glass was as important an export item as it was in the Roman period, or whether the glass was being shipped to places like Quseir al-Qadim and the African ports primarily for the use of the Islamic settlers, secondarily for their local clients. Some of the Quseir al-Qadim glass may actually represent imports into Egypt, but discussion of this question as well as the possible places of manufacture is treated in the next chapter, which deals with glass trade in the Mamluk period.

Finally, there is far less comparable material for the Islamic glass than for the Roman corpus. Again, primary reliance is placed on excavated glass rather than museum collections for which the provenience is not known. On the other hand, it does make the Quseir al-Qadim glass the more valuable as being one of few carefully excavated, large, Mamluk corpora with a range of ordinary to luxury glass. One frequently cited reference, Lamm's (1929) *Mittelalterliche Gläser und Steinschnittarbeiten aus dem Nahen Osten*, is little used here because a provenience such as "Syria" or "Egypt" is far too vague and many of the dates assigned need reassessment, not uncritical acceptance. On the other hand, three sites (Aqaba, Siraf, and Serçe Limani) repeatedly referred to below are not published and in fact only partly overlap the Quseir al-Qadim sequence. Aqaba is still under excavation but has a long history running from the Umayyad period to ca. 1200 and perhaps later; a few

parallels are found here. The full Aqaba corpus will be prepared for publication by the present author, and the citations are included here by the permission of the director, Dr. Donald Whitcomb. The dating for Siraf also has not been worked out in final form, but most of the material ranges from ca. A.D. 700 to 1000. Although this was the heyday of Siraf, there are earlier Sassanian remains, and later occupation down to ca. 1500 as well. The archaeological evidence suggests that the decline of Siraf after the 977 earthquake was less abrupt than the Arab writers indicated (Tampoe 1989: 79–80, 82). Thus, even lacking a specific locus and period assignment for a given sherd, it is still at least possible for it to have a parallel at Quseir al-Qadim. The Siraf material is cited by courtesy of Dr. David Whitehouse of The Corning Museum of Glass. Thanks are due to Dr. George Bass for permission to note comparisons to the Serçe Limani glass. The early eleventh century Serçe Limani shipwreck is roughly 150 years earlier than the reoccupation of Quseir al-Qadim, but some parallels for forms may be noted nonetheless. This does not mean that the Quseir al-Qadim glass can be dated to ca. 1025—the corpus as a whole is different—but that certain forms were long-lived enough to appear in both corpora, which is sometimes useful in determining possible shapes for the highly fragmentary Quseir material.

Bubble Neck Bottles (374–83)



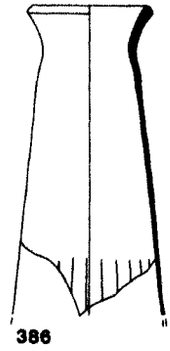
The bubble neck bottles all have a bulge or bubble below the mouth, probably to facilitate grasping them. Sherd 383 is a little different, more like a cup or funnel mouth bottle, but it has been grouped here because there is nothing else like it in the corpus. This mouth shape may also be functional, to allow pouring liquids into the container. Bottles 374–76 have bulges a little down from the mouths whereas the bulges on 377–82 are closer under the rims. Bottle 380 is decorated with a trailed thread. Another bubble neck bottle from J10a-9 was too fragmentary to draw. It was of emerald green glass with a dirty white patina, and although no joins could be proved the similarity of the glass and weathering indicate that the vessel is represented from rim to base. In addition to its bubble neck there are sherds of the neck to shoulder angle, very thin body sherds, and a fairly thick kick-up base (diameter ca. 4 cm) with a pontil scar. Four other bubble neck bottles from Quseir al-Qadim were drawn but are not illustrated here.

Although the bubble neck bottles can be grouped together, they are individual enough and some of the parallels from other sites are so remarkably close that the bottles are discussed one by one. Bottle 374, with a slightly flaring mouth, resembles bottles from Hama, undated (Riis and Poulsen 1957: 41); Gedi in Kenya (Kirkman 1954: 152, 183); and perhaps Siraf (Whitehouse, pers. comm.). Bottle 375 with a beveled rim is virtually a twin to bottles from Mafia off the coast of Tanzania, fourteenth century or earlier (Morrison 1987: 303), from Mombasa, fourteenth century (Sassoon 1980: 32), and from Kilwa, mid-fourteenth to early fifteenth century (Chittick 1974: 402–03). Flaring mouths like that of 376 may be noted at Hama, undated (Riis and Poulsen 1957: 35), and Mafia, ninth to fourteenth century (Morrison 1987: 301–02). Beveled rims with bulges near the mouth like

377–79 may occur at Al Mina in Syria, given as ninth to tenth century though there is twelfth to thirteenth century glass at the site as well (Lane 1938: 63, 66), and they certainly occur at Aidhab, tenth to fourteenth century (Harden 1961: 73–74), and at Kawd am-Saila and al-Qaraw in the vicinity of Aden (Lane and Serjeant 1948: 129; Whitcomb 1988: 245). A more flaring rim like 380 occurs on vessels from Aidhab, tenth to fourteenth century (Harden 1961: 73–74); Kilwa, late twelfth to late thirteenth century (Chittick 1974: 398–99); Manda, mid-ninth to late thirteenth century (Morrison 1984: 166–67); and Hama, undated (Riis and Poulsen 1957: 35). The sharp bulge on 381 seems to occur on a bottle from Kawd am-Saila near Aden, ca. fourteenth to sixteenth century (Whitcomb 1988: 245); Aidhab, tenth to fourteenth century (Harden 1961: 73–74); and perhaps Beth Shan, "Arab and Byzantine levels" (Fitzgerald 1931: 42, pl. 39). The relatively prominent bulge on bottle 382 may have a parallel at al-Qaraw in the vicinity of Aden, late twelfth through thirteenth century (Whitcomb 1988: 245).

The funnel mouth 383 resembles a bottle said to come from Sennar, probably thirteenth–sixteenth century (Harden 1961: 69–70); a rim from Kilwa reported as a very small bowl?, mid to late thirteenth century (Chittick 1974: 400–01); and a bottle from Hama, undated (Riis and Poulsen 1957: 35). A bottle from Baalbek with a small funnel mouth like 383 expands to a very large body somewhat like 399 (Kohl et al. 1925: 137–38). Earlier examples of funnel mouth bottles are reported from the Serçe Limani shipwreck, 1025 (Bass 1984: 68–69, fig. 5, and pers. comm.); and perhaps even Mezad Tamar, late third to early seventh century (Erdmann 1977: 127, pl. 4). Earlier examples of bubble neck or funnel mouth bottles from Siraf, Serçe Limani, or Aqaba do not mean that the Quseir al-Qadim vessels are tenth or eleventh century, only that the forms are long lived; the Mezad Tamar rim would have to be reinspected.

Bottles with Slightly Flaring Mouths (384–86)

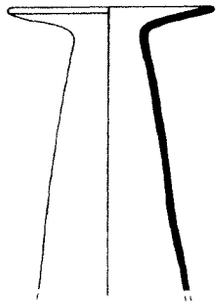

386

At least two of these bottles (385, 386) open downwards to conical necks wider towards the bottle body than towards the mouth. Bottle 386 has lightly molded ribs. Another sherd that may be a crude bottle mouth is not illustrated. The best parallel for 384 seems to come from Siraf (Whitehouse, pers. comm.). The closest comparanda for 385 and 386 come from Africa, at Mafia, ninth to fourteenth century (Morrison 1987: 301–02), and at Kilwa, ca. 1000 to late twelfth century (Chittick 1974: 402–03). Other similar bottles may be noted at Hama, undated (Riis and Poulsen 1957: 34, 41), Serçe Limani if with a straighter neck (Bass, pers. comm.), and perhaps in the series of "bag bottles" from Aqaba.

Bottles with Broad, very Flaring Rim (387, 388)

Only two examples of this kind of bottle rim were recovered at Quseir al-Qadim, but they are well attested elsewhere, mostly twelfth century or earlier. Similar bottles are reported from Manda, mid-ninth to early eleventh century (Morrison 1984: 165); Mafia eleventh–fourteenth century (Morrison 1987: 301–02); Kilwa, probably ca. 1500 (Chittick

1974: 406–07); Al Mina, listed as ninth–tenth century but possibly twelfth–thirteenth (Lane 1938: 63, 66). Many others are known from the Serçe Limani shipwreck (Bass 1984: 66, 68–69), and even Siraf (Whitehouse, pers. comm.), and Corinth, possibly ninth century (Davidson 1952: 113–15). Thus the bottle with broad, very flaring rims from Quseir al-Qadim may pertain to the earlier part of the Mamluk period; the date for the bottle from Kilwa is a *locus* date and there are earlier materials at the site.



388

Bottle Necks (389–93)

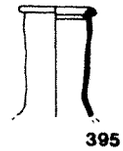
The bottle necks could have come from any of the three kinds of bottles discussed above, bubble neck, slightly flaring rim, or broadly flaring rim. Two of the bottle necks (389, 393) are conical like 385, 386, and 388, and the remaining three are more cylindrical. Four more cylindrical necks, presumably from bottles, are not illustrated. Given that entire vessels or at least rims are more diagnostic, we note only a few comparanda for the necks. Of two bottle necks from Baalbek with thread decoration like 389 and 393, one has a funnel mouth somewhat like 383, and the other, a flaring mouth like 388 (Kohl et al. 1925: 138–39). A conical bottle from Manda, mid-ninth to early eleventh century, seems to have spread out to a broadly flaring rim (Morrison 1984: 165). The funnel mouth bottle already mentioned, said to have come from Sennar, probably thirteenth to sixteenth century, has blue trailed threads on the neck (Harden 1961: 69–70). A flask with a flaring rim and trailed threads on the neck like 389 and 393 was recovered at Carthage, thought to be early Islamic intrusive into Byzantine levels (Tatton-Brown 1984: 205: fig. 67). Finally, a green bottle neck from Kawd am-Saila in the vicinity of Aden, ca. fourteenth–sixteenth century (Van Beek, pers. comm.) seems similar to 390 and 392 in shape, color, and thinness of the glass.

Bottle Bottom (394)

At least some of the bubble neck bottles had kick-up bases as noted above, but 394 indicates that other bottles or jars could have had round bases. A smaller round base was found at Siraf (Whitehouse, pers. comm.), and apparently ten or more at Beth Shan, broadly dated to "Arab and Byzantine levels" (Fitzgerald 1931: 42).

Bottle Rim (395)

This rim does not fit with any of the main groups of bottle rims (374–88), and its color, dark brown, is also somewhat unusual. This general kind of rim, folded in and downwards so as to leave a ledge on the inside, has been recovered at Aqaba, but other parallels are hard to find.



395

Sprinkler Bottles (396–98)

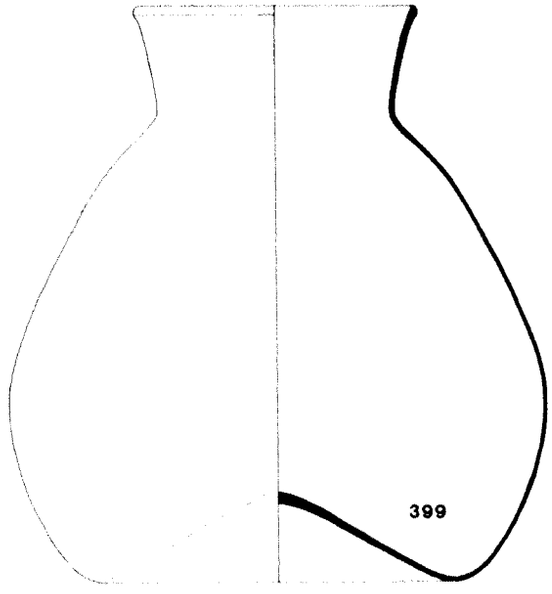
These are not the classic sprinkler bottles with long necks and pipette-like mouths (see perhaps 474), but the Quseir al-Qadim vessels do have very restricted mouth openings. But

for this they would be "... uncomfortably similar to the common rim on Roman [vessels]" (Whitcomb 1982: 234–36). Two of the vessels did come from Islamic loci, and the third from a mixed locus, a pocket in the caliche. A fourth example, not illustrated, is less restricted at the mouth opening but it too has an Islamic locus. Heavy, folded-in rims, some with narrow mouths, have been listed at Siraf (Whitehouse, pers. comm.), and at least one thin, crude rim at Aqaba. The main occupation of both these sites was earlier than Quseir al-Qadim, so only a general type continuity, not a direct connection, can be suggested.


397

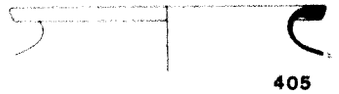
Jars with Tall Necks (399–402)

Bottles are defined as having necks taller than the mouths are wide, and jars, as having necks shorter than the mouths are wide. Jars are further divided into relatively tall necks (399–402) and quite short necks (403–06). The prize is clearly 399, one of few vessels that could be reconstructed from rim to base. The rim shape if not the color of the glass is close to 401, and both in turn resemble a thinner jar from Siraf (Whitehouse, pers. comm.) and smaller jars from Aidhab, probably tenth–fourteenth century (Harden 1961: 73–74), and Aqaba. The base is similar to a "white glass" base from Gedi (Kirkman 1954: 152, 183). Rolled-in rims like 400 are a fairly common means of finishing blown vessels in any period (cf. Susa, A.D. 750–800, Kervran 1984: 216–17). The slightly ribbed neck, however, seems more characteristic of earlier Abbasid glass. The neck sherd 402 is listed with jars because it would have made a large bottle indeed, but the trailed thread decoration does resemble 389 and 393.


399

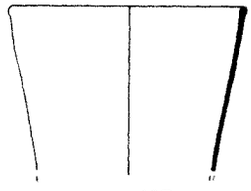
Jars with Short Necks (403–06)

These jars display a variety of rim forms, but unfortunately we have little idea about the rest of the body. A vessel from Kilwa, with a rim similar to 403 spreads downwards to a squat, carinated body with a kick-up base (ca. 1400–1500, Chittick 1974: 408–09), but a vessel from Kawd am-Saila, fourteenth–sixteenth century, seems to curve down to a more rounded body (Whitcomb 1988: 245). A rounded-out rim like 404 may be noted on a squat jar from Soba that has broad, round shoulders and a kick-up base (ninth–twelfth century, Harden 1961: 61–62). A jar from Corinth found with Early Byzantine pottery but thought to be Islamic, perhaps eleventh century, has a similar rounded-out rim and "bean pot" body (Davidson 1952: 120–21), and two other rims like 404 have been recovered at Siraf


405

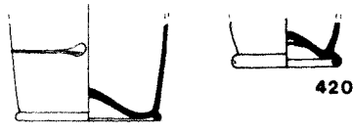
(Whitehouse, pers. comm.). The thickened, rounded-out rim 405 finds its best parallels at Aidhab, tenth–fourteenth century (Harden 1961: 73–74), but some other rims may be noted at Siraf, ninth–eleventh century or later (Whitehouse, pers. comm.), and perhaps at Hama, possibly tenth–twelfth century (photograph only, Riis and Poulsen 1957: 32–33). The abrupt, simple rim 406 seems most like one from Manda, mid-ninth to eleventh century (Morrison 1984: 166–67) and somewhat like one from Kilwa, late thirteenth century to ca. 1500 (Chittick 1974: 408–09).

Beakers (407–11)


407

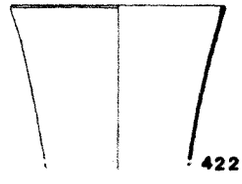
If cylindrical cups were the most common glass drinking vessel in the Abbasid period, by the time of Quseir al-Qadim their place had been taken by decorated or undecorated beakers with sloping sides and coiled-on bases. The beakers have thin and fragile walls, and hence may not be well represented in the literature. One other beaker out of the Quseir al-Qadim corpus was drawn and published (Roth 1979, pl. 61c) but is not included here as being redundant. Plain beakers like 407–09 and 411 seem to occur at Aidhab, eleventh century to 1426 (diameter not given, Harden 1961: 73–74); at al-Qaraw in the vicinity of Aden, late twelfth through thirteenth century (Whitcomb 1988: 245); and Kilwa, late thirteenth century to ca. 1400 (Chittick 1974: 400–01). Beaker 410 with a trailed thread has good parallels at Meiron, eleventh to thirteenth century (Meyers, Strange, and Meyers 1981, pl. 9.12) and at Siraf (Whitehouse, pers. comm.).

Coiled Bases (412–21)


413 420

If the delicate beaker bodies seldom survived well enough to be drawn, their heavy coiled bases did. In addition, five others were drawn, four of which were published with the 1978 Quseir al-Qadim glass but are not included here. Bases 412 to 421 were selected to show the range from largest to smallest, thread decorated or plain, moderate kick-up base to high kick. The best parallels again come from Aidhab, eleventh to fourteenth century (Harden 1961: 73, 75), and Siraf (Whitehouse, pers. comm.), though we note also a small beaker from Baalbek with a kick-up base and applied base ring (Kohl et al. 1925: 137–38).

Beakers with Coil Decorated Rims (422–24)


422

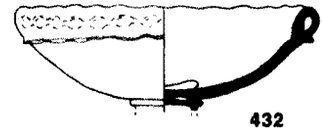
These beakers are the same shape as 407–11 but have a trailed on-rim of light blue or turquoise glass. All came from the P8 area, the Merchants' Houses. The only parallel located to date is one vessel from Corinth, though the applied greenish blue coil seems thicker than on the Quseir al-Qadim beakers. The Corinth piece is dated Late Byzantine, which here means after the twelfth century (Davidson 1952: 83, 120).

Beakers with Applied Decoration (425–31)


429

Three of the beakers discussed above have trailed thread decoration, but this grouping refers to ones with more elaborate zig-zags, prunts, and blue coiled bases as well as threads. Sherds 425 and 426 have trailed-on zig-zags, which may also be seen on the lower part of a beaker from Hama. It has trailed-on threads and a coil base as well, and it comes from a layer "*au-dessous de la couche superficielle*," which seems to mean before 1400 (Riis and Poulsen 1957: 58–59). The prunted beakers, of which at least one more sherd from Quseir al-Qadim is known, are also paralleled at Hama, mostly from the "*couche superficielle*" (ibid., pp. 57–59). Lamm sketches some prunted vessels said to come from Egypt and Syria (Lamm 1929, pls. 26–27). To date no parallels for the coiled-on blue bases have been found in excavated corpora, unless this feature exists but was not noted for the Hama beakers.

Fruitstand (432–35)


432

Item 432 is too small to be a real fruitstand; the label refers only to its shape as a pedestaled bowl. The best explanation for the odd looping at the join of bowl and base comes from some vessels from Hama. Here it can be seen that the side of the hot parison was pushed deeply inwards until the sides closed or almost closed at the center. The small central hole, if any, was filled by a blob of glass. The process also produced the waist, leading (where preserved) to a flaring foot. One of the Hama fruitstands has trailed-on threads (Riis and Poulsen 1957: 40, 47–48, 53–55), but none has a looped-out rim or the molded or pinched decoration of 432.

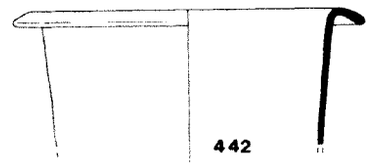
Rims 433 and 434 are included here because they are more like the fruitstand than the other looped-out rims (484–86). Another rim almost identical to 433 is not illustrated here. All of these, but especially 434, could be merely ordinary bowls; the latter sherd has a good parallel at Aidhab, tenth–fourteenth century (Harden 1961: 73–74), and perhaps at Gedi, eleventh–thirteenth century (Kirkman 1954: 152, 183). The pedestal base was grouped here because it is more similar to the Hama fruitstands than to any of the Quseir al-Qadim coiled, kick-up, or looped bases discussed below.

Green Bowls (436–40)


436

What cannot show up on a black and white line drawing is the bright green color of all these bowls. One is bubbly (439), one is opaque (440), but most are of good quality glass and all are a true emerald green, not a muddy natural green. Two others were drawn but not included; one is almost identical to 436, and the other, to 438. Comparanda are at best sparse. A green glass cup is reported from Hama, undated (Riis and Poulsen 1957: 39–40), and a small, thin emerald green cup or bowl is known from Aqaba.

Basket Bowls (441–43)



Bass referred to some bowls with very broad, nearly horizontal rims from the Serçe Limani shipwreck as "basket bowls" and the name is retained here, though the Quseir al-Qadim rims are less extreme. Nearly flat rims somewhat like 441 are reported from Aidhab, probably twelfth–fifteenth century (Harden 1961: 70–71); Manda, mid-ninth to early eleventh century (Morrison 1984: 162); and Serçe Limani (Bass, pers. comm.). A turned-down rim like 442 is found on a cup or bowl from Serçe Limani (Bass, pers. comm.). The tilted up rim 443 is best paralleled so far at Siraf (Whitehouse, pers. comm.). Although all the comparanda cited are bowls or cups, it is just possible that some of Quseir al-Qadim rims are actually jars, if large ones (cf. Riis and Poulsen 1957: 45).

Vials (444–59)

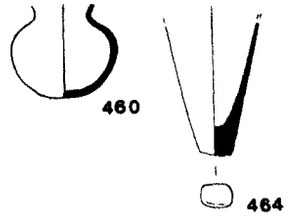
A notable variety of vials, presumably for perfume or kohl, were excavated at Quseir al-Qadim. Both perfumes and medicines were trade items in the twelfth and thirteenth centuries (Dikshit 1969: 66). The Quseir al-Qadim vials occur in many colors: shades of green, yellow-green, olive, emerald (plus one not illustrated), light blue-green, light blue, cobalt blue (plus two not illustrated), amber, black (possibly very dark olive or amber), reddish purple, and light yellow-green with a purple coil at the rim (456). Many of the rims are beveled (445–48, 452), but some are even more poorly finished (444, 449, 451). A few are thickened and flattened at the rim (450, plus one not illustrated), and a few others are rolled in (453, 454), everted (455, 457), or coil decorated. Such necks as are preserved are fairly tall (458, 459), but apart from 444 it is difficult to determine what the bodies looked like.

Comparanda are surprisingly sparse. A pale green vial from Mafia, fourteenth century or earlier, has a slightly flaring thickened rim and a bulge in the neck similar to 444 (Morrison 1987: 303). A tall, ovoid body somewhat like 444 is published from Beth Shan, "Arab and Byzantine levels" (Fitzgerald 1931: 42). A light green, thickened vial rim like 450, emerald green, is known from the Hadhramaut survey, dated to about 1150–1500 (Whitcomb 1988: 245). Vials from the Serçe Limani shipwreck have beveled rims and tapered necks like 445 and continue to narrow, angled shoulders and a slender cylindrical body (Bass, pers. comm.). Similar but wider-bodied vials are noted at Corinth, twelfth century (Davidson 1952: 113, 116), and perhaps Al Mina, ninth–tenth century or later (Lane 1938: 63, 65–66). A square-rimmed *colorless* vial from Mafia dates to the fourteenth century or earlier (Morrison 1987: 303). Further discussion of possible body shapes is included with the vial bases below.

Vial Bases (460–65)

The bases grouped here have little in common except that judging from their size and other features they could have come from vials. Flasklets or phials with round bases like 460 and fairly wide, slightly flaring mouths are published from Manda, late ninth to late

thirteenth century (Morrison 1984: 171), and Mafia, fourteenth century or earlier (Morrison 1987: 303). The elaborate profile of 461 has a parallel of sorts in an eleventh century bottle from Fustat with deeply indented sides (Scanlon 1984: 17). A squat vial from Susa, late ninth century, has similar proportions, if a simpler outline (Kervran 1984: 218–19). Bases 462 and 463 could conceivably be lamp stems (see 476–79) but were listed with vial bases either for the odd shape (463) or because the color, black, is unsuitable for a lamp (462). Bases 464 and 465 on the other hand can more confidently be called vials because they are squarish like the decorated vials 471–73. Also, they are rather dark glass for lamps, cobalt blue and dark green. Base 464 seems to have a parallel in a dark blue base collected by the Southern Ghors and Northeast 'Araba Survey (Meyer 1992); in a green base from Gedi (Kirkman 1954: 152, 183); as well as in a slender, square base from Kilwa, ca. 1000 to late twelfth century (Chittick 1974: 398–99); and a dark green base from the Hadhramaut survey, ca. 1150–1500 (Whitcomb 1988: 245). We note also a square base from Aqaba and perhaps even a base from Qasr-i Abu Nasr (Whitcomb 1985: 72–73, 155).

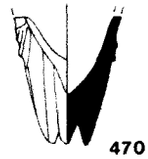


Cut Vials and Molar Flasks (466–73)

Separating sherds of molar flasks from those of square-bodied vials is not as obvious as it may seem at first. All the Quseir al-Qadim square-bodied and molar flasks are cobalt blue and have cut decoration. Judging from parallels (cf. Corning 1957: 281), molar flasks could have square shoulders and cut necks, though some vessels, such as 471 and 472, ended in square, stumpy bases rather than four legs or molar "roots." No close parallels have yet been found for the neck 466, but we may note a dark blue scent bottle neck with cut decoration from Aidhab, probably ninth–eleventh century (Harden 1961: 72–73), and the Corning molar flask mentioned above. Polygonal vial necks in general seem earlier, Abbasid period. The rather tall, narrow necks (466, 467) seem to continue to rounded shoulders (467–69) and squarish bodies (472, 473, one not illustrated). A cobalt blue vial from Fustat with shoulder decoration almost identical to 468 and 469, found in a sump along with a Mamluk water bottle filter, is nonetheless referred to Lamm's (1929) ninth century date (Scanlon 1967: 77). A bottle shoulder from Hama has a curving decoration very much like 468 but is made of an unusual opaque turquoise glass (Riis and Poulsen 1957: 53–54). A dark blue bottle from Aidhab, probably ninth–eleventh century, has cut decoration of U-shaped designs and fillers (Harden 1961: 72–73), and a dark blue bottle shoulder from Serçe Limani, ca. 1025, has a similar shape but cut designs of a quite different style (Bass, pers. comm.). The cut ovals with hatched filling on the Corning molar flask (Corning 1957: 281) are somewhat similar to 469 as well.

The one definite example of a molar flask (470; the other fragment is badly broken and not illustrated) seems to have a cut "U" decoration on its body. The problem here is that molar flasks—whether dark blue, green, or colorless, elaborate like 470 or simpler—are usually said to be much earlier, ninth–tenth century (Lamm 1929; Lane 1938: 63, 66;

Whitehouse 1968: 19; Clairmont 1977: 91–92, pl. 17; Kubiak and Scanlon 1989: 51). However, a molar flask from Kilwa, colorless and quite different from 470 but four-footed nonetheless, has a late twelfth to late thirteenth century context (Chittick 1974: 398–99). For the sake of geographical distribution, we note one of the few Indian comparanda, a four-legged scent bottle from Brahmanabad in the Sind, which is dated stylistically to ninth–tenth century (no illustration, Dikshit 1969: 65).


470

Spouts (474–75)

A variety of ancient spouted vessels are often called "alembics" or "cupping glasses." An alembic must have at least a head with a spout to catch the distillate and drip it *down*. The vessels with spouts drooping down (*up* if inverted to make a spouted head) would at best be inefficient alembics (Al Mina, ninth century, Lane 1938: 63, 66; Fustat, eleventh century, Scanlon 1984: 29; Qasr-i Abu Nasr, early Islamic, Whitcomb 1985: 158–59). Vessels with spouts rising up, (down if inverted) might be somewhat more efficient depending on the shape (Clairmont 1977: 110–11, pl. 23; Fustat, Scanlon 1984: 25). A cupping glass is partly evacuated of air by means of heat in order to suck blood from a cut or wound, but the glass does not have to have a spout. Sherd 475 is curved enough for an alembic but as nothing else is preserved of the vessel, it is here simply labeled a spout. Sherd 474 could be a sprinkler bottle of the long-necked, tiny mouth type, but in this case the actual mouth or rim is missing. "Alembic" or other spouts are usually attached separately to the body, and the fact that the spout 474 seems continuous with the vessel body suggests that it may be a sprinkler bottle (cf. Kawd am-Saila, Whitcomb 1988: 245; Hama, possibly thirteenth–fourteenth century, Riis and Poulsen 1957: 34). On the other hand, it does not resemble the restricted-opening bottles called "sprinkler bottles" (396–98) discussed above, the mouth is broken off and hence inconclusive, and the "spout" may be off center.


475

Lamps (476–79)

These are the bases of stemmed (478) or roughly conical lamps (476, 477, 479) that had to sit in a holder of some sort, often metal. The lamp bodies would have opened out to a bowl shape to hold the water, oil, and wick. The bodies were much thinner than the heavy bases, and they had to be in order to let the light shine through. Several thick green(?) bases like 476 and 477 are published from Aidhab, tenth–fourteenth century (Harden 1961: 73, 75), and from the vicinity of Aden at al-Qaraw, late twelfth through thirteenth century, and at Kawd am-Saila, fourteenth–sixteenth century (Whitcomb 1988: 245). A nearly solid lamp stem like 479 is reported from Aidhab, tenth–fourteenth century (Harden 1961: 73, 75). Stemmed and conical lamps have a wide distribution and go back at least to Byzantine times. We note here only two other late period stemmed lamps like 477, an example from Siraf (Whitehouse, pers. comm.) and one from Meiron, eleventh–fourteenth century (Meyers, Strange, and Meyers 1981, pl. 9.13).


479

Stemmed lamps with a bulb at the tip also have a long history (cf. Meyer 1987: 203, 205). We may however mention a number from Kawd am-Saila near Aden, fourteenth–sixteenth century (Whitcomb 1988: 245; Monod 1978: 124), and perhaps an example from Kilwa, ca. thirteenth–seventeenth century, labeled "phial? base" (Chittick 1974: 400–01).

Mosque Lamps (480–83)


480

Mosque lamps are represented here only by handles. The bodies were usually broad and jar-like and the mouths were generally short, flaring, and wide enough to admit the separate flame-holding lamp. The bodies were quite thin in order to transmit the light, so it is not surprising that only the blob-like handles survived. There were usually four of them to take the suspension chains. Although there is no evidence for it in these sherds, mosque lamps were sometimes beautifully decorated with enamel, gilding, and Koranic verses. The attention given to lamps may stem from the fact that in Islamic tradition as in Christianity, a shining light was an image of God. The Verse of Light sometimes written on lamps runs as follows:

> God is the light of the heavens and the earth; a likeness of His light is like a niche in which there is a lamp; the lamp is in glass; the glass is as if it were a shining star (Atil 1981: 120).

The two plain greenish handles 480 and 481 (plus one not illustrated) have parallels at Mafia, eleventh–fourteenth century (Morrison 1987: 304); Manda, mid-ninth to early eleventh century (Morrison 1984: 175); and Aqaba. The dark blue handle 482 applied to a transparent body is very like a handle from Manda, mid-ninth to late twelfth century, as well as some very large, somewhat earlier mosque lamp handles (ibid., p. 175). The narrower handle 483 is quite similar to a blue handle on a colorless body from Kilwa, late thirteenth century to ca. 1400 (Chittick 1974: 400–01); a sherd from Gedi (Kirkman 1954: 153, 184); clear or light blue-green handles from Manda, mid-ninth to early eleventh century (Morrison 1984: 175); and Aqaba sherds. Finally there are a number of blob or mosque lamp handles from Siraf (Whitehouse, pers. comm.), some as large as the Manda handles, and an entire upper half of a lamp from Serçe Limani. The latter seems to have a broad, cylindrical body, a bubbly fabric, a wide, flaring mouth, and four unevenly spaced blob handles on the shoulder (Bass, pers. comm.).

Looped Rims (484–87)


485

Three of the rims (484–86, plus one not illustrated) are looped out, and 487 is looped in. The first three could come from bowls; looped-out rims with a different profile have already been discussed with the fruitstand. Looped rims having a hollow space in cross-section are such a common means of finishing vessels that we note only a rim from Meiron, dated to the eleventh–fourteenth century (Meyers, Strange, and Meyers 1981, pl. 9.10). The looped-in rim 487, plus a similar but broader one not illustrated here (Roth 1979, pl. 60d), might come from a bottle or jar. Rims of this sort have been recovered from Siraf (Whitehouse, pers. comm.), and

perhaps an example from Soba in the Sudan, a small flasklet from a ninth–twelfth century locus (Harden 1961: 63, fig. 37).

Miscellaneous Rims (488–503)

The number of one (or two) of a kind rims, of which many of the body forms can only be guessed at, suggests a wide variety of glass vessels at Quseir al-Qadim. The thick rim 488, plus one not included here (Roth 1979, pl. 59d), probably came from a bottle, body shape as yet unknown. The curved-down rim 489 could be a bottle or jar, but no comparanda have yet been found. The amber colored rim 490 could be a beaker, though the color is uncharacteristic, or a flask or bottle rim as at Manda, mid-ninth to late thirteenth century (Morrison 1984: 166–67). The folded-in rims 491 and 492 probably came from bottles with slightly flaring necks like one from Siraf (Whitehouse, pers. comm.). Rim 493 could not be checked, but if it were thinner and steeper it could be a beaker like 407, or it could be a flaring jar mouth like those from Hama (Riis and Poulsen 1957: 36–37) and Siraf (Whitehouse, pers. comm.). The most unusual rim is certainly 494. One possibility is that it is the very top of a bulge-neck bottle, somewhat like those recovered from Serçe Limani (Bass, pers. comm.), Siraf (Whitehouse, pers. comm.), and perhaps Qasr-i Abu Nasr, also dark green (Whitcomb 1985: 156–57). A small pot with an incurved rim from Serce Limani is also known (Bass, pers. comm.). Even more problematic are some incurved rims from Siraf (Whitehouse, pers. comm.). Rim 495 may be a cup or beaker; it was found with four body sherds and a thin kick-up base that might pertain to it. Vessel 496 seems too large for a beaker like 422 or 423, but the rim treatment, a trailed-on coil of blue, is the same. The thickened rim 497 could have come from a bowl or even a jar; it seems rather thick for a drinking vessel. Bowl 498 had no good locus (surface) but was placed with the Mamluk glass on the basis of the quality of the glass, a gray-green with many bubbles and impurities. The thickened, triangular rim 499 (plus one illustrated in Roth 1979, pl. 63c) resembles a bowl from Aidhab, twelfth–fifteenth century (Harden 1961: 70–71). Rims 500 and 501 are similar but turn down more abruptly. The thin, light blue-green rim 502 could have been a bowl as could a somewhat thicker yellow-green one (not illustrated). The thick rolled-out rim 503 was checked and the angle seems correct, but if so there are as yet no parallels for it. There are however some thick, rolled-out rims with similar profiles that narrow in to the mouth rather than flaring out. They have been called "large bowls with restricted necks" and are known from Manda, mid-ninth to early eleventh century (Morrison 1984: 162); Aidhab, tenth–fourteenth century (Harden 1961: 73–74); and the Hadhramaut survey, ca. 1150 to 1500 (Whitcomb 1988: 245).

Kick-up Bases (504–12)


506


509

Unlike the wide variety of rims, there are far fewer kinds of bases. Special shapes such as round base (394), coiled-on beaker bases (412–21, 428–31), pedestal base (435), vial bases (460–65, 470–71), and lamp stems (476–79) have already been discussed. All the other bases are kick-up or looped. The

range of kick-up bases 504–12 is intended to show only the range of sizes, thickness, and height of kick. Five other bases were drawn but are not illustrated, and many more were recovered. Depending on size, the bases here could have come from beakers, bowls, bottles, jars, or other forms. Kick-up bases were and are such a standard means of forming a base that they would be remarkable only if they were completely absent from a corpus. Given such limited usefulness for chronological or distribution purposes, only a few comparanda for the more distinctive bases are noted. Bases with very high kicks like 506 are reported from Manda, mid-ninth to twelfth century (Morrison 1984: 173); Aidhab (Harden 1961: 73–75); and a number from the vicinity of Aden at Kawd am-Saila, Khanfar, and other sites (Whitcomb 1988: 245; Van Beek, pers. comm.). Other kick-up bases similar to the Quseir al-Qadim ones are known from Kilwa, late twelfth century to ca. 1400 (cf. 504; Chittick 1974: 398–99); Aidhab, tenth–fourteenth century (cf. 507, 510; Harden 1961: 73, 75); the vicinity of Aden at al-Qaraw and Kawd am-Saila (Whitcomb 1988: 245; Van Beek, pers. comm.); Hama (Riis and Poulsen 1957: 39–40); and Meiron, eleventh–fourteenth century (Meyers, Strange, and Meyers 1981, pl. 9.13). Given the number of other comparanda with these sites, kick-up bases would be surprising only if lacking.

Looped Bases (513–19)


518

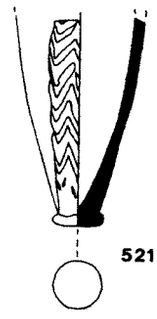
Looped bases are made by kicking up the vessel base and narrowing it in to form a hollow tubular base. Like simple kick-up bases, it is a very common means of making a base. Again, a variety of vessels from vials and beakers to bowls, bottles, or jars could have looped bases, as may be suggested by the angles of the sides of the examples shown here. The small, thick base 513 has a twin at Aidhab, tenth–fourteenth century (Harden 1961: 73, 75), and a parallel at Manda, mid-eleventh to late thirteenth century (Morrison 1984: 173). As might be expected, looped bases very similar to certain of the other Quseir al-Qadim bases are known from Kilwa, late thirteenth century (Chittick 1974: 402–03); Mafia, eleventh–fourteenth century (Morrison 1987: 304); Gedi (Kirkman 1954: 153, 184); al-Qaraw, late twelfth through thirteenth century (Whitcomb 1988: 245); Southern Ghors and Northeast 'Araba Survey (Meyer 1992); Meiron, eleventh–fourteenth century (Meyers, Strange, and Meyers 1981, pls. 9.12, 9.13); Hama (Riis and Poulsen 1957: 35–36, 47–48); and Siraf (Whitehouse, pers. comm.).

DECORATIVE TECHNIQUES

Molded Decoration (520–22)

Mold blown decoration was more or less common from the invention of glass blowing onwards. Relatively abundant during Roman times—though not at Quseir al-Qadim itself—and in the Abbasid period, it was less popular in the Mamluk period, judging from the present corpus at least. A few molded pieces have already been discussed, such as the ribbed bottle 386. The small bottle or jar 520 with ribs could not be checked but was almost certainly blown rather than tooled; its counterparts from other sites are. We may note a ribbed

base from Siraf (Whitehouse, pers. comm.); an amber, optic blown flask base from Soba, ninth–twelfth century (Harden 1961: 64, fig. 37); a ribbed flask from Manda, mid-eleventh to late thirteenth century (Morrison 1984: 169); and a thick, ribbed vial or bottle and some thin, ribbed shoulders from Kilwa, late twelfth century to ca. 1400 (Chittick 1974: 408–09). The unusual herringbone molded vial 521 has as yet no excavated parallels. The dark green rippled or ribbed sherd 522 may have been optic blown, like one other sherd of blue-green glass, no provenience, noted but not drawn. A sherd (not illustrated) with a diamond pattern like 523 was also optic blown, that is, blown once into a mold to receive the pattern and then blown again without the mold to expand and thin the vessel. The result is a vessel wall with the design shaped on the back as well as the front. Simple molded patterns such as dimples or diamonds go back to Roman times but became quite common in the Abbasid period (e.g., Aqaba). Mamluk comparanda are sparse, though there is a base with molded lozenges from Manda, mid-eleventh to late thirteenth century (Morrison 1984: 169), and a dimpled sherd from Hama (Riis and Poulsen 1957: 51–52).


521

Cut-out Loops (524–26)

Cut-out loops such as these, probably from squat jars or perhaps small bowls, are well attested at Kilwa on large and small bowls and a vessel neck, late twelfth century or later (Chittick 1974: 400–01, 410–11); Aidhab, tenth–fourteenth century (Harden 1961: 73–74); a squat jar with diagonal ribbing from Soba, ninth–twelfth century (ibid., pp. 61–62); Kawd am-Saila, fourteenth–sixteenth century (Whitcomb 1988: 245); al-Qaraw near Aden (Van Beek, pers. comm.); and Hama (Riis and Poulsen 1957: 32–33).


525

Trailed Threads or Coils (527–29)

Most of the examples of trailed thread decoration have already been mentioned with the bottles (380, 389, 393), jars (402), beakers (412, 413, 422–31), and vials (456). Sherd 528, dark blue-green on transparent glass, and sherd 529, completely transparent, could have come from beakers but are too small to be certain. Sherd 527 seems to be the bulge from a bottle neck. Bottle necks with or without bulges and clear or turquoise threads or zig-zags are published from Hama (Riis and Poulsen 1957: 55–56, 60). Finally, a bottle from Corinth, after the twelfth century, has a flaring mouth, straight neck with blue coils, a cut-in loop at the widest part of the body, and looped base with a high kick (Davidson 1952: 118–19).

Prunts (530–31)

Prunts have already been discussed with the decorated beakers (427, 429) as well as with the Roman glass (359). Two other prunted sherds similar to 531 were drawn but are not illustrated; all but 531, a surface find, are from Mamluk loci and all seem larger than the Roman prunts. Sherd 530 is far too thick to


531

be a beaker, but more than that cannot be said. Prunted decoration was applied to beakers, jars, pitchers, bottles, and bowls from Aidhab, twelfth to early fifteenth century (Harden 1961: 70–71); Hama (Riis and Poulsen 1957: 55–58); as far away as Malaya, eleventh–fourteenth century (Lamb 1965: 36–37); and supposedly from Syria and Egypt (Lamm 1929, pls. 26, 27).

Painted Decoration (532–38)


533 537

All of the Quseir al-Qadim painted sherds included here, plus one not illustrated, are thin, transparent glass painted or enameled with some combination of red, blue, white, green, and gold. Typically, red serves to outline a band or design. Such sherds as are large enough to suggest an original vessel shape seem to have come from bottles (534) or beakers. None appear to be mosque lamps, though plain mosque lamp handles do occur (480–83). Painted beaker sherds were recovered at Manda, dated mid-ninth to early eleventh century, possibly of Egyptian manufacture (Morrison 1984: 164, 177). Kilwa yielded one gilded and painted sherd, ca. 1400–1500 (Chittick 1974: 404–05). There is a fine colorless goblet or beaker in the Benaki Museum with a flaring rim, a wide band of red and gilt floral decoration, and a kick-up base that seems to have a coil around it. The vessel is thought to be Syrian, thirteenth century (Clairmont 1977: 120, pl. 23). The best parallels for the Quseir al-Qadim sherds are in fact some beakers from Al Mina in Syria, twelfth–thirteenth century. Here too the designs may be gilt outlined in red, plus blue, black, white, red, or yellow enamel. The borders of two vessels, or sherds rather, have a twist like that of 533. One Al Mina beaker has a band of curling, formal floral elements perhaps similar to fragments 535 and 536. Finally, two sherds bear inscriptions, as do 537 and 538. Lane (1938: 73, fig. 13) suggests that the enameled beakers at Al Mina were produced by the Raqqa school. With the evidence on hand it cannot be stated whether the Quseir al-Qadim vessels were manufactured in Syria or in Cairo, long said to have been a center for glass enameling, especially for mosque lamps.

Cut Decoration (539–41)


540

The only Mamluk vessels at Quseir al-Qadim that routinely carry cut decoration are the molar flasks and cut vials. Sherd 539, blue, could be a vial fragment, as could one other with a curvilinear design, not illustrated. However, sherds 540 and 541, as well as one other not shown here, are clear glass. Although blue appears to be favored, colorless molar flasks are certainly known (Chittick 1974: 398–99; Clairmont 1977: 91–92, pl. 17).

Marvered Decoration (542–47)


543

Marvered decoration, either lines (542–43, 547) or festoons (544?, 545–46), certainly was used in Roman and earlier periods,

and one green and white marbled unguentarium (182) has been discussed. The purple and white marvered sherds 542 and 543 (plus one body sherd not illustrated) probably came from a bottle and a small bowl respectively. A number of vessels with similar decoration are published from Hama (Riis and Poulsen 1957: 63–64, 66–67) and from the Southern Ghors and Northeast 'Araba Survey (Meyer 1992). The very thick green and white marvered sherd 544 might come from a small bottle and might be part of a dragged festoon decoration, a pattern also found on a white and red on green sherd (not illustrated). Both unfortunately have only a surface findspot, as does 546, green with yellow and white dragged festoons. A dark olive and white dragged and marvered shoulder sherd from Aqaba may be earlier, and a small, thick green and yellow-white marbled bottle in the Benaki collection may be later, fourteenth–fifteenth century (Clairmont 1977: 134, pl. 23). There are no close parallels for 545, dark blue with white (plus one small sherd not illustrated), but there is a flask or jug shoulder from Debira West made of clear brown glass with dragged white and pale blue lines. Most of the glass from the site is tenth–eleventh century, but there is earlier material (Harden 1978: 83, 86, 91). The thinner bottle(?) sherd 547 of green glass with white lines does have a Mamluk locus date, but two similar body sherds were surface finds.

Herringbone Marvered Decoration (548–53)


551

These elegant brown, black, or green and white dragged and marvered vessels are all vials, with one possible exception. Shoulder 550 if turned the other way could conceivably be a bottle neck, like an example from Hama (Riis and Poulsen 1957: 65–66). A large number of herringbone marvered vessels were recovered from Hama, including a near twin to 551, in purple and white (ibid., p. 66) rather than brown and white. The bulbous shape of the neck and body of 551 may be seen also in a greenish "small flask" from Baalbek (Kohl et al. 1925: 138). The Corning Museum of Glass has a "white on violet" vial, thought to be Syrian, perhaps eleventh–twelfth century (Corning 1957: 253). Lane and Serjeant (1948: 129–30) refer to but do not illustrate some blue and white, combed and marvered, faceted scent bottles. Farther afield, vials with festoon decoration and square cross-sections like 552 are reported from Siraf, no color noted (Whitehouse, pers. comm.), from Iran, no provenience, said to be ninth–tenth century (Lamm 1935: 14–15, pl. 44), and perhaps from Gedi in Kenya (Kirkman 1954: 151, 183) and Mombasa, listed as a handle (Sassoon 1980: 32).

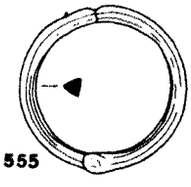
BRACELETS

Glass bracelets were manufactured as early as the Roman period, but they enjoyed an explosion in popularity in Mamluk times. Glass bracelets are easily formed by taking up a bit of hot glass on an iron rod and rotating and hitting the rod with a second one until the glass opens up into a bracelet-size loop. Alternately, a cane of glass can be drawn out and lapped at the ends to form a circle, as may be seen on the monochrome and spiraled bracelets 554, 555, 563, and 565. It takes about 25 seconds to make a simple bracelet

(Francis 1982: 21). At some stage of manufacture further decoration could be added by dotting on prunts, applying pre-formed twisted canes, layering on larger or smaller strips or blobs of colored glass, or a combination of techniques. Glass bracelets seem to have been made in many countries, but the Quseir al-Qadim examples most likely come from Egypt, Aden, and perhaps India. The Fustat reports mention bangles, amulets, and beads but provide no illustrations or descriptions (Pinder-Wilson and Scanlon 1973: 17). Large numbers of bracelets have been recovered from sites in the vicinity of Aden including Zinjibar site, Khanfar (Harding 1964: 17–18, pl. 5), Kawd am-Saila, including bracelet wasters (Van Beek, pers. comm.), and other sites mentioned with specific kinds of bracelets below.

In India, glass was long used primarily for fake gemstones, beads, and bracelets rather than vessels (Dikshit 1969). Glass bracelets, however, are specifically stated to have become popular after the Muslim conquest of India, completed by 1309, though there is a literary reference to the jingling of glass bangles as early as 1255. Sankalia (1977: 228) dates the manufacture of glass bracelets in India to the fourteenth century on the basis of the excavations at Kolhapur, and attributes the craft to the Persian Muslims. With the spread of Islam, certain customs associated with glass bracelets are said to have become current: green was the color for unmarried or newly-married women, breaking bangles was bad luck, and all of a woman's bangles were broken at the death of her husband (Dikshit 1969: 67). Glass bracelets must have been manufactured in India, as at Aden and elsewhere, but it is impossible to tell as yet whence the original impetus for the tremendous popularity of bangles, whether India or the Near East. Few are reported from the African sites repeatedly cited above, and surprisingly few sites in the Palestinian area have yielded bracelets.

Plain Bracelets (554–60)


555

The plain or monochrome bracelets range from a child size 4.8 centimeters interior diameter to 6 centimeters or larger. Although shades of blue are most popular, green, dark blue-green, amber, and opaque black bracelets are included in the Quseir al-Qadim corpus. Not shown are six more blue bracelets, three black, one very dark brown, and one blue-green. All are more or less triangular in cross-section, versus round or rectangular or flat, and they seem to have been made by simply overlapping the ends of a strip of hot glass. Numerous plain bracelets, some with triangular cross-sections, mostly blue but some black, are reported from al-Qaraw and other sites in the vicinity of Aden (Whitcomb 1988: 247; Van Beek, pers. comm.). One dark, opaque bracelet was recovered at Jerash, Mamluk locus (Meyer 1987: 214), and one from Meiron was made of "drawn glass," color not noted, eleventh–fourteenth century (Meyers, Strange, and Meyers 1981, pl. 9.7). Salem-Liebich (1978: 145) mentions some 400 monochrome bracelet fragments from Qasr al-Hayr as-Sharqi. Turquoise, dark blue, and green are said to be most common, but beyond this little information is given and none are drawn or illustrated. One black bracelet segment, rounded rather than triangular in cross-section, is published from Manda, thirteenth–fourteenth century (Morrison 1984: 176). Bangles are known from Siraf, usually plain but

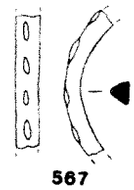
sometimes decorated with colored threads. According to the preliminary report, the earliest bracelets are period 3, after 1055 (Whitehouse 1968: 19). In India, the eleventh–thirteenth century monasteries at Sirpur in Madhya Pradesh manufactured bangles, almost all monochrome (Dikshit 1969: 68–69). Given that all the Quseir al-Qadim monochrome bracelets have triangular cross-sections, we note only the existence of round or flat cross-section bracelets from the fill of Theban Tombs 253A and 294 (Meyer, in press), the vicinity of Aden (Whitcomb 1988: 247; Van Beek, pers. comm.), Meiron (Meyers, Strange, and Meyers 1981, pl. 9.7), Sardis (von Saldern 1980: 98–101, pl. 18), Carthage (Davidson 1940: 322), and Malaya (Lamb 1965: 36, 38).

Spiraled Bracelets (562–65)


563

These were made by twisting thick canes of two or more colors and then overlapping the ends to close the circle. One other bracelet of blue and purple threads on white is not illustrated. Most of the spiraled or twisted bracelets from other sites, however, seem to have a black base with colored threads rather than a white or blue matrix as at Quseir al-Qadim. Two bracelets from Kawd am-Saila, surface finds, are clear blue or blue and red on black (Monod 1978: 123). There is a white on black fragment from the Southern Ghors and Northeast 'Araba Survey (Whitcomb 1992), a yellow, blue, and red on black bracelet from Jerash (Meyer 1987: 214), a yellow on black example from Hama (Riis and Poulsen 1957: 68), and black, white, and red bracelets from Sardis, twelfth–thirteenth century (Hanfmann 1959: 53–54). Apparently several hundred twisted bracelets, mostly light green, dark blue, or opaque black were recovered at Qasr al-Hayr as-Sharqi (Salem-Liebich 1978: 145). Colors are not noted for the twisted bracelets from Meiron, eleventh–fourteenth century (Meyers, Strange, and Meyers 1981, pl. 9.7). The eleventh–thirteenth century opaque blue-green on dark blue wound bracelets from Sirpur in Madhya Pradesh (Dikshit 1969: 68) seem heavier than the Quseir al-Qadim spiraled bracelets.

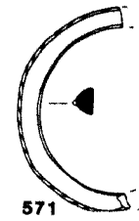
Prunted Bracelets (566–69)


567

Red dots on yellow seems to have been a relatively popular combination at Quseir al-Qadim; two others like 566 were drawn but are not shown here, nor is one white on black bracelet like 568. Not surprisingly, prunted bracelets were recovered at Kawd am-Saila (Monod 1978: 120, 123) and HDR 10 in the vicinity of Aden (Whitcomb 1988: 247), if in different colors. Five prunted bracelets were found in the fill of Theban Tombs 253A and 294 (Meyer, in press), and one other simple prunted bracelet was published from Hama (Riis and Poulsen 1957: 60–61). Perhaps the "studs of beads" decorating some fifteenth century Indian bracelets (Dikshit 1969: 69) are what we call prunts here. More elaborate combinations including prunts are discussed below.

Cane Decorated (570–71)

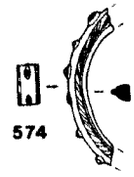
Twisted canes are also used on some of the composite bracelets in the next section, but on 570 and 571 this is the only decoration. A very similar bracelet with a black, white, and red twisted cane on a black base is published from HDR 20 near Aden (Whitcomb 1988: 247), and "cabled" decoration is mentioned on Indian bracelets, especially from the Deccan, during the Bahmani period, 1435–1518 (Dikshit 1969: 69).

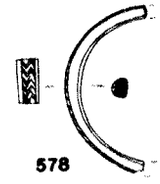

571

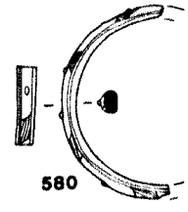
Polychrome Bracelets (572–84)

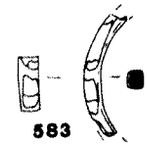
At this point the glassworker's fancy seems to take over, and it is a pity the bracelets could not be shown in all their brilliant color. Details of color not mentioned in the text are listed with the plate labels.

One bracelet similar to 572 was noted from Quseir al-Qadim, in green, yellow, and red rather than green side stripes and yellow prunts on black. At sites in the vicinity of Aden, however, bracelets with this general decoration scheme are abundant at HDR 20, Khanfar, and above all at Kawd am-Saila (Monod 1978: 119–20; Whitcomb 1988: 247; Van Beek, pers. comm.). A prunted bracelet with a similar pattern of decoration is reported from as far away as Bampur, Iran (Stein 1937, pl. 10). Bracelet 573 is ornamented with side canes of white and yellow on red twisted canes plus prunts apparently snipped from the same cane. Fragments 574–76 have twisted side canes and dot on dot prunts, a pattern found at Kawd am-Saila (Monod 1978: 119) and at Hama (Riis and Poulsen 1957: 63, 68). Bracelet 577 (plus one not illustrated) differs from 574–76 only in that a broad strip of yellow was applied to a green base, and then the canes and prunts. Fragments 578 and 579 are decorated with herringbone patterns made by fusing S and Z twist canes side by side to form a zig-zag. Bracelet 578 is red and yellow on green, but another (not illustrated) has a thick blue surface band over a small green core, two yellow side stripes, and a black and white herringbone strip. Black and white herringbones are known from the vicinity of Aden (Whitcomb 1988: 247; Van Beek, pers. comm.), Qasr al-Hayr as-Sharqi (Salem-Liebich 1978: 145), and from India, Bahmani period (1435–1518; Dikshit 1969: 69). Bracelet 580 has twisted or swirling strips overlaid by broad plain patches, marvered-in side strips, and prunts. Bracelet 581 has a broad band of swirled colors plus two side stripes. Somewhat similar bracelets may be found at Kawd am-Saila (Monod 1978: 120); Sardis, late tenth to thirteenth or fourteenth century (von Saldern 1980: 98–100, pl. 18); and perhaps Meiron (Meyers, Strange, and Meyers 1981, pl. 9.7). Fragment 582 (plus one not illustrated) has a swirled band plus side canes and two-color prunts; a similar bracelet was recovered at Bampur, Iran (Stein 1937, pl. 10). Bracelet 583 has large red and yellow or red and blue


574


578


580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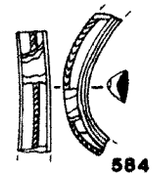
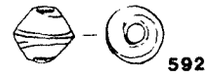

584

blobs on a black base. The fill of Theban Tomb 253A yielded two bracelets with similar blob decoration (Meyer, in press). At Sardis a common type of bracelet, perhaps local manufacture, has white, green, or yellow patches on a black base (von Saldern 1980: 98, 100, pl. 18). Two bracelets from Jerash (Meyer 1987: 214) have colored patches on wide red bands or strips, and a fragment from Chah Husaini near Bampur has multicolored patches on a black strip over a green base (Stein 1937, pl. 10). Finally, sherd 584 has a broad, thick ornamental band with a chevron double-cane overlain by a striped patch, similar to bracelets from Qasr al-Hayr as-Sharqi (Salem-Liebich 1978: 145).

BEADS

As for the Roman period, little can be said about the beads. All the ones shown here come from the 1980 excavations and all are from Islamic or mixed loci. The 1978, 1982, and remaining 1980 beads are tabulated below. Note also that "Roman" beads 370 and 371 could conceivably be Islamic. So far as can be determined, all the Mamluk beads were formed either by winding a coil of glass on a rod, as 592 and 593, or by making a tube of glass and cutting it into smaller segments.


592

The string of beads 585 reminds us that not all beads were necessarily worn strung as necklaces. Beads from Soba, shaped like 586 and 589, occur by hundreds. Most of them are Venetian "pound" beads in green, yellow, and blue, with some red and black, and they are dated to ninth–twelfth centuries (Shinnie 1961: 52, 54–55). Bead 591 has a unique gold sheen, but this may be only weathering. Wound beads like 592 and 593 are abundant at Kilwa, though round beads are the usual form and bicones uncommon. Most Kilwa wound beads date to the late twelfth through fourteenth century; beads cut from tubes became prevalent after that (Chittick 1974: 468–70). Wound beads are also reported at Soba, ninth–twelfth century (Shinnie 1961: 54–55); Zanzibar (van der Sleen 1962: 82); and India, Bahmani period or 1435–1518 (Dikshit 1969: 71). Wound and cylindrical beads from Zimbabwe have been broadly ascribed to Arab trade (Beck 1931: 237; Robinson 1961: 235). The only decorated bead, 595, black with a yellow squiggle, has parallels at Hama, perhaps fourteenth century (Riis and Poulsen 1957: 59–60, 68); and perhaps at Gedi, late fifteenth century (Kirkman 1963: 66–67); and Kilwa, late thirteenth through fourteenth century (Chittick 1974: 469, 480).

Unlike bracelets, beads seem to be rare at sites in the vicinity of Aden, only one having been sketched (courtesy Van Beek). Soba in the Sudan, however, yielded hundreds of "pound" beads, and some 18,000 were recovered at Kilwa in many varieties (Chittick 1974: 460, 468–70, 479). As there is no evidence that beads were manufactured at Kilwa, they seem to have been favored import items, as in later centuries. Chittick (1974: 482) suggests that most of the beads came from India, but some perhaps from as far away as Malaya or Malacca. There is indeed a reference to small glass beads or *pota* in an Indian literary work of 1172 (Dikshit 1969: 67), and coiled beads are known from the later Bahmani period. In Malaya glass beads as well as glass slag and "knock off" fragments are reported from an eleventh to fourteenth century site (Lamb 1965: 36, 38–39).

The remaining beads may be tabulated as follows:

Locus	*Registration Number*	*Locus Date*	*Color and Weathering*	*Shape*
1978				
F8d-1	78/90	Top	Opaque red	Spherical
F8d-1	78/77	Top	Opaque black, coiled	Biconical
F9c-5	78/316	Mixed	Opaque turquoise	Like 588
F9c-5	78/316	Mixed	Opaque yellow, coiled	Bicone
F10a-8	78/131	Islamic?	Transparent?, white weathered	Cylinder
G8d-1	78/82	Top	Opaque turquoise	Small, ovoid
G8d-1	78/82	Top	Opaque black, coiled	Crude bicone
G8d-1	78/82	Top	Opaque white	Small, ring
K9b-5	78/14	Caliche	Opaque yellow, coiled	Small bicone
K9b-5	78/14	Caliche	Translucent green on yellow opaque core	Cylinder
K9b-16	78/177	Islamic	Opaque light yellow	Crude barrel
P8c-11	78/138	Islamic	Opaque yellow, coiled	Crude barrel
1980				
E6d-1	80/62	Top	Color?	Like 588
F7a-5	80/65	Mixed/Islamic	Blue	Like 588
G8b-9	80/73	Islamic	Opaque yellow, coiled	Spherical
1982				
F8d-10	82/395	Islamic	Opaque blue	Rounded
F8d-10	82/395	Islamic	Opaque blue	Rounded
F8d-15	82/399	Mixed/Roman	Opaque blue	Rounded
G8a-22	82/417	Roman	Opaque turquoise	Short cylinder
G8b-20	82/405	Mixed	Opaque yellow	Small barrel
G8b-20	82/409	Mixed	Translucent green, opalescent	Short cylinder
G8b-20	82/410	Mixed	Opaque green, coiled	Crude barrel
G8b-32	82/401	Mixed	Opaque turquoise	Rounded
G8b-32	82/401	Mixed	Translucent green	Rounded
G8b 33	82/403	Islamic/Mixed	Opaque red	Spherical
G8b-33	82/403	Islamic/Mixed	Opaque yellow, coiled	Lenticular
J9d-6	82/391	Islamic	Opaque turquoise	Short cylinder
J10c-14	82/414	Islamic/Mixed	Opaque turquoise	Barrel
L7d-7	82/398	Islamic/Mixed	Opaque yellow, coiled	Lenticular
Surface	82/380	Surface	Opaque green, coiled	Bicone
Surface of East Area	82/416	Surface	Opaque blue	Very small, rounded
Surface of East Area	82/419	Surface	Opaque red, coiled	Barrel

Given approximately a thousand years between the Roman and Mamluk glass corpora at Quseir al-Qadim, one would expect differences; any similarities would have to stem

from similar functions. What we may note is the different overall character of the corpora, the predominance of utilitarian vessels over luxury items in the Mamluk glass. All the glass is blown and relatively little of it is decorated. Bottles and beakers appear to be fairly common, perhaps as tableware. The prunted (427, 429) and trail decorated beakers (412, 425, 426) and the coiled blue bases add a little ornament, and some of the rare sherds of gilt and enameled glass (532–33, 535–38) may have come from exceptionally fine beakers. Spouted vessels, whatever their function, are new, as are glass lamps. The existence of mosque lamps—and hence perhaps a small mosque?—is suggested by the blob handles (480–83), though no structure at Quseir al-Qadim has been identified as a mosque. The perfume or kohl vials, some of which are very elaborate (444–73, 548–53), would have contributed a touch of elegance to a lady's possessions. The beads and especially the bracelets would have added color and glitter to personal dress. The glass weights will be treated by Donald Whitcomb later; we note only their presence at the site and their usefulness in business transactions. The questions of place of manufacture of the Mamluk glass, whether any of the Islamic glass at Quseir al-Qadim was intended specifically for trade, or whether it was brought to the site primarily for use there are treated in the next chapter.

CHAPTER 5

QUSEIR AL-QADIM AND THE MAMLUK GLASS TRADE

Roughly a thousand years after the abandonment of the Roman port of Leucos Limen, the site, now called Quseir (*qusayr* = little fort), was built up anew and once again saw ships and travelers off to Arabia, Aden, Africa, India, and beyond. The entire geopolitical situation had changed drastically. Roman Quseir al-Qadim had lain on the edge of the empire; regions beyond were too distant to be conquered and were definitely not part of the Graeco-Roman civilization. By the thirteenth and fourteenth centuries most Mediterranean trade was, after a period of Arab control, once again in European hands; Moslem merchants from North Africa to Turkey generally turned to the Indian Ocean trade and connections farther to the east. Goitein (1968: 329) would even say that

> the India trade was the backbone of international economy in the Middle Ages in general and inside the Islamic world in particular. More than anything else it stimulated interterritorial traffic, furthered the rise of a flourishing merchant class and created close and fruitful links between the countries of Islam and the Far East on the one hand and Europe on the other.

After the decline of the caliphate following the Mongol conquest of Baghdad in 1258, neither the overland trade route through Iran nor the Persian Gulf trade were of major importance. Rather, the Red Sea took as much as eighty percent of the east-bound sea trade (Curtin 1984: 121),[1] a shift that actually began much earlier, as discussed below. Furthermore, Arabic was spoken throughout much of the Indian Ocean region regardless of religion, or at least Arabic-speaking merchants or their agents were well established in the ports of Africa, India, and eastwards. Islam, if not universal, was at least widely recognized, and religious ties also linked Jewish and Christian traders respectively. The Mamluk trade extended farther to the east than the Roman ventures, which did not as a rule pass the tip of India. Although the direct Abbasid-Tang trade ended abruptly when rebels sacked Canton in 878 (ibid., p. 108), the merchants still sailed to Southeast Asia and there acquired Chinese and local goods. In late Ayyubid and Mamluk times Alexandria was no longer the political and economic capital of Egypt, though it did continue to serve as the

1. We have trouble reconciling this with Lewis' (1974: 258) statement that between about 1200 and 1368 the Persian Gulf trade was *more* important than the Red Sea trade. He seems however to be referring to Hormuz at the mouth of the Persian Gulf rather than to more northerly ports such as Basra.

major Mediterranean port and gateway to the West. Instead, Fustat and Cairo[2] were established successively as capital of Egypt, the seat of economic organizations, a manufacturing center, and node for trade between the West and the East. Secondarily, Aden flourished as the prime port for the Yemeni sultanates, especially the Rasulids of the thirteenth to fifteenth centuries. Indeed it became one of the busiest ports in the whole Indian Ocean sphere and even a manufacturing center for certain goods. Aden to Cairo was at times a critical link in international trade and certainly important for the existence of the Mamluk port at Quseir al-Qadim, which could carry at least a small portion of the trade.

Finally, the documentation for the Mamluk period is embarrassingly rich in some respects, such as historical records, travelers' accounts, and even day-to-day business and letters. There is no compendium quite like the *Periplus Maris Erythraei*, however, and the archaeological evidence is meager, with the notable exception of East Africa. Thus, while more information is available on court intrigues, plagues, wars, family genealogies, and even gossip, there are very few excavations of Mamluk period towns, domestic architecture, household equipment, and the like. The study of the glass carried through Quseir al-Qadim therefore has to be set against whatever can be gleaned about Indian Ocean trade in general, uneven as that may be.

ORGANIZATION OF OVERSEAS TRADE

Discussion of the organization behind the Islamic trade through Quseir al-Qadim has to begin with Old Cairo and Fustat in the Fatimid period (969–1171) because the most fulsome documentation by far is found in the Cairo geniza. These accounts, scraps, and letters illuminate certain aspects of the trade that the later thirteenth and fourteenth century Karimi merchants may conceivably have adopted. The Karimi themselves constitute the second half of this discussion.

The Cairo geniza contains records going back to the tenth century, including letters of India traders from the end of the eleventh to the early thirteenth century (Goitein 1973: 231). Most of the documents related to the India trade are letters to or from Old Cairo, Aden, South Arabia, India, or the Red Sea ports, but a few are communications between Aden and India, between Indian cities, or between Arabia and the Red Sea ports. Although the Jewish merchants were not major participants in the Indian Ocean trade (Goitein 1968: 330–32), the geniza documents are the most thoroughly researched segment of that trade.

Generally speaking, a merchant in the time represented by the Cairo geniza documents did not assemble a trading expedition single-handedly. First, the amount of goods and money required to hire, fill, and equip a ship was beyond the reach of most individuals, and even if one man could have done it, the risks were considerable. It was safer to send

2. The capital of Egypt shifted from regime to regime from Roman Babylon or Old Cairo, to Fustat, to a succession of palaces and administrative cities progressively northwards. Cairo (al-Qahirah) was the northernmost, founded in 969 under the Fatimids. Modern Cairo now encompasses all the earlier cities. The medieval capital of Egypt is referred to here as "Cairo," though the suburb of Fustat remained an active mercantile center, at least until its burning in 1168.

smaller loads in many ships sailing for different ports. One of the best-known merchants in the Cairo geniza, Halfon ben Nethanel Dimyati, active ca. 1125–1146, had business connections in Spain, Morocco, Egypt, Yemen, and India (Goitein 1968: 337), and he was by no means unique. The Cairo geniza contains many legal documents pertaining to partnerships for overseas trading ventures drafted according to Moslem law (ibid., p. 335). The partnerships often seem unequal in that the man who put up the most money might stay at home, whereas the one who advanced less money traveled and did the work, shares of the profits being determined beforehand. Although it may be a result of the fact that the geniza is by definition a Jewish corpus, many of the partnerships seem to have followed sectarian lines, if only for the sake of observing holy days, prayers, and dietary restrictions while traveling (ibid., p. 350). One always traveled with a companion (Goitein 1967: 346–48), whether or not there was a formal financial partnership. Finding (or losing) a congenial and skilled traveling companion was always a matter of concern. The merchants actually journeying together, versus partners back home, might form a loose organization for the duration of the trip and agree to a proportional distribution of losses if cargo was jettisoned, stolen, or lost (ibid., p. 348).

Taking interest on loans has always been a thorny issue within both Jewish and Moslem law; if possible, some other means would be used to make a loan and still maintain appearances. Between sects, however, as between Jews and Moslems or Jews to Christians, loans for interest seem to have been a regular feature by the thirteenth century (Goitein 1967: 256–57).

A number of financial techniques existed to facilitate long-range transactions. The *suftaja* was a bill of exchange, a document sent to a banker to hand over immediately the coins deposited at the other end. This worked only for direct and permanent business connections such as Old Cairo to Aswan, Aidhab, or Sijilmasa (on the northern edge of the Sahara) (Goitein 1967: 244). In another kind of transaction, this one dated to 1140/1, an India trader in Fustat wrote to his representative in Aidhab to buy goods, and if he have insufficient cash, to borrow from the diwan, the local government office (ibid., p. 269), an order that seems to have called for no special directions or comment.

Although there were no merchants' guilds on the medieval European pattern (Goitein 1968: 345) either for internal or foreign trade, the overseas traders did have some organization, headed by a merchants' representative, the *wakil al-tujjar*, who had a wide range of functions. He was a legal representative in another city and could handle lawsuits there. If a merchant had no friend, partner, or agent in a foreign city, the *wakil al-tujjar* could buy or sell according to written instructions. He sometimes served as a banker in that he could receive deposits of money and make payments as required by a *suftaja* or other order. Many representatives had their own warehouse, a *dar wakala*, where clients' property could be stored, goods salvaged from shipwreck held, or possessions of a dead merchant kept until claimed. The warehouse could serve as a convenient clearinghouse for transactions, a court for settling disputes, or even as a postal address. In addition, a *wakil al-tujjar* might have further duties as a Moslem *qadi* or judge, or if Jewish as head of the local religious com-

munity.[3] A few had additional responsibilities such as superintendent of a port or customs house, or even fixing customs tariffs. The *wakil al-tujjar* was recognized as the head of sojourning foreigners and as such had some degree of responsibility to the local authorities. The merchants' representative was a long-term or permanent resident in his city, and the position was sometimes handed down in the family (Goitein 1968: 345–48). Curtin (1984: 115) characterizes a *wakil al-tujjar* as a "landlord broker" in that he was a trusted, permanent representative for the more transient merchants.

The above outline pertains to the eleventh and twelfth centuries; by the thirteenth and fourteenth centuries the Karimi merchants[4] had largely taken over the Indian trade.

> The Karim merchants of the late thirteenth, fourteenth and early fifteenth centuries were as prominent in the countries of the Middle East as the German Hanse was in contemporary central and northern Europe. They all but monopolized the trade with India, East Africa and the Far East and constituted the greatest financial power in the Mamluk state besides the government (Goitein 1968: 351).

The etymology of the word "Karim" is uncertain, perhaps from a Tamil word *karyam*, "business" or "affairs," but in any case it does refer to the India traders (Goitein 1968: 360). Like their predecessors, the Karimi merchants appear to have had no formal organization. The title "Karimi" and the position, however, were often passed from generation to generation within the same family, and the great Karimi families sometimes intermarried. There is considerable historical information on many families, and some of the Karimi merchants were fabulously wealthy (Lane and Serjeant 1948: 113–14; Wiet 1955: 108). All of the Karimi merchants were Moslem, though they may have originated from different backgrounds (Wiet 1955: 105–29), and they succeeded in hindering or blocking Jewish and Coptic traders on the Red Sea (Labib 1978: 640). Many Karimi merchants also had reputations as religious scholars and benefactors of schools, holy places, and other public works (Fischel 1937: 76; Wiet 1955: 105–29). The Karim seems to have centered in Egypt, where some two hundred of its merchants are said to have operated at one time. Others are known from Yemen, Damascus, and perhaps elsewhere in Syria (Goitein 1968: 351), and they traveled widely to Hijaz, Central Asia, Abyssinia, and above all to India (Wiet 1955: 129–31). The Karimi goods were usually respected both for high quality and sheer quantity. One Cairo geniza document mentions three thousand bales for one group or convoy in one year. If bales averaged roughly five hundred pounds, then this equals about 750 tons or four 200-ton ships, and this at an early period in Karimi history, the early twelfth century (Goitein 1968: 358–59).

If the Karim had no official political power, it did have considerable financial influence (Goitein 1968: 351) and did grant large loans to the governments of Egypt and Yemen as well as paying heavy levies for military purposes (Fischel 1937: 77–78; Wiet 1955: 103–

3. There seems no mention yet of Christian merchants' organizations or representatives.

4. There are earlier twelfth century references to the Karim or Karimi merchants (Wiet 1955: 86; Goitein 1968: 353, 355–56), but they are not yet the powerful group of the later period.

04). On the other hand, the tremendous financial success of the Karim may be attributed in part to government assistance. The early Ayyubid rulers were especially strong in their support of the Karim and the defense of the Red Sea trade (Labib 1978: 640). A high official of the Mamluk government, the inspector of spices and Karimi-merchandise, was responsible for the Karimi traders and for collecting their customs and taxes (ibid., p. 642). The officials were explicitly directed to act with cordiality and justice (Wiet 1955: 96). An early (1198) reference to the Karim says that during the troubles in Aden, the Karimi merchants alone were exempt from the thirty percent import/export charges (Goitein 1973: 214). The government at times provided a degree of protection against the Red Sea pirates; some three to five ships were stationed at Aidhab for that purpose (Wiet 1955: 93), and at least one expedition was sent from Aidhab against the pirates. The prosperity of the Karim as a whole lasted until about 1429 when the sultan's newly decreed pepper monopoly ended Karimi control (Fischel 1937: 82) of one of its most important trade items. War, disease, and desperate economic measures were draining the resources of all levels of Egyptian society as well (Darrag 1961).

Some of the formal and informal business arrangements sketched for the earlier period may or may not have been utilized by the Karim. The type of documentation is different enough—written family histories and genealogies versus letters, legal records, and accounts—that there are gaps. If individual Karimi merchants were wealthy enough to finance not merely part of a venture but many ventures at one time, then partnerships may have been less common. Loans for interest between Moslems would presumably have been avoided still. Traveling companions would have been as desirable and necessary as ever, but as all Karimi merchants were Moslem, religious restrictions would seldom have interrupted trade and travel schedules. The letters of credit, *suftaja*, and orders, *sakk*, were certainly in use to handle long-range transactions (Wiet 1955: 133). How much of the former merchants' organization, notably the overseas *wakil al-tujjar* and the *dar wakala*, survived is uncertain. In the early twelfth century one merchants' representative does mention the "Karim" having docked at Suakin instead of Aidhab (Goitein 1968: 354–55). Titles such as *rais al-karimiya* and *rais al-tujjar* are also known (Wiet 1955: 130), and various government officials oversaw certain government-related aspects of the Karim business, such as the director of warehouses (ibid., p. 96). Certainly the Karim had its own warehouses, the *funduq al-karim* (ibid., p. 94), and must have had its own far-flung agents, many presumably family members. Closer to Quseir, there were Karimi merchants and a *funduq* at Qus, the jumping-off point for desert travel to Aidhab and Quseir. We may wonder whether there was a Karimi agent at Quseir al-Qadim; the letters from the Sheikh's House there are not yet fully translated.

What of the goods shipped out by the Egyptian traders? Again, most of the detailed information comes from the Cairo geniza. Textiles and clothing were sent to the East, as well as glass, paper, books, ornaments, and vessels of brass or other metals (Curtin 1984: 114). Dikshit (1969: 66) mentions Indian imports of medicinal mercury and phials and other items of glass. Silk was certainly an import from the East, but the Mediterranean also had a

large silk industry and some of this was shipped *to* India. Silk was such a common trade good that a certain grade and weight functioned as a standard unit like dinars, two dinars per pound of standard silk or twenty dinars per unit of ten pounds (Goitein 1967: 222). It has been suggested that many of the manufactured goods were intended for personal use of the merchants overseas. The manufactured products are also said to have been of relatively small value (Goitein 1968: 342), though whether they were considered cheap by the time they reached India is another question. Whomsoever they were intended for, items such as textiles, vessels, glass, or paper products were exported when possible, but the principal trade items remained copper and other materials for the Indian brass industry, as well as silver and gold, especially Egyptian gold coins (ibid., p. 342). Reminiscent of the Roman India trade, the reliance on gold is said to have created an unfavorable balance of trade with India (ibid., pp. 343–44). A fifteenth century Portuguese sketch of Mamluk trade mentions much the same items: gold or gold coins, silver, copper, tin, brass, red lead, mercury, alum, copper oxide, saffron, rosewater, wool and silk textiles, velvets, brocades, coral, and gold thread (Wiet 1955: 133). The sixteenth century traveler Tomé Pires adds to this list vermilion, weapons, and glass beads (Chaudhuri 1985: 109). Two of these items, the mercury and the rosewater, might have been shipped in glass containers. One item *not* mentioned in the Cairo geniza is the slave trade, which does not seem to have been handled by the Jewish merchants, though they did own slaves and did trade in them at earlier and later periods. From other sources, however, slaves appear to have been important in the Indian and African trade (Goitein 1968: 341).

The following list of various items exported from Aden or the Red Sea ports is extracted from the Cairo geniza documents:

Textiles and clothing		36 items
Vessels and ornaments of silver, brass, glass, etc.		23 items
Household goods (carpets, mats, tables, frying pans, etc.)		7 items
Chemicals, medicines, soap, paper, books		19 items
Metals and ingredients for copper industry		7 items
Coral		1 item
Food (cheese, sugar, raisins, olive oil, linseed oil, etc.)		10 items
	Total	103 items

Textiles may have been the most numerous good, but the metals and the coral were probably the most costly (Goitein 1968: 341). The following list notes shipments to India, with costs (ibid., p. 343):

Yemeni walnut sweetmeats	2 3/4	Maliki dinars
Wheat	3	Maliki dinars
Dura grain/sorghum	1 1/6	Maliki dinars
Clothing from Egypt	9	Maliki dinars
Glass vessels, Egyptian and Yemeni	1 1/2	Maliki dinars
2 Silver ingots, 605 dirhams weight	124	Maliki dinars
100 Egyptian gold pieces	(not given, but see below)	
Cash, owed to recipient	300	Maliki dinars

The Maliki or Yemeni dinar had an accepted exchange rate of 235 to 100 Egyptian gold pieces (Goitein 1968: 342).

Imports from the East are similar to the Roman selection: spices, dyes, drugs, and some Chinese porcelains and silks (Curtin 1984: 114). One Cairo geniza document mentions Chinese porcelain and Yemeni stone pots ordered as presents or household items, but not as commercial goods (Goitein 1968: 340). The fifteenth century Portuguese traveler noted above described merchants in Mecca and Jidda whose agents in Calicut (southern India) sent spices, drugs, cotton, and precious stones (Wiet 1955: 133). Finally, imports from India and the Indian Ocean region to Egypt include:

Spices, aromatics, and plants for dyes, varnish, or medicines		36 items
Iron and steel		6 items
Brass and bronze vessels		12 items
Indian silk and other textiles, mainly cotton		8 items
Pearls, beads, cowrie shells, ambergris		4 items
Shoes and leatherwork		2 items
Chinese porcelain, Yemeni stone pots, African ivory		3 items
Tropical fruits, e.g., coconuts		5 items
Timber		1 item
	Total	77 items

The iron and steel were particularly valuable imports (Goitein 1968: 339). The only possible glass item in the whole list might be some of the beads.[5]

MAMLUK GLASS

The spices are long consumed, the silks and cottons long rotted,[6] the metals long corroded or remelted. What can we say, then, of the surviving, ubiquitous, but low-value and generally ignored glass? Where was it manufactured and what was it used for? The archaeologically recovered glass comparable to the Quseir al-Qadim corpus is discussed in *Chapter 4*.

One of the biggest glass manufacturing centers, certainly the most important in Egypt, was Fustat/Cairo. Thanks to war and turmoil in the Syro-Palestinian region in the eleventh and twelfth centuries, Egypt received so many silk-weavers, dyers, and glassmakers that they competed with the local workers (Goitein 1967: 51; Goitein 1968: 264–65). The Cairo geniza contains a number of contracts for partnership for glass production (Goitein 1967:

5. Sa'di (thirteenth century) spun a story about a merchant supposedly encountered on the island of Kish or Qais opposite Muscat who wanted to take Persian saffron to China, Chinese vessels to Greece, Greek brocade to India, Indian steel to Aleppo, Aleppan glass to Yemen, and complete the circle by conveying Yemeni striped cloth to Persia (Wiet 1955: 85–86).
6. Preservation at Quseir al-Qadim is exceptional. For the report on the resist-dyed textiles, see Vogelsang-Eastwood 1990.

85, 87, 363, 365), which seems to have been a fairly common occupation for Jews (ibid., pp. 109–10). Other glassworkers were Moslem, including a number of religious scholars (Goitein 1968: 261–62); even Jewish-Moslem partnerships are documented (Goitein 1967: 85). There is also one geniza reference to Fayyumi glassworkers about 1100 (ibid., p. 84).

The Syro-Palestinian region had a long tradition of glass making, and we do find a Cairo geniza letter originating from Aden ordering "a wickerwork basket with red glasses from Beirut, and if they cannot be had, white glasses" (Goitein 1967: 110). A draft of a partnership (A.D. 1217) mentions buying 108 qintars[7] of red glass, possibly Beiruti, and 105 qintars of local glass (ibid., p. 365). Red glass is exceptionally tricky to make, but perhaps the deep purple color is meant, and this is well attested in the Hama and Quseir al-Qadim corpora. According to literary sources Tyre was exporting glass in the twelfth century and making high-quality glass in the thirteenth century; Akko and Tripoli were also production centers in the twelfth and thirteenth centuries (Riis and Poulsen 1957: 31). Haynes (1948: 51) suggests, however, that the early Crusades at the end of the eleventh century may have interrupted glass manufacture at Tyre, Hebron, and elsewhere.

Aleppo also had a reputation for glass manufacturing (Wiet 1955: 86). One town near Aleppo, Armanaz,[8] settled after the Crusades (1268–1291) (Riis and Poulsen 1957: 31) still has, or had until recently, a traditional glass industry. Al-Maqdisi (ca. 985) mentioned it, as did Benjamin of Tudela, and Hafiz Abru of Herat in the fifteenth century (Gaulmier 1936: 53–54). Antioch had a glass industry as well in the twelfth and thirteenth centuries, and Damascus was especially famous for its enameled glass in the fourteenth century, until Tamerlane ravaged Syria and reportedly took the most skillful glass masters to his capital at Samarkand ca. 1400 (Riis and Poulsen 1957: 31). The enameled sherds at Quseir al-Qadim most closely resemble some beakers from Al Mina in Syria, thought to be products of the Raqqa school (Lane 1938: 73).

Literary accounts or even day to day records or letters rarely mention what glass vessels were used for. The abundant bowls, beakers, and bottles at Quseir al-Qadim were surely tableware. Goitein (1967: 109–10) suggests that one reason for the large number of Jewish glassworkers in Old Cairo was that the dietary laws were more easily observed with glass dishes, though there is no reason as yet to suspect a Jewish community at Quseir al-Qadim. Pharmaceuticals then as now were often contained in glass vessels, as was perfume and kohl. Judging from the abundance of perfume and kohl vials from archaeological

7. One qintar equaled about 45 kilos or 100 pounds (Goitein 1967: 360).

8. Gaulmier's (1936) account describes the contemporary Armanaz industry, which still uses many of the old techniques. The glassmakers work in pairs, trading off the more strenuous blowing and the less arduous fashioning. The work is particularly hard on the eyes and lungs, but it is also relatively highly paid. For most of the workers it is a seasonal activity carried out mainly during agricultural off-seasons, the primary income deriving from the land, an option probably not available to the Fustat or Cairo workers. The repertoire produced is fairly limited, mainly *qatramiz* or short necked bottles in three sizes, cupping glasses, flat arak flasks, and by special order, pitchers, drinking glasses, or cups, in red or blue if desired. Skilled workers can make about eighty *qatramiz* per day. Details concerning raw glass (remelted old glass), tools, fuels, furnaces, and prices are also given.

sites, both were popular and widespread in the Mamluk world. A Cairo geniza contract for setting up a small shop includes three glass vessels of lemon juice, with their baskets, worth 1¼ dinars, and 18 empty glass vessels worth two dinars (ibid., p. 151). Minced pickled fish was sent in a glass jar from Alexandria to Old Cairo (ibid., p. 126). A letter from Aden to India in the late 1130s lists among presents "a [glass?] bottle, in a tight basket, entirely filled with raisins" (Goitein 1973: 195–96). We note here the Quseir al-Qadim lamps, spouted vessels, bracelets, and weights, though the last-named will be treated with the epigraphic material in a separate report.

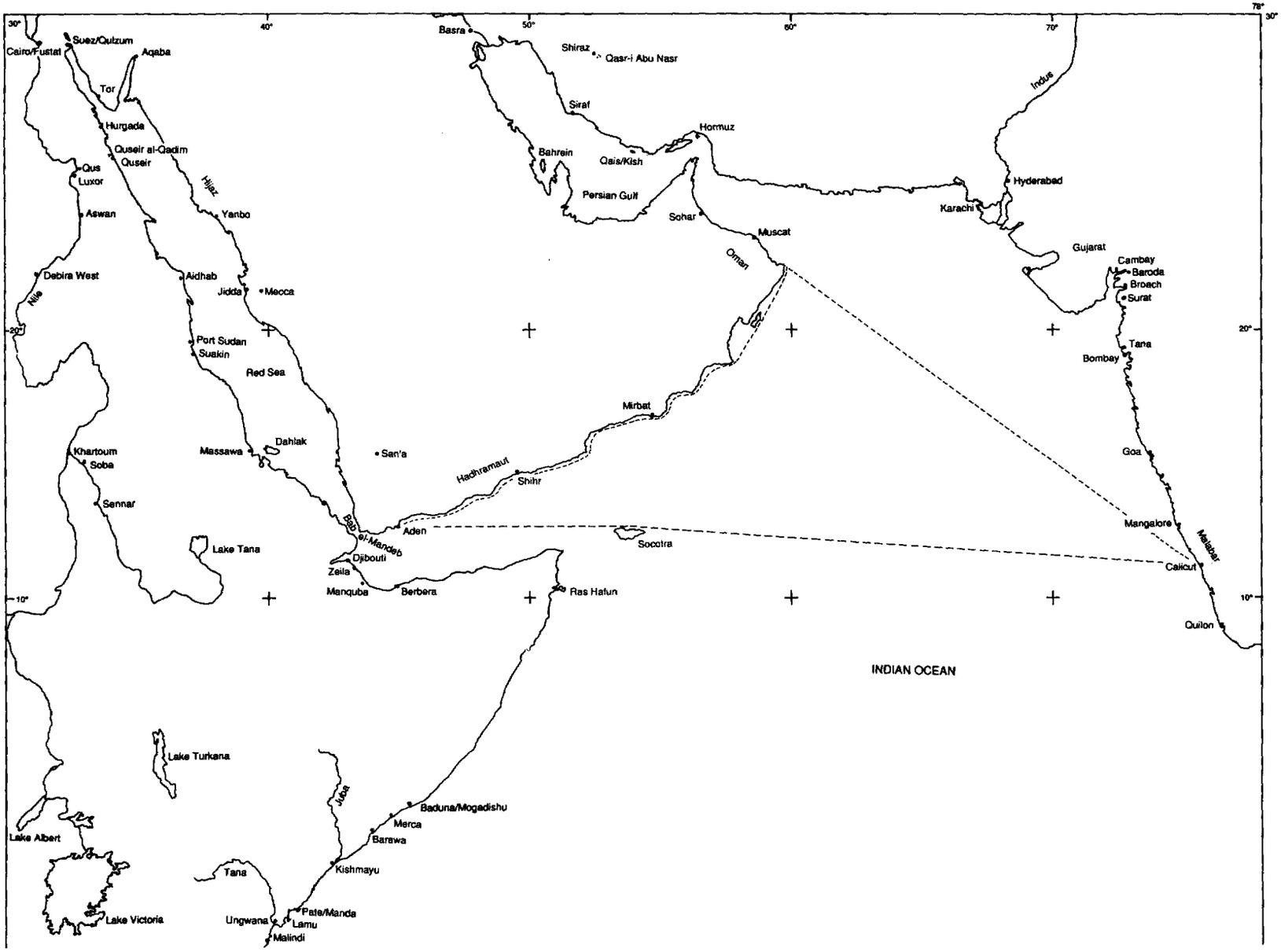
THE JOURNEY TO THE RED SEA

Having collected the financial backing for a trading venture, either personally or in partnership, having decided who would stay home and who would travel, having collected all or part of the trade goods and selected a companion, the traveler still had to outfit himself. One provided one's own bread supply (Goitein 1967: 316), chickens and quails are mentioned (Goitein 1973: 334), and Goitein (1967: 316) suggests carobs as a stand-by. Travelers had to bring their own cutlery, utensils, mattresses, and bedding as well (ibid., p. 315). In addition to money, one carried letters of introduction and safe-conduct if possible, and it would be foolish to start without an omen or divination and a prayer (ibid., pp. 346–48).

The first leg of the journey to the Red Sea and the Indian Ocean ran up the Nile to Qus, slightly to the south of the Roman emporium at Coptos (fig. 5). The route continuing southwards to Aswan and across to the Red Sea was another option (Curtin 1984: 114).[9] Sea travel was hazardous enough, but even the Nile had its dangers. Numerous letters refer to running aground, losing items, and delays. Many types of riverboats were in use, perhaps overcrowded at times, and some were in better repair than others (Goitein 1967: 295–98). Ibn Battuta in the mid-fourteenth century noted eight days from Cairo to Qus as the shortest time, but that is so fast that he may actually have meant Qus to Cairo in flood season. Ibn Jubayr's journey in the late twelfth century took eighteen days (Ibn Jubayr 1952: 57), and records from the Cairo geniza note up to forty to fifty days from Fustat to Qus if traveling without any official assistance (Garcin 1976: 10). Delays of as much as five days might occur at Akhmim (Goitein 1967: 298) and doubtless anywhere else there was a breakdown, problems, or unfavorable winds.

Qus in the thirteenth and fourteenth centuries was both the capital of Upper Egypt and the jumping off point for the desert routes to Aidhab and Quseir. Qus grew up during the Fatimid reorganization of Egypt in the eleventh century and declined in the last years of the fourteenth century when the dwindling resources of the Mamluk state had to be concentrated on the protection and administration of more limited territories where commerce took shorter routes (Garcin 1976: 574). Another problem at the end of the fourteenth

9. The later fifteenth century trade often went by camel from Cairo to Suez and thence by small boats to Jidda, bypassing Upper Egypt altogether (Wiet 1955: 133).



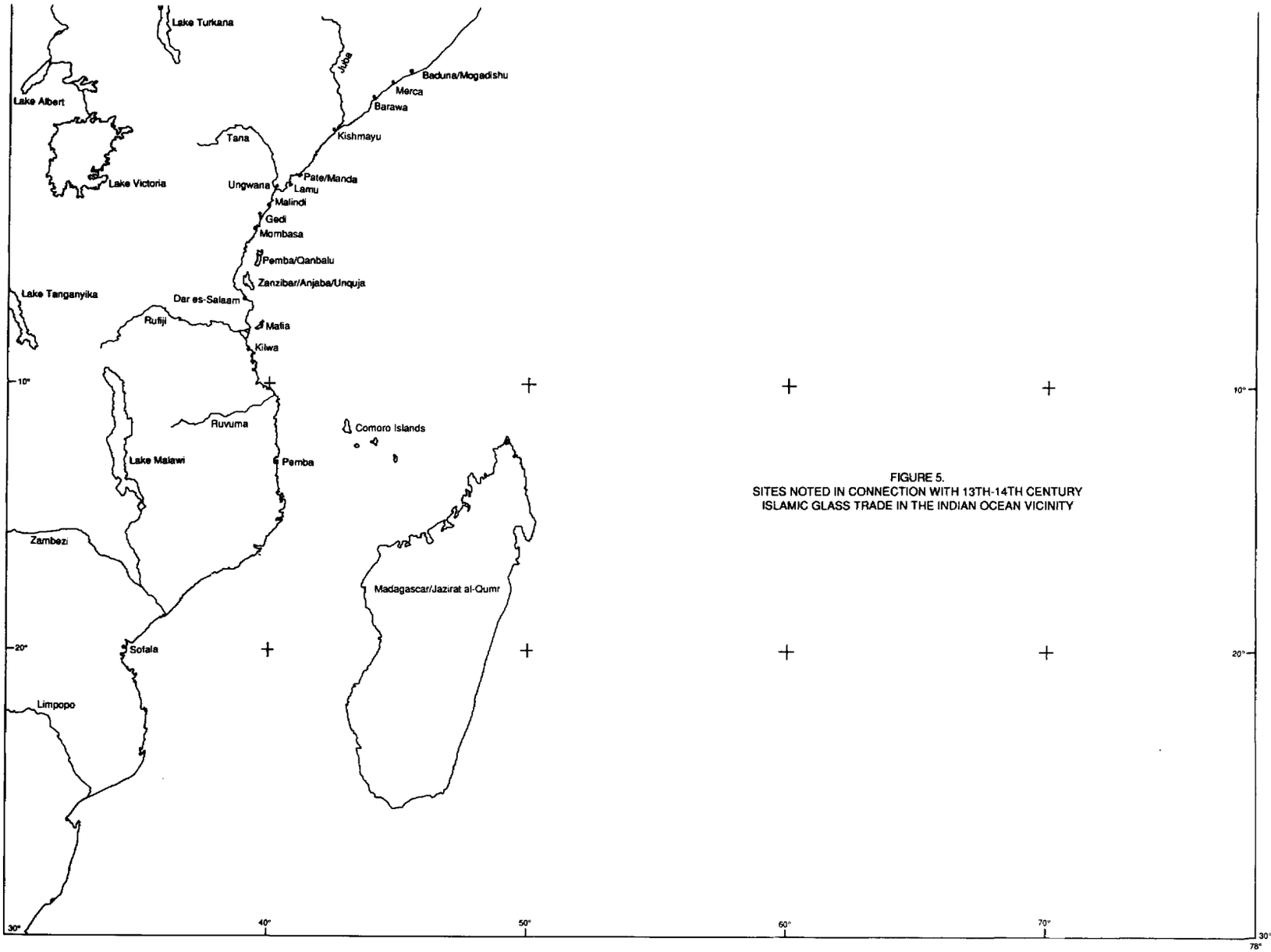


FIGURE 5.
SITES NOTED IN CONNECTION WITH 13TH-14TH CENTURY
ISLAMIC GLASS TRADE IN THE INDIAN OCEAN VICINITY

century may have been the excessive demands of Mamluk officials, which could have driven people away from commerce or even from the city. At about the same time Bedouin raids, versus protection, disrupted the Qus-Aidhab route (ibid., pp. 405–06).

The spice trade was always a major factor in the prosperity of Qus, and spices are reported coming in from Aidhab, Suakin, and Quseir. For some of the Aden merchants, Qus was a place of rendezvous (Fischel 1937: 74; Ibn Jubayr 1952: 58; Garcin 1976: 228). As a relay station like Roman Coptos, bales could be warehoused at Qus, transshipped to camels or boats for the outbound or homeward journeys, and taxed (Wiet 1955: 94). Government offices overseeing the Karimi trade were located there, as well as the authority directing and outfitting the military fleets that protected against pirates, at least in the thirteenth century, and perhaps earlier (Garcin 1976: 209). In addition to warehouses and caravansaries, one would also expect woodworking and shipbuilding facilities (ibid., p. 209) and all the commercial activity of messengers, victualing and provisioning enterprises, and animal corrals and stables. Ibn Jubayr (1952: 59) describes a large open space lying close to the city and surrounded by palm trees. Here goods and baggage were collected, weighed, and loaded.

Qus seems to have been a "modest but solid commercial station for the Karim" (Garcin 1976: 265). A fire in the *funduq* in 1220 reportedly destroyed 500,000 dinars worth of goods, probably Karimi for the most part. In the fourteenth century at least twelve Karimi merchants are attested at Qus, originating from Alexandria (ibid., p. 142), Fao, Esna, Damamin, and even as far away as Balis on the Euphrates (ibid., pp. 261–62). Although the ultimate goal for most of the Karim was the *funduq al-karim* at Old Cairo (Wiet 1955: 94) or Fustat (Garcin 1976: 349), some did retire in Upper Egypt, and some owned property around Qus, as much as 3,438 feddans in the case of one exceptionally rich Karimi merchant (ibid., pp. 261–65).

The route from Qus to Quseir presumably took the same amount of time as in the Roman period, five to six days, though there is no evidence that the elaborate system of fortified hydreumata, signal towers, and military stations on the Wadi Hammamat route was maintained. Alternatively, the trade may have followed the Wadi Qash slightly to the south; there are at least three wells en route (Bell, Johnson, and Whitcomb 1984: 29, 44), as well as fortuitous catch basins in the desert. According to al-Idrisi (mid-twelfth century) it took twenty days for the Qus to Aidhab journey, and according to Maqrizi (mid-fourteenth century), seventeen days (Garcin 1976: 10–11). Whatever the complaints about the Nile boats or the sea, there seems to have been little hardship on the desert roads. Thirst, hunger, and getting lost are seldom mentioned, though Bedouin raids did become a problem late in the fourteenth century (ibid., pp. 405–06). On the contrary, large numbers of caravans are mentioned, especially those carrying pepper, and bales abandoned in the desert could safely be left there until reclaimed (Ibn Jubayr 1952: 61; Wiet 1955: 94).

In the medieval period carriages or carts for desert transport, as in the Roman period, are no longer mentioned (Goitein 1967: 275). Camels however are plentifully attested, and Ibn Jubayr specifically says that only camels can endure the shortage of water in the

Eastern Desert. He also describes a relatively comfortable two-man litter, as well as the more Spartan mode of traveling unprotected on top of the baggage (Ibn Jubayr 1952: 60). A large pilgrims' caravan coming from Suez/Qulzum to Cairo with spices and Eastern goods consisted of five hundred camels (Goitein 1967: 215, 276). The standard ships' bales ranged from about 450 to 600 pounds (ibid., pp. 215–16), and a camel load was almost as much, approximately 500 pounds. Pepper bales from India were somewhat lighter, about 375 pounds (ibid., pp. 220–21), perhaps because of the bulk. In addition to facilities for freight and provisions, there were shipyards at Qus that made boats to be transported in pieces by camelback to the Red Sea (Garcin 1976: 209). Large caravans obviously needed camel drivers to tend the animals and load and unload them, though we have virtually no information on the subject. It seems unlikely that the camels remained loaded continually for the seventeen to twenty day journey to Aidhab if only because it would weaken them. Perhaps they wore a simple harness and the bales were hooked on and off daily. There is some information about freight costs, which presumably covered both the camels and drivers. An eleventh century Cairo geniza document records that twenty-eight camel loads, or roughly 14,000 pounds, incurred a freight charge of 157.5 dinars from the Lebanon to Cairo (Goitein 1973: 89).

In the Roman period Berenice was the most important Red Sea port; Myos Hormos and Leucos Limen were secondary. Similarly, Aidhab in the thirteenth and fourteenth centuries was far more important than Quseir, though Ibn Jubayr (1952: 65–67) had such an unspeakable experience at Aidhab that he returned to Spain from Mecca via Baghdad and recommended that all other pilgrims do the same. Despite the volume of shipping that passed through Aidhab and despite the documentation for its traffic and history, we note only Aidhab's importance, and the fact that one of the few good Mamluk glass corpora comes from there. It is a surface collection but has nonetheless been ably studied and published by Harden (1961); it is frequently cited for parallels in *Chapter 4*.

If less important than Aidhab, Quseir still served several kinds of traffic. As mentioned, spice caravans did arrive at Qus from Quseir (Wiet 1955: 94), and pepper and Eastern textiles are archaeologically attested there. Grain shipments to Mecca and the holy cities are said to have been carried from Quseir (Whitcomb and Johnson 1979: 3–4), and probably some of the pilgrimage traffic passed through as well. Should there be trouble at Aidhab, Quseir was at least an alternative port (Garcin 1976: 399). Sailing times to and from Quseir to link up with the Indian Ocean trade would probably have been similar to the Roman seasons, with the proviso that the lateen sails were more adjustable; the topic is treated in more detail below. The grain for the holy cities was presumably shipped any time after the spring harvest, and the pilgrimage season of course shifted by about eleven days each year. All these diverse activities would suggest that however bleak the site, it was inhabited year round, with seasonal influxes of pilgrims and traders.

The historical information on mediéval Quseir is scrappy but may be summarized as follows. The earliest references are thirteenth century. Yaqut calls Quseir a "port of the Yemeni ships" and says that it is three days from Aidhab and five from Qus (Garcin

1976: 6; Whitcomb and Johnson 1979: 3; Whitcomb 1988: 187). The three day estimate has to be wrong, but the Qus to Quseir time is accurate. Ibn Sa'id gives the latitude of Quseir as 59°, about the same as Qus, and calls it the "port of Qus" meaning the natural or closest port, given that Aidhab carried by far the bulk of the commerce (Garcin 1976: 6; Whitcomb and Johnson 1979: 3). The tag "port of Qus" was repeated down to the fifteenth century (Garcin 1976: 6). By the fourteenth century Quseir appears on maps and portulans, though often confused with Qus (ibid., p. 225). The year 1265/6 must have been an exciting one for the port. The new Mamluk government sent a fleet of forty boats with troops from Aidhab to Suakin to fight pirates. The boats were constructed in Qus, disassembled for transport across the desert, and then rebuilt. Five of them, also with soldiers, sailed directly from Quseir (ibid., p. 210; Whitcomb and Johnson 1979: 3). Qalqashandi's notice in the fourteenth century says only that

> al-Quseir is on the northern side of Aidhab and some of the ships frequent it; it is near to Qus and Aidhab is far from Qus. The merchandise is carried from Quseir to Qus, then from Qus to the warehouse of al-Karim in Fustat (Whitcomb and Johnson 1979: 4, citing Qalqashandi, *Subh al-A'sha*, vol. 3, 1913).

This is at least a positive link to the Karim. Another is Badr al-din Hasan ibn Muhammad Sa'di, who, though not titled as a Karimi merchant, did travel to India. He was born in Yemen in 1388 and retired to Mecca in 1429, but some time before that he visited India, Aden, Suakin,[10] Mecca, Egypt, and Quseir. Late fifteenth and early sixteenth century reports of Quseir still mention pilgrims, supplies for the holy cities, and pepper (Garcin 1976: 399, 418–19, 422–23) but by this time may refer to new Quseir at or near the present town rather than to Quseir al-Qadim.

THE SHIPS OF THE INDIAN OCEAN TRADE

The ships that made the voyages in the thirteenth and fourteenth centuries down the Red Sea and the African coast, across to India, and on to Southeast Asia are surprisingly poorly known. We have only scrappy, scattered descriptions of Indian Ocean ships, few illustrations, and no excavated shipwrecks. In order to piece together any sort of picture we have to include information from earlier and later centuries, as we have done in this study for mercantile practices. There are some valuable studies treating Mediterranean ships, but this material, as applied to the Indian Ocean, must be taken very judiciously.

At the time of the Arab conquest in the seventh century, Byzantium was the naval power par excellence; the Arabs had little sea-faring tradition. Nonetheless, they rapidly adopted the Greek style ships and tactics, and for several centuries they succeeded in controlling most of the Mediterranean trade. By the eleventh and twelfth centuries, however, the Europeans were regaining control of the Mediterranean, and concomitantly the art of shipbuilding was changing in two important respects. First, the large triangular lateen sails

10. Aidhab declined rapidly after 1399.

came to be used on all Mediterranean ships, and secondly, ship construction shifted from shell-first to skeleton-first (Kreutz 1976: 79–80). Skeleton-first construction is both faster than shell-first and requires less skilled labor. Master shipwrights are needed primarily to lay the keel and shape the ribs properly; less highly trained workers can nail on the planking and interior fittings. Construction based on keel and ribs is at least as strong as a shell-first hull secondarily reinforced by ribs or cross beams. The skeleton-first technique was probably an important factor in the "veritable naval explosion of the central and later Middle Ages" (ibid., p. 104).[11] From approximately the eleventh century onwards ships tended to become larger (ibid., p. 102), presumably because of the improving construction and sailing techniques but perhaps also because less anarchical political conditions permitted bigger and slower ships to survive. It has even been suggested that the demand for wood for the larger, more rapidly built skeleton-first ships contributed to the deforestation of the Near East and even to declining Arab control over the Mediterranean versus the Europeans who had vast forests reserves (ibid., p. 106).

Two of the best studied of the thirteenth century Mediterranean ships are the *tarida* and the *navis*. The *taridae* of the twelfth and thirteenth centuries were round-hulled, lateen-rigged, and provided with a complement of oars. At times associated with pirates, perhaps for their versatility, they also served as transport vessels, including horses (Kreutz 1976: 99–100). The standard *navis* was a round ship with two to four decks and usually two lateen sails raked forward (Pryor 1984). Other types of ships are known at least by name, as well as the fully oared galleys, which were mainly of military use.

Unfortunately, much of this characterization of thirteenth century Mediterranean ships does not hold true for the Indian Ocean vessels. On the one hand, we do not believe that the two seas were as isolated from one another as is sometimes portrayed; goods, crafty merchants, new tricks, and bright ideas were carried back and forth, and perhaps sailors, shipwrights, and even ships. On the other hand, another shipbuilding tradition is attested in the Indian Ocean centering around a "broad class of vessels akin to present day Arabo-Indian dhows" (Manguin 1985: 3). Many or most of these boats were sewn rather than nailed together, though this feature may have struck travelers as so unusual that sewn boats, rather than the more familiar nailed boats, were recorded. Coir or other fiber does have the advantage of being cheaper than nails, and the boats are more flexible if run up on shore, though they are also said to be leaky and fragile (Hourani 1963: 94–96), and they do require considerable maintenance and recoating (Hawkins 1977; Manguin 1985: 5). In addition to the stitching, there is some evidence for ribs inserted to strengthen the hulls, and for doweling (Manguin 1985: 4), though the hulls remained basically shell-first construction. Hourani (1963: 91–92) states that the Arab ships of the eighth through tenth centuries and later were sewn together on the grounds that nails were a European introduction. This is less than certain; nails could also have been copied from Chinese or Southeast Asian

11. Evidence for construction techniques is available from several shipwrecks: Serçe Limani, ca. 1025 (Bass and van Doorninck 1978: 121–23); the Pelagos wreck, twelfth century (Kreutz 1976: 105); and the Contarina wreck no. 1, ca. 1300 (Bonino 1978: 12–15).

shipbuilding techniques (Manguin 1985: 11). Some of the Cairo geniza letters mention ships held together by ropes (Goitein 1968: 334), and Ibn Jubayr (1952: 65) in the late twelfth century describes the Aidhab *jilabah* sewn together with coconut fiber. In the sixteenth century Duarte Barbosa mentions, as do many other European authors, large sewn boats (Lewis 1974: 247), and sewn dhows did survive on the Indian Ocean until fairly recently (Hawkins 1977). However, Ibn Jubayr (1952: 65) also mentions in passing nailed boats as well as ships dismantled, carried overland, and nailed together near Qulzum (ibid., p. 52). Some large Malabar ships are specifically stated to have been built up strake by strake, pitched, and held together with large quantities of iron nails (Lewis 1974: 247–48; Chaudhuri 1985: 150). Some but by no means all of the Gujarati ships of the earliest Portuguese contact period were also constructed with "a large quantity of iron nails" (Manguin 1985: 10). It might be safer to say that many or most of the medieval Indian Ocean ships were sewn rather than *all* of them.

Although many studies of medieval vessels indicate that they used one or two steering rudders on either side of the stern (Hourani 1963: 98–99; Goitein 1967: 318; Bonino 1978: 26; Pryor 1984: 281–84), the stern rudder was coming into use in the thirteenth century (Arenhold 1911: 300), perhaps as early as the eleventh or twelfth century (Pryor and Bellabarba 1990: 107). The al-Hariri ship, illustrated in a manuscript dated to about 1235, had a flat stern rudder (see fig. 6), and Marco Polo mentioned stern rudders as well (Manguin 1985: 6). Quarter rudders are said to be better suited for quick maneuvering in shallow waters such as the Red Sea coral reefs, as opposed to the slower stern rudders (Chaudhuri 1985: 147–48). Thus it would seem that shipbuilders had a choice, depending on where the ship was intended to sail.

Ibn Jubayr describes ships built at Aidhab from Indian teak, a classic wood for shipbuilding. It is strong, elastic, not too hard to be easily worked, and if properly seasoned it does not shrink or crack. The Maldive Islanders used coconut wood (Hourani 1963: 89–91; Lewis 1974: 250). The medieval Indian Ocean ships used caulking made from the wood of the date palm and further sealed with a mixture of pitch or resins and whale oil, or at times fish or shark oil (Ibn Jubayr 1952: 65; Hourani 1963: 97–98), many of these being products not readily available in the Mediterranean.

Although oared galleys were still used for military purposes, the available evidence indicates that most ships were sail-powered and the sails were lateens. Mediterranean lateen sails were triangular with a stiff leading edge at the yardarm (Kreutz 1976: 82); the yard and aft corner of the sail were controlled by a series of ropes. The lateen sail has a number of advantages over square-rigged vessels, especially for smaller boats. Unlike a square sail, the lateen operates best with a beam (side) wind (ibid., p. 82), it can tack far more easily and point closer into the wind (Pryor 1984: 363), and, if the sheets were dropped immediately, the whole sail could fly free and hence would be harmless in a sudden squall (Kreutz 1976: 98). By the thirteenth century two masts were common on Mediterranean ships, though three masts are attested (Arenhold 1911: 300; Bonino 1978: 9, 11; Pryor 1984: 172–73; Pryor and Bellabarba 1990: 100–01). The forward mast was the taller and

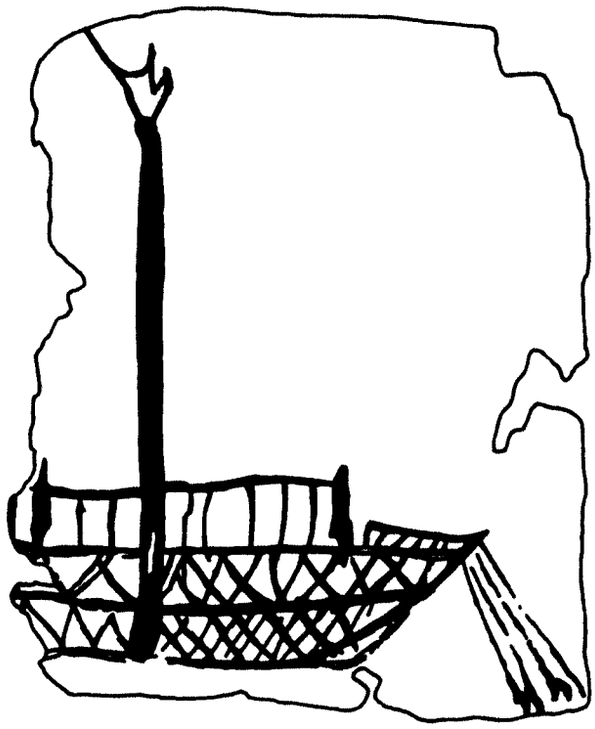


Figure 6a. Sketch of a ship from Quseir al-Qadim. Ink on paper. Note the multiple anchors at the prow and what appears to be a deck cabin or shelter. The jagged piece on top of the mast could be a crow's nest or banner; both are attested. Courtesy of Donald S. Whitcomb

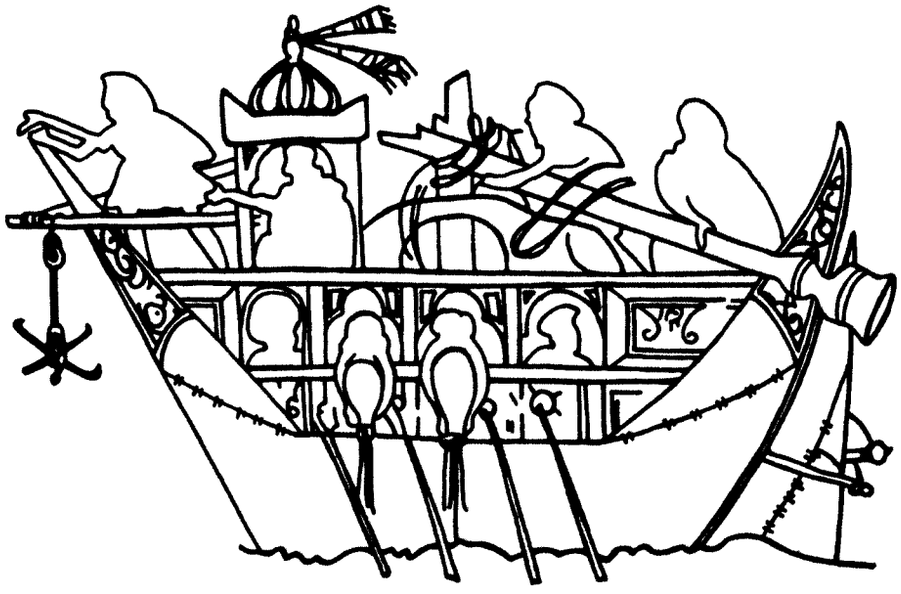


Figure 6b. Vessel from the *Maqamat of al-Hariri* (redrawn from Nicolle 1989: 176–77, citing the Library of the Academy of Sciences, MS S23, Leningrad). Note the grapnel anchor, stern rudder, stitched construction, deck cabin, and what seems to be another row of cabins. The mast is broken and two people are bailing out water with large jars. Manuscript dated to 1225–1235

was raked forward at a rather stiff 13°, probably to facilitate swinging the sail (Kreutz 1976: 108; Pryor 1984). The mainmast tended to be more vertical and shorter than the foremast; the average lengths are about 35.3 meters versus 36.6 meters (Pryor 1984: 284–86). The yardarm came to be slung off center for still greater height, somewhat like the modern feluccas (Kreutz 1976: 108). Because an individual sail could not be reefed or adjusted to varying wind strengths, a ship carried different sizes of sails for each mast, about six or seven sails for an ordinary three-deck *navis* (Pryor 1984: 363). The difficulties of the lateen rig became increasingly evident as ships grew larger, masts taller, sails vast and hard to control. As mentioned, the whole sail had to be changed to increase or decrease the sail area. If the sail were *not* loosed fast enough to fly harmless in a sudden squall, it could shatter both itself and the yards. A lateener normally carried many spare yards as well as sails (ibid., p. 363). Furthermore, a vessel generally could change direction only by wearing ship, loosing both the yard and the sail and swinging the stern around, said to be a dangerous maneuver in high winds (Hourani 1963: 109–10).[12] Finally, a big lateen-rigged ship required more crew than the square-rigged cog.[13] By the late thirteenth and fourteenth centuries, Mediterranean shipping, including at least some Arab vessels, was changing in favor of the square-rigged northern cogs (Kreutz 1976: 107).

This concerns the Mediterranean, and again the application to the Indian Ocean is hazy. Hourani, writing about Arab seafaring during the eighth through tenth centuries and later, mentions only lateen sails, probably tacked by wearing ship, and the fact that some ships had two masts, probably very tall (Hourani 1963: 100, 109–10).[14] The sails could be woven of cotton, palm leaves, or coconut leaves (ibid., pp. 100–01; Lewis 1974: 248). The *jilabah* of Aidhab had mat sails, said to be unsound (Ibn Jubayr 1952: 65). On the other hand, Kreutz (1976: 81) says that there is no depiction of lateen-rigged ships in the Indian Ocean until *after* European contact in the fifteenth century, and the Portuguese were sailing square-rigged ships. She does however note a possible literary reference to lateens by one John of Monte Corvino in the late thirteenth century. Manguin (1985: 8) would accept lateens as the usual type of sail on an Indian Ocean vessel but also produces some evidence for a rectangular "dipping lug-sail." Finally, if the Arab captains and merchants were not using ships with lateen sails on the Indian Ocean, what were they using?

Even the existence of decks on the Indian Ocean vessels is, rather surprisingly, debated. The thirteenth century Mediterranean round ships discussed at length by Pryor

12. The ability to wear or tack depends on the type of lateen sail and yard suspension; there is considerable variability here and at least some limited choice in the manner of changing direction (Norton 1957: 327).

13. Note that very large crews were needed for the extremely low, broad Roman square rigs (Bass 1972: 77).

14. Manguin (1985: 7) notes Indian ships of the first millennium A.D. with two masts (see also *Chapter 3*), but for the medieval period he finds no satisfactory proof for more than one mast. On the other hand, Lewis (1974: 247) describes the large, long-distance Indian-style ships as carrying several masts. Perhaps he is speaking of the end of the medieval period.

(1984) typically had three decks and as many as three or four additional decks for cabins in the high fore- and aftercastles.[15] There are some medieval references to cabins on ships engaged in trade with India, which would imply some sort of deck. The cabins may have been no more than screened areas, but as they were used for cooking, sleeping, and storing items (Goitein 1973: 197) they must have had a floor. The much earlier Serçe Limani vessel (A.D. 1025) appears to have had living quarters at the stern because here were found pottery vessels for cooking, eating, and storage, intact or nearly intact glass vessels, iron swords and balance pan weights, presumably personal property (Bass and van Doorninck 1978: 125). On the other hand, sources such as Duarte Barbosa, early sixteenth century, specifically describe a type of ship from Calicut that was sewn, undecked, but quite large (Lewis 1974: 247). Manguin's study would indicate, perhaps, a poop deck and weatherproof siding but no more. He cites Marco Polo's description of ships loaded with bales that were covered with hides, and the top cargo of horses stood on that. A somewhat later Cananore ship, ca. 1500, is described as having bales in the hold, huts and roofing of matting or thatch around them, and a thick cane lattice atop the "huts" for walking or resting on (Manguin 1985: 6). The milder Indian Ocean may have rendered decks and shelter less critical to survival than on Mediterranean or northern European waters, and multiple decks are so far poorly attested, but the references to cabins and the size of the boats would suggest a partial deck at the very minimum.[16] Note that the Quseir ship (fig. 6) and the al-Hariri ship seem to have at least one level of cabins or shelters. Were the "decks" and "cabins" then temporary structures erected at the beginning of each voyage?

Who built the boats and where might give some further clues. As noted, some were built in Qus, were disassembled for camel transport to the Red Sea, and were reconstructed there. Ibn Jubayr tells the story of Christian raiders who transported their ships in segments overland and nailed them together near Qulzum. They were defeated by ships "prepared in Misr [Cairo] and Alexandria" (Ibn Jubayr 1952: 52). Some of these might have been the skeleton-first, lateen-rigged vessels of the Mediterranean.[17] Yet other ships, probably akin to modern dhows, were built from teak or other woods on the Malabar coast (Wiet 1955: 133; Curtin 1984: 120), at Arab ports, and on the eastern coast of Africa (Lewis 1974: 250); we have mentioned Ibn Jubayr's account of ships built at Aidhab from Indian teak.

15. The Indian Ocean vessels definitely had neither fore- nor aftercastles. Rather the stem and the stern both came to a more or less sharp point (Manguin 1985: 5).

16. One of the arguments for undecked vessels is that the modern Indian Ocean dhows have no decks. The cargoes are covered by hides or some other protection and the crew sleeps on top (Hourani 1963: 98). The medieval ships did not shore hop or put in every night, which would require either cold rations only for a very long time over the open sea or else some cooking facilities, and in fact some are mentioned.

17. Speaking for the Mediterranean, Spanish ships were eagerly purchased in Tunisia, and one Cairo geniza document mentions the forced sale of a Tunisian ship in Alexandria for 300 dinars (Goitein 1967: 312). Given the volume of trade with Spain and its more ample supply of wood, this seems reasonable, and again these ships were most likely the Mediterranean type of skeleton-first, lateen-rigged vessels.

The fact that ships carried numerous anchors, ship's boats, and other installations on board might also imply a deck. The Serçe Limani ship carried at least eight iron anchors shaped like broad Y's [18] (Bass and van Doorninck 1978: 124). The Quseir ship (fig. 6) shows four anchors, although the al-Hariri ship displays only one, a sophisticated grapnel type. One thirteenth century Mediterranean ship, the *Paradisus*, carried twenty-five anchors; known weights of anchors of the period range from 166.6 to 476 kilos. Pryor (1984: 369–71) suggests that the extra anchors were needed partly because of their inefficient design and frequent loss, and partly because of cumbersome raising mechanisms—no capstans—that might require cutting the cable if a speedy departure were urgent.

A large ship was normally accompanied by a small one, a *qarib*, especially on the India run. It served as a ferry to port, not infrequently as a lifeboat (Goitein 1967: 306), and perhaps for communication between ships in convoy.

A number of new navigation aids were available. Compasses are mentioned in the late eleventh century for Arab and Persian ships running between Canton, Sumatra, and India. Hourani (1963: 108–09) however suggests that given technical difficulties with a wet-mounted compass and the generally clear skies, compasses may not have been too important on the Indian Ocean. Astrolabes were known in the early Abbasid period, especially for astronomers on land. Latitude was measured by the height of stars above the horizon, and we have noted the early reference to the latitude of Quseir. The thirty-two-point windrose could have provided a standard for reference, and various handbooks listed winds, coasts, reefs (Hourani 1963: 106–07), latitude, or sailing instructions (Tibbetts 1961: 323, 327; Lewis 1974: 252).

As for the Roman period, perhaps the most important feature of these ships insofar as long-range shipping is concerned is their tonnage and cargo capacity. This seems to have been considerable. By the thirteenth century Indian Ocean ships or dhows were carrying 100 to 400 tons cargo, others as much as 100 soldiers plus crew, passengers, and 70 horses. Manguin (1985: 6) lists tonnage figures for only two ships, 180–200 and 100 tons respectively. From a slightly later period, Duarte Barbosa's early sixteenth century Malabar ship carried 350 to 400 tons burden (Lewis 1974: 247). The large Gujarati ships of the same period seem to have averaged 300 to 600 tons, and these are still the sewn, deckless type (Manguin 1985: 9). The Mediterranean ships for all their elaboration seem to have carried less, about 100 to 250 tons cargo (Curtin 1984: 120). This agrees with Pryor's (1984: 219) estimates for an average of 300 metric tons deadweight[19] for a two-decked ship and 545 to 1085 tons for a three-decker. Arenhold (1911: 300) estimated about 240 tons for the largest English vessels of the fourteenth century. A less direct measure is the passenger capacity. Buzurg Ibn Shahriyar (active 930–947) mentions ships, possibly quite crowded, carrying 400 men (Hourani 1963: 113). Cairo geniza references note up to 400 or 500 passengers

18. The simplest anchors might have been no more than stones with holes in them (Hourani 1963: 99), but we are dealing here with large, long-range trading ships.

19. Deadweight tonnage is the weight of water displaced by the cargo when fully laden (Pryor 1984: 373).

for long runs on the Mediterranean (Goitein 1967: 215, 315). This again agrees with Pryor's (1984: 374–75) studies: up to 500 passengers on a normal three-decked ship, and one Genoese ship carried up to 1000 passengers plus about 85 crew and officers.

Another question important to long-range Indian Ocean trade is the speed of these ships. Hourani (1963: 110–11) gives a normal speed of two to four knots, up to five or six in favorable conditions. Al-Maqdisi in the late tenth century gives twenty-five days for the relatively short distance from Qulzum to Jidda, or sixty days maximum if anchoring each night (ibid., pp. 110–11), but as we have seen, the winds often fail at the northern end of the Red Sea. The 1183 journey of Ibn Jubayr from Aidhab to Jidda in a small *jalbah* took eight days plus one day for embarking. En route they encountered a storm, spent some nights camping on shore, and took another day to pass the tricky approaches to Jidda (Ibn Jubayr 1952: 66–69; Hourani 1963: 120–22).

The crew on a lateen-rigged ship was fairly large, 50 sailors for a 240-ton ship versus 28 for the somewhat later square-rigged vessels of comparable size (Kreutz 1976: 107). Pryor (1984: 374–75) estimates roughly one sailor per ten metric tons, though this could vary widely. Vessels in the 300 metric ton range carried 38 to 55 sailors (ibid., p. 219), though this pertains to the Mediterranean vessels. The Cairo geniza indicates that large ships sometimes had two captains for navigation as well as a manager acting as agent and purser. The latter oversaw cargo stowing, gave permission to unload, and made necessary arrangements with merchants and passengers (Goitein 1967: 312–13). Ibn Majid, late fifteenth century, discriminates between navigators, *mu'allim*, and coastal pilots, *rubban* (Tibbetts 1961: 325). Boats generally had a single owner rather than a consortium, and the shipowner himself might deal with customers (Goitein 1967: 309, 312–13). A passenger booked his space as soon as possible, perhaps immediately after the arrival of the ship in port. Both goods and passengers loaded on board days before sailing, at the very least one day (ibid., pp. 313–14) in order to sail with the first favorable wind. Sindbad's fifth voyage gives a sketch of sailing procedures. He says that he bought his goods and a ship at Basra and hired a master and crew over whom he set certain of his slaves and servants as inspectors. Other merchants brought goods and paid for freight and passage. All recited the *Fatihah* and set out (Hourani 1963: 112–13).

This lengthy discourse on the types of ships that may have called at Quseir al-Qadim was necessitated by the patchiness of data for the Indian Ocean itself, and the sometimes contradictory interpretations of those data. Tentatively, then, we may say that many or most of the Indian Ocean ships had sewn hulls, lateen sails, one or two side rudders although stern rudders may have been an option, some temporary decking and enough cabin space at least for the merchants and more affluent passengers, multiple anchors, and at least one ship's boat, not to mention all the other sailing and provisioning paraphernalia. The range of variation of variation in size and shape of the ships is at least partly reflected in the large number of names of types of dhows (Hawkins 1977; Chaudhuri 1985: 141). Probably smaller, shallower boats tended to be used on the Red Sea and Persian Gulf, instead of the deep draft ocean-going ships crossing to India. Crews were probably fairly

large. The ships carried 100 to 400 tons cargo, most likely in the 300 ton range, and sailed at about 4 to 5 knots. Many other kinds of vessels including nailed ships must have been sailing these waters as well. Even Chinese junks[20] might have been sighted at Aden, the best attested occasions being Cheng Ho's and Chou's expeditions in the first third of the fifteenth century (Serjeant 1988: 74–75).

Let us assume that our merchant is well accustomed to delays, and that while waiting for a ship of one description or another he has been attending to the packaging of his goods. The bales could be very large and heavy and were liable to be tossed about, torn, or damaged by sea water, which made proper packaging especially important (Goitein 1973: 19). If the bales constituted the complete fill of the vessel and people, horses, ship's boats, and other items had to travel on top of the bales, then they had to be solid indeed. In fact, the "technicalities [of adequate packing] had a great influence on the very organization of commerce" (ibid., pp. 332–33). The kind of wrapping could indicate the contents. Canvas was the preferred material for many purposes and it was expensive enough to warrant reclaiming and reusing it. Fabrics, silks, ambergris, and the like might at times be further covered inside a bale by means of hides or some other second wrapping (ibid., pp. 332–33). Leather bags or skins were used for liquids, oil, wine, and also for parchment, silk, or indigo. Amphorae seem to have been far less important than in Roman times, mainly being used for food supplies (Goitein 1967: 334). Wooden boxes were valuable but occasionally utilized for books, corals, beads, or saffron. Baskets and wickerwork crates might hold copper, antimony, sal ammoniac, books sometimes, or glass vessels (ibid., p. 334). Glass vessels themselves were "rarely used for transportation in the Mediterranean area, even less, it seems, than in the India trade" (ibid., pp. 334–35). Packing costs and transport to the ships had to be paid early, in our case presumably at Qus or even Cairo, but freight costs might be paid on arrival of the goods at their destination (ibid., pp. 340–41). Perhaps the most important aspect of packaging procedures for the glass trade on the Indian Ocean is the common practice[21] of attaching small bundles to the large bales. The bundles and their contents were a sort of lagniappe, usually presents for someone or special requests. They include garments, spices, household items, ornaments, and glassware for personal use (Goitein 1968: 334–35; Goitein 1973: 195–96).

ADEN

Embarking from Aidhab or Quseir with bundles and bales and having caught a favorable wind, the first port of call would probably have been Aden. Unlike the Romans, the Arab vessels did not normally shore hop (Goitein 1967: 318–19) though they might anchor at night (Hourani 1963: 110–11). This may have avoided the danger of crossing coastal breakers or perhaps the complications and exactions of landing at a port (Goitein 1968:

20. Junks, characteristically Chinese, are defined as flat bottomed, nailed, decked, divided internally into watertight compartments, carrying three or four masts, and sometimes very large (Lewis 1974: 248).

21. Contra Goitein 1967: 337.

348–49). Ibn Majid, writing in the late fifteenth century, included a section on navigation of the Red Sea. According to him a true *mu'allim* or navigator (versus a *rubban* or pilot) sailed straight down the center of the Red Sea and then at the appropriate latitude turned to the east or west towards the port. If anything, ships tended to favor the Sudanese side lest a sudden westerly wind blow the ship onto the Arabian shoals. Voyaging to Aden, the navigator first headed for a string of islands at Saiban (Jebel el-Tair), then for al-Ab'alah (Zubair), then Zuqar, and so the Bab el-Mandeb and Aden, avoiding Mocha if possible. Local trade of course could follow the reefs and channels closer to shore on the Sudanese or Arabian side (Tibbetts 1961). Ibn Majid made no reference to Aidhab, long declined, or Suakin, though he did mention Aqiq and Jebel Erba, but then he was mainly concerned with the route to Jidda (ibid.).

Aden has had a long and checkered history as a harbor; we have encountered it already in the Roman period. Idrisi, writing prior to 1154, reported that a governor of Yemen seized Kish, opposite Muscat, fortified it, and despoiled the Omani merchants to the extent that trade shifted to Aden (Lane and Serjeant 1948: 113). Under the Fatimid and Ayyubid rulers, based in Cairo, Egyptian trade was enhanced, and Aden with it as "the channel through which all merchandise passed *en route* for Egypt and the Mediterranean countries" (Di Meglio 1970: 107). The policy of bolstering Egyptian trade, and hence the Red Sea ports, was continued by the early Mamluk sultans, not to mention the Karimi merchants working on their own behalf (Di Meglio 1970: 107–08). Despite political upheavals around 1200 thanks to the nephew of Salah al-Din (Goitein 1973: 212–13) and disruptive Rasulid commercial practices about a generation later (Wiet 1955: 88; Serjeant 1988: 69), by the fourteenth century Aden was nonetheless an especially busy harbor receiving ships from Hijaz, Sind, India, China, Abyssinia (Wiet 1955: 92–93), and Egypt. The Karimi merchants are known to have been active in Aden in the fourteenth century, and an Indian quarter of the city is found there as well (Serjeant 1988: 70–71). The Yemeni merchants, who had their own group of notables, seem to have been answerable to or organized under a headman, sometimes called the *mashayikh al-tujjar* or the *rais tujjar al-Yaman* (ibid., p. 66). A Chinese source discussing trade with the West in the twelfth and thirteenth centuries mentions among other locales Mirbat, Shihr, and Zufar (Lane and Serjeant 1948: 119), close to Aden. Marco Polo's return journey from China via India, Hormuz, Trebizond, and Constantinople includes a description of Aden, noting the volume of traffic from India (Toussaint 1961: 92; Casson 1989: 159).

Given the difficulties and risks of travel, merchants usually stayed overseas several seasons, sometimes even most of a lifetime (Goitein 1968: 335). They tended to live in the same vicinity, and the *wakil al-tujjar* was recognized as the head of the foreign community (Curtin 1984: 114–15), at least in the earlier part of the period under discussion. The Cairo geniza preserves records covering a century and a half that concern the post of *wakil al-tujjar* at Aden (Goitein 1968: 345–46). One family of India traders based at Aden, the Lebdi, can be documented for two and a half centuries, and some of them held the position of *wakil al-tujjar* (ibid., p. 336).

Sites around Aden give further evidence not merely of trade but also of production of commercial goods, notably glass. Much of this has been cited for parallels in *Chapter 4*, particularly for the bracelets. The material from al-Qaraw has been dated to the late twelfth through the thirteenth centuries. Khanfar and Kawd am-Saila are a little later, probably fourteenth to sixteenth centuries (Whitcomb 1988). Al-Habil and Zinjibar in the Abyan oasis have also yielded traces of glass manufacture; al-Habil has been dated by a surface find of a Mamluk coin (Lane and Serjeant 1948: 108; Harding 1964: 19). At Kawd am-Saila "good burnt brick kilns are visible here and there" (Lane and Serjeant 1948: 108) as well as many wasters and drips (Monod 1978), including debris from bracelet manufacture (ibid., p. 121; van Beek, pers. comm.). The commonest colors are blue-green and almost colorless green with a yellowish tinge. Small, thin vessels in shades of blue or amber are also reported but are less abundant than bracelet fragments (Lane and Serjeant 1948: 129). Al-Maqdisi (tenth century) mentions Aden exporting glass (Chaudhuri 1985: 190). An 1139 letter from Aden to Malabar lists some household goods ordered, including glassware, namely, sixty-eight goblets, ten bowls, five cups in their basket, and five green bottles with a basket. The total cost, one dinar and eleven qirat, is so low that the glass is thought to be local Adenese manufacture (Goitein 1973: 189). Certainly the buyer, Yiju, one of the most important India traders, could afford expensive glass had he wanted it. Among other products we note only the Yemeni stone pots (Goitein 1968: 340) and a type of yellow-glazed pottery found near Aden and exported to Kilwa, Gedi, the Kenyan coast (Chittick and Rotberg 1975: 12), and Quseir.

Jidda was also an important Karimi port in the fourteenth century. Goods were shipped from Jidda to Aidhab to Qus (Wiet 1955: 93–94), though Quseir would have been a much shorter route. Also, at the very end of the fourteenth century when the trade through Aidhab declined rapidly, Tor at the tip of Sinai became a preferred alternative (Garcin 1976: 405–06) because it fed into the Qulzum to Cairo route.

THE AFRICA TRADE

In the Roman period few if any permanent merchant colonies were established to the south of the horn of Africa; Rhapta is the possible exception, but it has not been definitely located. In the medieval period on the contrary many towns were built up, partly as refuges for those fleeing troubles in the Persian Gulf and elsewhere but also for the sake of trade. In addition, the native groups—Galla, Somali, Bantu, and others—were coming into conflict with each other, migrating southwards, and gradually adapting to new environments and technologies. The exports, as earlier, were mainly raw goods such as ivory, gold, smelted but unshaped iron, ambergris, slaves, and perhaps gum copal and mangrove poles (Chittick and Rotberg 1975: 14). Imports were manufactured goods such as pottery and porcelains, glassware, Indian iron tools and beads (ibid., p. 12).

Trading settlements that linked Africa to the Persian Gulf and South Arabia existed by the tenth century (Chittick and Rotberg 1975: 2–3). In northern Somalia the Galla herdsmen were still in place but perhaps starting to shift to the south towards Kenya. Along the

southern Somali and northern Kenyan coast, the Zanj tribes tended to mixed agriculture. Their ruler, usually titled "king," had his seat at Shungwaya, thought to be near the Somalia-Kenya border.[22] Although the Zanj participated in the Indian Ocean commerce, they were at this early date still pagan (Grottanelli 1975: 61–65; Trimingham 1975: 121–22). Later, by the twelfth century the people of the Benadir coast of Somalia had converted to Islam, and the religion and presumably elements of Islamic culture were beginning to be accepted at some places down the eastern coast as well. The island of Anjaba or Unquja is mentioned as Moslem, and the Moslem dynasty of Kilwa is said to have been founded about 1150 (Trimingham 1975: 124–25). After about the mid-twelfth century there was a major influx of Islamic settlers, primarily from Arabia and the Persian Gulf. "Shirazi" was in fact the general term for an Islamicized African culture (ibid., pp. 128–29). Initially the African towns traded mainly with the Persian Gulf (Chittick and Rotberg 1975: 9), but as that area declined the trade probably had to look to Aden and the Red Sea. Expansion continued in the thirteenth century and by the end of the fifteenth century some thirty to forty stone-built towns existed from Somalia to Sofala. Each was an independent city state controlled by the merchants; at that time there were no comparable African states in the hinterland for competition (Curtin 1984: 121–22). Furthermore, the Galla-Somali wars that peaked in the fourteenth and fifteenth centuries (Grottanelli 1975: 56) would seem to have militated against the possibility of an organized African state capable of rivaling these Islamicized city states, especially in Somalia.

For East Africa there is a sizable body of archaeological evidence, and parallels to the Quseir al-Qadim glass are cited extensively in *Chapter 4*. The data on given sites and towns is supplemented by medieval travelers' accounts, local histories and genealogies, and a few other written records, which do not always agree with the archaeological evidence. The information is summarized here by starting from Zeila just across from Aden, continuing around the horn of Africa, and then reviewing sites southwards to Sofala.

Zeila must have been an important town; Casson (1989: 116) places it to the south of the Bab el-Mandeb and to the southwest of Aden.[23] On the one hand, Chittick (1979: 277) located no Islamic towns on the northern coast of the horn of Africa. On the other hand, Curle (1937) did find ruined towns inland as well as some twelfth to fifteenth century Sung and Ming celadons. Pottery, porcelain, glass, beads, and metal are mentioned but not illustrated; bracelets are described as black or blue, twisted polychrome, or elaborate, multicolored ones. Curle's notice of towns inland agrees poorly with Grottanelli's reconstruction of the history of the Galla herdsmen. Said to have lived fairly close to the coast at one time, they "seem always to have avoided the coast" itself (Grottanelli 1975: 55), perhaps to avoid malaria and tsetse flies (ibid., p. 61). Prior to the Galla invasion of Ethiopia, sometime before the sixteenth century, they had no metals, weaving, pottery, horses, mules, or sheep, and little if any agriculture (ibid., p. 55). To whom then do the elegant celadons and

22. Bur Gavo in southern Somalia is one of the plausible candidates for the location of ancient Shungwaya (Sanseverino 1983: 163).

23. Chittick (1979: 277) however states that the ancient site has not yet been securely identified.

fancy glass bracelets pertain? Perhaps the entire area of northern Somalia should not be painted with a single brush stroke as having a purely nomadic population.

The early Islamic settlements begin well to the south of the horn of Africa,[24] in the vicinity of Mogadishu, modern-day Baduna (Chittick 1980: 365; Trimingham 1975: 138). According to the Kilwa Chronicle, Mogadishu was founded by Arabs from the Persian Gulf early in the tenth century, and there is later thirteenth century evidence for Persians (Grottanelli 1975: 73–74). Al-Idrisi, writing in the mid-twelfth century, described the indigenous Zanj, at that time perhaps settled in Mogadishu and regions to the south, as black people living in the midst of nomadic Berbers. By the middle of the next century, however, Mogadishu had become a famous Islamic center (Trimingham 1975: 127), nothing less than an Arab-Somali sultanate (Grottanelli 1975: 74) with its own mint (Chittick and Rotberg 1975: 13–14). At this time a trade route ran from Aden to Mogadishu, Kilwa, and Madagascar, and ambergris is particularly noted as an import to Aden in the fourteenth century (Chittick and Rotberg 1975: 11). Celadons and Chinese and Arabic coins ranging from eleventh to thirteenth century have been recovered at Mogadishu, and indeed "the whole coast from Kishmayu to Zanzibar is littered with Chinese pottery" (Lane and Serjeant 1948: 116).

The next town to the south, Merca, was according to tradition founded by Sirafis in the early tenth century. Yaqut, ca. 1228, described Merca of the Zanj coast as belonging to the "black Berbers." The next town in line, Barawa, is said to be a foundation of Persian Gulf Arabs like Mogadishu, also early in the tenth century (Grottanelli 1975: 73–74).

Manda, in the Lamu archipelago, has been excavated and well published. The earliest Islamic pottery is ninth–tenth century, probably from the Siraf area (Chittick and Rotberg 1975: 11). The settlers themselves, on the other hand, are said to have come from Yemen and "al-Sham," perhaps referring to the northern Hijaz rather than Syria (Kirkman 1975: 235). In any case, Siraf was definitely a major transshipment point in the tenth century. If Chinese wares are found in Africa, they probably passed through Siraf, Sohar, or South Arabia, and quite possibly local Persian or Arabian goods or ceramics were also picked up there. By the fourteenth century Chinese imports were common at Manda, especially celadons (Chittick and Rotberg 1975: 13). The glass corpus is cited in *Chapter 4*.

Close to Manda, Ungwana on the Tana River has been excavated. Kirkman (1975: 241) dates the lowest levels to about 1200 and the latest after 1450 by reference to the construction history of two mosques, the "old Jami" and its successor. Pottery and glass are not discussed in any detail, but a glass ewer, two bottle mouths, and a few beads are illustrated (Kirkman 1966: 108–09; Kirkman 1975: 241).

A short distance from Manda and Ungwana, three more Arab towns may be mentioned: Malindi, Gedi, and the now-important city of Mombasa. The founders of Malindi are said

24. A survey of the southern Somali coast, northwards from Mogadishu, encountered sparse remains of mosques, tombs, and town walls, mostly sixteenth century or later with a little earlier material, notably some possible fourteenth–fifteenth century celadons at Myaandi (Sanseverino 1983: 151, 161).

to have come from Kufa in Iraq. Gedi may have been founded in the thirteenth century, though most of the buildings are fourteenth or fifteenth century (Kirkman 1975: 235, 237).

Excavations at Mombasa have yielded stratified remains of stone structures built about 1250–1300 as well as deeper levels that may go back to ca. 1000 (Sassoon 1980: 37–40). This seems to fit the brief accounts of Idrisi in the mid-twelfth century, who first describes Mombasa as a small town of the Zanj, and Ibn Battuta a century later. He comments on the stone and wooden buildings, fine mosques, and devout Muslim population (ibid., pp. 3–4). The town, like others on the East African coast, is said to have been settled by Shirazis, in this case perhaps at a second remove, having sojourned on the Benadir coast of Somalia. The traditional date of foundation of Mombasa is also disputed, tenth versus twelfth century (Kirkman 1975: 235, 327).

Qanbalu on Pemba Island on the other hand was an important trading station early on, supplanted later by Mogadishu (Trimingham 1975: 124). Islamic immigrants to Qanbalu, perhaps Iraqis, are said to have arrived before the tenth century, which would make them some of the earliest settlers on the eastern coast of Africa. Chittick and Rotberg (1975: 9) state that by the tenth century there was a considerable Islamic settlement. Archaeological evidence for occupation of Pemba before the late eleventh century, however, is slim (Horton and Clark 1985: 169). By far the most dramatic find of that date is a hoard of at least 12 gold and 2060 silver coins buried in a mud and timber hut at Mtambwe Mkuu. The gold coins bear mint marks ranging from Tunisia to Cairo, Tyre, and Damascus; the silver ones are of East African production (Horton, Brown, and Oddy 1986). Although Mogadishu may have carried more trade after the mid-twelfth century, there are still twelfth and thirteenth century references to Qanbalu or Pemba (Trimingham 1975: 136), and the archaeological evidence continues through the fourteenth century (Horton and Clark 1985: 169–70).

Zanzibar (= *Zanj-i bar*, "coast of the Zanj"), one of the most exotic names in international trade, has traces of settlement in the ninth century with substantial occupation in the twelfth through fourteenth centuries (Horton and Clark 1985: 169–70). Zanzibar is noted by a Chinese author, Chau Ju-kua, in discussing the twelfth and thirteenth century trade with the West; he remarks that the Ta-Shi (Arabs and Persians) trade from the Malabar coast directly to Zanzibar. Goods listed are white cotton cloth, red cotton, porcelains, and copper (Lane and Serjeant 1948: 116). The sultanate of Zanzibar was economically and politically developed enough to need to mint its own copper coins (Chittick and Rotberg 1975: 13–14).

Mafia, off the coast of Tanzania, was occupied by Arabs as early as the ninth century and seems to have prospered especially in the eleventh through thirteenth centuries. Thereafter Kilwa, to the south, became dominant, especially as a center of the gold trade. Mafia was a sizable settlement of some 50 hectares, though about one-third of that is now washed out. Three mosques were studied and dated to the eleventh through fourteenth centuries. Two excavated stone houses are thirteenth–fourteenth century. Both mosques and houses yielded glass (Morrison 1987: 299–301) as noted in *Chapter 4*. The numismatic

evidence is cosmopolitan: two Mongol coins have been recovered, one Egyptian Ayyubid, one Chola from southern India, and many copper coins minted by the sultans of Mogadishu, Zanzibar, and Kilwa (Chittick and Rotberg 1975: 13–14), and apparently Mafia as well (Horton, Brown, and Oddy 1986: 120).

The ruling dynasty of Kilwa, said to have originated in southwestern Arabia and to have become rulers of Kilwa in 1150, seems to have been influential in the spread of Islam on the African coast (Chittick and Rotberg 1975: 11–12; Trimingham 1975: 124–25). Yaqut in the thirteenth century barely mentions Kilwa, but a little later Ibn al-Mujawir lists it as an important stop on the route to the Jazirat al-Qumr, or Madagascar (Trimingham 1975: 127). In the mid-fourteenth century Ibn Battuta found Hijazi scholars at Kilwa, and the town certainly survived well into the fifteenth century (Chittick and Rotberg 1975: 11–12). Excavations at Kilwa recovered, among many other valuable discoveries, glass vessels which are cited in *Chapter 4* and thousands of beads of many sorts (Chittick 1974: 460, 468–70, 479). There is no evidence for bead manufacture at Kilwa, and many, especially the Indian red *mutisalah* beads, may have come from India. There are also reports of beads imported from as far away as Malacca or Malaya, and odd beads such as the transparent or folded ones may have had yet another origin (ibid., p. 482).

The entire island of Madagascar seems to have been uninhabited until the first millennium A.D., and evidence before ca. 1000 is sparse. The two main groups of settlers were Indonesian and Bantu, the Islamic presence coming later, perhaps in the thirteenth century. Madagascar was tied to the Indian Ocean trade (Vérin 1986: 33) and points beyond. Sung coins have been found there (Lane and Serjeant 1948: 116), as well as celadons and other exotic goods. Two sites, Vohemar and Antanandava, both on the northeastern side of the island, have yielded medieval glass. Vohemar may have been settled as early as the thirteenth century, but it flourished mainly in the fourteenth through seventeenth centuries (Vérin 1986: 209). The glass from the Vohemar tombs includes looped bases and a variety of bottles and vials (ibid., pp. 240–42). Among the glass finds from Antanandava are a flaring mouth bottle, vials, and a decorated sherd (ibid., pp. 272–73) that seem medieval though the drawings are not as clear as might be.

Below Kilwa, Idrisi (ca. 1154) refers to a string of settlements down the African coast (Trimingham 1975: 138), but except for Sofala we have little information about any of them. Even Sofala, below the mouth of the Zambezi River, was different from the Islamicized towns to the north. "Sofala" in fact seems to mean a region, the most southerly point to which the tenth century Omanis and Sirafis ventured (ibid., p. 121). Although there seems to have been no permanent colony or "Shirazi" culture (ibid., p. 129), there must have been some sort of trading point or port. Sofala was a connection to Zimbabwe inland and a most important link in the Indian Ocean gold trade, which carried at least one metric ton per year by 1500 (Curtin 1984: 121–22). The Sofalans are said to have been completely dependent on foreigners for trade; Omanis, Indians, and even perhaps Javanese are mentioned (Trimingham 1975: 125). Control of the Sofala gold was vital to the rise of Kilwa, well over 1000 kilometers to the north (Morrison 1987: 299–300).

Kilwa was about as far as trading ships could regularly proceed. This is close to the point the Roman vessels reached as well, assuming that Rhapta lay in the vicinity of the Rufiji River. The monsoons are reliable as far as Zanzibar, and almost to Kilwa at 7° south latitude (Chittick and Rotberg 1975: 1). Local coasting vessels presumably linked the Sofalan gold transporters to Kilwa; foreign ships further to the south would probably have been rare.

Thus a merchant trading out of Aden or the Red Sea to East Africa in the thirteenth and fourteenth centuries would have had many possible ports of call: Mogadishu, Merca, Barawa, Manda, Ungwana, Malindi, Gedi, Mombasa, Pemba, Zanzibar, Mafia, and Kilwa. At least two of these, Manda and Kilwa, had historical ties to South Arabia, and Mogadishu had a known commercial link, the ambergris trade. Three of these city states, Mogadishu, Zanzibar, and Kilwa, claimed to be sultanates and had their own currency, as did Mafia. The Hijazi scholars of Kilwa should have helped to preserve Islamic culture and traditions even in that remote town. Which languages were spoken is still a problem. Arabic was presumably the religious and legal language used in the towns and their immediate hinterlands, Bantu probably served the local Africans, especially the agriculturists (Grottanelli 1975: 74), and Swahili might have been the commercial language (Tampoe 1989: 123). Given a similar technology—sails—the optimal traveling seasons were the same as in the Roman period. The annual trading fleet could leave Aidhab or Quseir in July, call at Aden, and reach Cape Guardafui in 75 to 100 days. Mid-October to mid-November winds are favorable for the run southwards, but unlike the Roman period there were many settled towns on the African coast with the same roots, namely Islamic. We have only the general information on Indian Ocean ships summarized above, but we note that the winds and seas are not so rough as the crossing to India and hence the East African boats need not have been quite so strong. Ships in the 100 to 300 ton cargo range could have carried away the raw materials and slaves exported from Africa and brought in the textiles, metal tools and utensils, pottery, porcelain, celadons, and glass. Apart from beads, especially abundant at Kilwa, and perhaps glass bracelets, as in northern Somalia, glass items may not have been major trade goods. On the other hand, the merchants prospering in the Islamicized towns along the coast certainly could and did afford stone-built houses and mosques, large amounts of imported pottery and whatever glassware they wanted. We see the glassware coming with the bundles or presents so often attached to the main shipping bales; some ordinary quality vessels from Aden and most of the rest from Cairo, especially the high-quality glass. The glass bracelets came primarily from the vicinity of Aden, plus perhaps some from other countries. Trade beads may have been regular but low-bulk imports from India, or maybe Egypt or even Southeast Asia.

THE INDIA TRADE

The alternative to going southwards to Africa from Aden was to sail eastwards to India or points beyond. Here the evidence for glass trade becomes scrappy indeed, limited to

hints from the Cairo geniza, travelers' accounts, a few glass studies, and very little archaeology.

The lateen sails permitted somewhat more flexibility in sailing schedules than the Roman square rigs. Thus it was possible to sail along the Arabian coast to Oman and then with the *northeastern* monsoon in the cool months to the Indian coast (see dashed lines on fig. 5). The other option, the only one regularly utilized by the Romans, was to sail sometime between late August and early October with the southwestern monsoon.[25] Either way, the ships could return with the northeastern monsoon with little delay (Curtin 1984: 98–99), further speeded by the current. There is a little information on actual travel times. Ibn Battuta in the fourteenth century mentions the trip from Zufar, on the Hadhramaut coast half way between Aden and Muscat, as taking one month sailing day and night with good winds. It would require more time if the ship anchored in the afternoon and at night (Wiet 1955: 131). From India it was at least a month to Malaya or Indonesia, and a journey from Cairo to Indonesia required four months or more (Goitein 1973: 227–28).

As a rule, ships to India called at one and only one port. This may have been an attempt to pay customs and port duties only once, and they could be extortionate, or to avoid the danger of crossing the coastal waves near shore (Goitein 1967: 319; Goitein 1968: 348–49; Curtin 1984: 114). Also, if the bales and their coverings in fact constituted the entire fill of the hull plus support for the temporary decks, deck cargo such as horses, and deck cabins or shelters, it would have been desirable to disassemble the cargo structure as infrequently as possible. References to storms, shipwreck, loss of goods or their salvage by divers occur repeatedly in business documents (Goitein 1968: 335, 348; Wiet 1955: 131). In addition to natural hazards, attack by an enemy navy (Goitein 1973: 322–23) or by pirates was at times a real danger. We mentioned the Mamluk government's efforts to fight pirates with a navy operating from Aidhab and Quseir. Thanks to these undertakings the Red Sea was "relatively safe from pirates" though merchants still sometimes sailed in convoys of two or more. The crossing to India itself seems to have been more risky. Again, ships could sail in convoy (Serjeant 1988: 63), and by the fourteenth century they often carried soldiers in addition to other personnel. Ibn Battuta sailed on one vessel that had fifty archers and fifty Ethiopian soldiers (Goitein 1968: 348; Curtin 1984: 114).

Whether on not the ships unloaded, restocked, and returned immediately to Aden or the Red Sea, the traders themselves tended to stay overseas for several seasons (Goitein 1968: 335). The merchants usually lived in the same part of town, but whether there was an official *wakil al-tujjar* or *rais al-karimiya* in a given Indian city is not clear. The Arab merchants did play some economic and political role in their cities of residence, and they certainly maintained their religion. Cambay, in northern India, according to Ibn Battuta was a

25. Optimal sailing dates varied according to point of departure, i.e., distance to India. The late fifteenth and early sixteenth century Arab navigators recommended leaving Zeila or Berbera on the 24th or 25th of August; Aden on the 24th to 29th of August but even as late as the 18th of September; the coast from Shihr to Zufar between the 3rd of September and the 8th of October. This is a little later than the Roman schedule (Casson 1989: 290–91), but the lateen sails could utilize lighter winds.

beautiful city with fine mosques and houses. A later Genoese traveler encountered both Alexandrine and Damascene merchants there (Wiet 1955: 132). In southern India on the Malabar coast at least four merchant groups were in existence by the sixteenth century, two Hindu and two Moslem. Of the latter, one group consisted of visitors from Arabia or Persia and the other was descended from Moslem traders who had settled in India by the twelfth century. This community, known as the Mappila, kept their religion but by intermarriage eventually became largely Indian by blood (Curtin 1984: 146). We even know of one India merchant, Abraham ben Yiju, active in the mid-twelfth century, who owned a brass factory, a characteristically Indian industry (Goitein 1968: 336–37).

Unlike Africa, there were local Indian merchants, and we have a few hints about them and their organization, both for the Gujaratis and for the Malabar traders and merchants under their *rais* (Lewis 1974: 253). It has been suggested that the very word "Karim" comes from the Tamil word for "business" or "affairs." In the twelfth century Indian trade was controlled mainly by merchant guilds, mostly connected with caste and religion (Goitein 1968: 360). A man called PTN SWMY in the Cairo geniza was probably a *pattana svami*, the head of a large merchants' guild and a sort of mayor. From northern to southern India, however, the merchants were hardly a homogeneous group; Chaudhuri (1985: 100) notes both Jains and Chettiars as good traders and sailors, though they could never intermarry or even socialize to any degree. Indian shipowners are mentioned (Goitein 1968: 349–50), though as noted in the discussion of Indian Ocean ships we have few data on Indian vessels. Indian merchants availed themselves of well-developed business techniques and partnerships, something like the European *commendas*, though many banking instruments seem to have been lacking (Lewis 1974: 254). Again, the language of trade in western India may have been Arabic (Goitein 1968: 350), though Tamil and Persian are other possibilities.[26] Certainly the Indian merchants were successful in their own right and by the late thirteenth century were gaining in the sea trade over Arab and Persian competitors. We have noted the Baniyan or Indian settlement in Aden in the fourteenth century (Serjeant 1988: 71). Northern India especially saw much economic development in the Indus plains, with Cambay in Gujarat serving as a major port (Curtin 1984: 122). By the time of Tomé Pires and Duarte Barbosa in the early sixteenth century, it was the Gujaratis who carried much of the far-flung trade to East Africa, Arabia, Hormuz, southern India, Bengal, and especially eastwards to Burma and Malaya (Lewis 1974: 243; Chaudhuri 1985: 100). Many of the Quseir al-Qadim textiles are probably Indian, though there are other possibilities. The resist-dyed textiles, however, can be attributed to Gujarat (Vogelsang-Eastwood 1990). Whatever the earlier prosperity of the Arab merchants, by the first part of the sixteenth century few were left in Calicut in southern India (Wiet 1955: 132); Indian or Islamicized Indians seem largely to have taken over.

Reported glass finds or literary references from India are meager indeed, and yet glass was probably at least as abundant as in East Africa. Perhaps it was too common to be considered worth recording. There is however evidence for glass production or processing at

26. The sherd at Quseir al-Qadim with Tamil letters on it came from a Roman period context.

some eleventh–thirteenth century Buddhist monasteries at Sirpur in Madhya Pradesh. Here were found large sherds used as crucibles, slag, and drawn wires or canes of glass. Bracelets seem to be the main item produced, and they are described as heavy rods two to three centimeters thick of amber or "brandy-colored" glass with yellow trails. Dark and translucent green and purple glass were also recovered (Dikshit 1969: 68). The bracelets described do not seem to match any Quseir al-Qadim examples.[27] Numerous glass bracelets, wires [= canes?], and slag were found at Kolhapur in fourteenth century Bahmani context. Although none are illustrated, Sankalia (1977: 230) refers to similar bracelets from Chandravalli, Mangalvedha (Sholapur), Khanapur, Paithan, Kadkal, Maski, and places in the Deccan. There is evidence, sometimes debatable, for bracelets in earlier periods, but Sankalia's point is that the industry was not of major importance until the fourteenth century, probably founded by Muslim craftsmen from Persia (ibid., p. 228). Among the few other items of glass, "phials" and mercury containers are mentioned (Dikshit 1969: 66). Ibn Battuta, traveling from Multan to Delhi in the mid-fourteenth century, described a royal feast at which sherbet was served in gold, silver, and glass cups (ibid., p. 113).

An analysis of a series of Indian glass samples included four from Vankali in Sri Lanka, dated to about 1200 to 1250. Three were black bracelets and one a piece of cullet. The glass had a high-alumina low-lime recipe believed to be characteristic of Indian glass, but definitely not a Mediterranean product. Brill suggests a silica and plant ash recipe, the black color and high alumina content coming from crushed obsidian, slag, or some other unusual silica source. The high alumina content makes a stiff glass usable for bracelets but difficult for blowing to form vessels (Brill 1987: 5).

There is an opaque black bracelet from Quseir al-Qadim (561), a black bracelet with white prunts (568), a black or very dark blue one with a red and white cane (571), and several with polychrome decoration on a black base (572–75, 583), but they do not seem to differ in style from the other Quseir al-Qadim bracelets. None of the Indian comparanda listed in *Chapter 4* seems to have more than a general similarity, though without good illustrations it is impossible to be sure. Still, testing the Quseir al-Qadim black bracelets for their chemical composition just might point to an Indian origin for a little of the glass. Another possibility is the beads; if they were in fact imported from India to East Africa, then some might have been carried to the Red Sea as well since they are easy to transport. Indian glass production did traditionally center on bracelets and fake gems rather than vessels. Having considered the problems of raw ingredients, the acquisition of glass-making skills, and local demand for glass, we are abruptly reminded of cultural factors. Chaudhuri observes that:

27. The still later glass from the Vijayanagar state (1336–1555), specifically from Maski and Kadkal, is said to have been predominantly an opaque bright green (Engle 1976: 128–29), a color not noted at Quseir al-Qadim.

> ... in the Indian subcontinent ritualistic authority and the laws of religious pollution ruled out the usage of fragile but high-valued glass and porcelain objects for serving food and drink. The manufacture of beads and bangles remained the basic outlet for glass-making in India (Chaudhuri 1990: 332).

SOUTHEAST ASIAN AND CHINESE TRADE

Beyond India, Arab ships regularly sailed to Southeast Asia and at times even to China. They could catch the monsoon across the Bay of Bengal in December, then the southern monsoon up to Canton in April or May. Ships could depart in the fall on the northern monsoon, and then from the western coast of India they could sail with the familiar northeastern monsoon to Aden and the Red Sea (Curtin 1984: 108). Unfortunately it was a little more complicated than this. First of all, a trader from the Red Sea area could not get to India and around the Coromandel coast in one monsoon season. He could only reach Cambay or Calicut and then, in the next sailing season, proceed to Bengal, Malacca, or Southeast Asia (Di Meglio 1970: 120–21). This schedule in the long run gave the Gujaratis and Persian Gulf cities such as Hormuz an advantage, which they were indeed exploiting by the end of the fourteenth century. By the time of Quseir al-Qadim in the thirteenth and fourteenth centuries, the Indian Ocean trade tended to break down into three spheres, the western Indian Ocean, with which we are primarily concerned, the eastern Indian Ocean up to the Malacca and Sunda straits, and the China Sea up to the ports of China (Chaudhuri 1985). Furthermore, Chinese policy veered from favorable enough to permit foreign colonies to total exclusion, even to the extent of limiting native Chinese ventures overseas. Thus the Malacca straits became the farthest goal for many Arab, Persian, and Indian merchants (Di Meglio 1970: 113, 126). There they could acquire spices and silks to carry to the West, in exchange for Western goods intended for Indonesia or China. We do not wish to explore Arab trade in the eastern Indian Ocean partly because the Arab literary sources are difficult to interpret (Tibbetts 1956), but mainly because so little glass has been reported from this region. The most noteworthy exception is the glass from Pengkalan Bujang on the shore of the Malacca straits. The glass is mostly Middle Eastern, and the corpus may be broadly dated to the eleventh through fourteenth centuries (Lamb 1965: 35). Other finds from Malaya, Thailand, Sarawak, and the Philippines are mentioned (ibid., pp. 39–40), though they are not abundant and not all of them imply direct trade with the Middle East.

Arab and Persian merchants did journey all the way to China, especially in the early Abbasid period, up to about 878 when rebels sacked the foreign colony at Canton (Curtin 1984: 108). Although many traders sailed only to India or the Malacca straits, some did continue on to China even in the later medieval period. One very wealthy thirteenth century Karimi merchant made the voyage to China no less than five times (Serjeant 1988: 69). A tenth century Chinese source remarks on some attar of roses from Persia, sent in glass phials sealed with wax (Chaudhuri 1985: 53). Another source discussing trade in the eleventh and early twelfth centuries says that the Persians, possibly including Arabs, intro-

duced coral, amber, carnelian, and transparent and opaque glass into China. A slightly later source, Chou K'u-fei, 1178, remarks that the products of the Hadhramaut include frankincense, myrrh, ambergris, pearls, opaque glass, rhinoceros horns, ivory, coral, asafetida, liquid storax, and rosewater. Marvazi in the twelfth century notes that Canton was importing glass but does not say whence (Lane and Serjeant 1948: 118–19). Glass had long been known in China, with occasional imports as early as the Roman period, but the medieval emphasis on Western glass maybe explained by a Chinese account. Chau Ju-kua states that

> Liu-li [glass] comes from several of the countries of the Ta-shi [Arabs and Persians?]. The method followed in making it is the same as that in China, that is to say, it is made by burning oxide of lead, nitrate of potash, and gypsum. To these materials the Ta-shi add southern borax which causes the glass to be elastic, so that one may put it in water for a long time without spoiling it. It is, therefore, more valuable than the Chinese product (Lane and Serjeant 1948: 118–19, citing F. Hirth and W. W. Rockhill, *Chu-fan-chih, on the Arab and Chinese Trade in the Twelfth and Thirteenth Centuries*. St. Petersburg, 1911).

The Chinese glasses thus seem to have been unstable and likely to decompose readily.

THE RETURN JOURNEY

Let us return our merchant to India and ready him for the long trip to Cairo. Let us assume further that his business has prospered and that he has lost little to shipwreck, pirates, and water or shipping damage. He has already paid heavy charges to get his goods to India, though he may have been able to pay for the freight on his bales out of their sale in India, rather than at embarkation. He still had to pay the porters, guards, and tips to the sailors, customs dues (Goitein 1967: 340–41), sales tax, and perhaps a brokerage fee and rental on storage space (ibid., pp. 342–43). Paperwork or worse, its loss, may have presented problems. Vessels arriving at Aden had to produce a manifest and a list of merchants aboard (Serjeant 1988: 65), and one Cairo geniza letter says "I had great trouble getting the shipment out to harbor, for its papers had been lost" (Goitein 1973: 235). One did not wish to pay duties twice. There may have been required gifts to the local rulers (Hourani 1963: 113). In the Mediterranean trade, and perhaps the Indian Ocean trade as well, one had to pay for an official seal on the consignment and for the official money changer (Goitein 1967: 340–41). Certainly our trader had to see to and pay for the proper packing of his goods.

Coming into Aden there was a medical examination for ships arriving from India (Goitein 1967: 351), and further duties to pay. A Cairo geniza letter of about 1130 mentions thirteen dinars paid for dues and freight charges on two bales (Goitein 1973: 182–83). In the late tenth century Aden took in some million *'aththar* dinars in revenue, plus duties on Indian ships, plus "contributions" of musk, camphor, and ambergris. "Apparently ... it was customary to take part of the dues on cargoes in kind" (Lane and Serjeant 1948: 112). This was also true at Shihr, Mirbat, Abyan [Zinjibar], and the provinces of the Red Sea coast as far as Hali (ibid., p. 112). At Aidhab, the 1130 letter cited above mentions another

14 dinars paid in Qassi (Indian) fabrics for Aidhab customs and for freight through the desert (Goitein 1973: 183).

We have not discussed the various customs duties, tolls, and taxes in any detail because they seem to have been far less predictable than in the Roman period. Time and again travelers and merchants complain bitterly about customs exactions, examining bales item by item, cloth by cloth, and even body searches (Ibn Jubayr 1952; Darrag 1961; Serjeant 1988: 65). We recall Ibn Jubayr's complaints about treatment of arrivals at Alexandria, the Akhmim and Qus inspectors searching clothes and prodding bundles with long pointed staves, and the greed of the residents and captains at Aidhab (Ibn Jubayr 1952: 31–32, 56, 65–66). Repeatedly rulers ordered taxes to be lifted or regularized, much to the expressed joy of the merchants. Rulers might explicitly order their officials to deal fairly with the traders, or they might issue safe-conducts to all foreign merchants in order to further trade. Just as regularly, however, a sultan could appropriate goods and money outright, or lay on prohibitive charges. One cynical writer observes that when the ruler "... ordered injustices to be lifted and sent someone to see about this, they would outwardly obey his order, but when his commissioner had left, they would go back to the very injustice they had been practicing" (Serjeant 1988: 71). Favorable reception and just treatment at a given port one year could next year be replaced by sheer expropriation of the fruits of years of labor. For the medieval merchants this would have made it difficult or impossible to calculate rates of taxes, tolls, protection, duties, and other exactions. Nonetheless, despite shipwreck, loss at sea, delays, uncertain markets, and highly variable transport, customs, and tax charges, fabulous fortunes were wrested from the Indian Ocean trade, and many merchants did succeed in returning home to Qus or Cairo, or retiring to Mecca in the odor of prosperity.

CHAPTER 6

CONCLUSIONS

Having presented the glass from Quseir al-Qadim, the comparanda, and the distribution around the Indian Ocean, we may return to our original three questions. The first one, just how important was glass in the Indian Ocean trade in the Roman and Mamluk periods respectively, requires looking at the quantity and quality of the glass recovered archaeologically, plus whatever evidence may be culled from written sources.

For the Roman period the best evidence comes from the horn of Africa, supplemented by more scattered information from other regions. In the first and second centuries most of the archaeologically recovered glass is luxury wares, containers for luxury goods, or ornaments like beads or "glass stones" (see fig. 4). We note here the mosaic glass from Massawa, Axum, Heis, and Begram, the ribbed bowls from Heis, Taxila, Begram, and Arikamedu, and decorated pieces such as cut or painted vessels from Begram,[1] and lace mosaic from Taxila. Only Axum seems to have yielded any of the mold-cast colorless plates so abundant at Quseir al-Qadim. Flagons, especially their thick, heavy handles, and unguentaria have been reported from Axum, Taxila, and Ter, and the *Periplus Maris Erythraei* lists places importing perfume. In the case of the containers, however, the vessels were probably valued for their contents more than for the glass. The beads and "glass stones" are somewhat more problematic. Even with sifting approximately half the loci at Quseir al-Qadim, surprisingly few beads, "game pieces," or pendants were found, much less any glass ingots. The *Periplus Maris Erythraei*, however, notes places in Africa that will accept "glass stones" and markets in India for raw glass. Some beads from the eastern coast of Africa are thought to be in the first–second century range. For the time being, however, the source(s) of the beads, raw glass, and "glass stones" must remain speculative. Equally, the ports through which such items were exported are as yet unidentified. So far, virtually no Roman tableware such as the thin beakers or the thumb-indented beakers have been reported from overseas sites, and mold-blown cups or vessels of any category are rare at Quseir al-Qadim. Unfortunately, there might be a problem of recovery here; all too often in the past thin glass sherds have been discarded or not collected. With this proviso, the Roman ports such as Quseir al-Qadim and presumably Myos Hormos and

1. Begram is so far up the Indus River that its source of fine glasses is problematic. It lies far from the port cities such as Barygaza, but if the glass came overland through Mesopotamia, it had to pass through the generally hostile Parthian kingdom.

Berenice seem to have exported costly glasses and products in glass containers on a regular basis. Glass was less valuable than the gold coins and less bulky than wine amphorae but was nonetheless a consistent item in the assortment of trade goods.

In the late Ayyubid-Bahri Mamluk period, however, the picture is rather different. A study of thirteenth–fourteenth century trade reveals that goods were shipped in standard bales of about 500–600 pounds or 230–270 kilograms. Merchants routinely attached to these bales smaller packets containing luxuries or household goods intended to make life a little easier back home in Cairo or out in Calicut, Kilwa, or elsewhere. The packets were not small; a letter of 1139, slightly earlier than the Quseir al-Qadim material, lists goods sent from Aden to a wealthy merchant on the Malabar coast of India. The package included sixty-eight goblets, ten bowls, five cups "in their basket," and five green bottles also in a basket. The cost is one dinar eleven qirat (Goitein 1973: 189), not a lot of money. Most of the archaeological evidence for glass trade comes from Aden and the East African Arab town sites (fig. 5), and this appears to consist mainly of bottles, bowls, cups, and vials. With the exception of the small, fancy perfume or kohl vials, there is little elaborately decorated glass such as that often illustrated for Mamluk glass (cf. Atil 1981). The second exception is the glass bracelets, for which Aden and sites in its vicinity were production centers. Many of the Adenese bracelets have close parallels at Quseir al-Qadim and thus they may have been shipped *to* Egypt rather than out of Egypt. Evidence for production of glass vessels at Aden is sparser, though there are literary references. Another aspect of the distribution pattern of glass bracelets is that they are uncommon at the African sites but abundant in India, constituting in fact one of the most prominent uses of glass there. So far, however, very few of the published Indian bracelets match Adenese or Egyptian ones.

Overall, in the medieval period glass would seem to be a routine, predictable adjunct to the bulk trade in textiles, pepper, or spices rather than a major export item in its own right. The Roman merchants may have handled a greater volume of trade than their predecessors, but this still tended to emphasize low-volume, high-value items. The comparison for the Mamluk glass trade, as seen at Quseir al-Qadim, might be found in the liquor cabinet of an archaeological expedition house. The major imports to the expedition are supplies, equipment, and above all people. Liquor comes in bottle by bottle in individual suitcases but quickly adds up to a cabinet full. It should not, however, be taken to mean that it is a major item nor that the mission has direct trade contacts with the United Kingdom, Ireland, France, Italy, Greece, Russia, Mexico, or Jamaica.

The second question concerns the export of glass technology, not just the glass vessels but also the skill of making them. The assumption made here is that technology is always exported into any environment that will support it. In other words, if the knowledge or information can be exported, and if materials and demand are sufficient, the technology will be exported, and legal barriers will only delay, not stop, the process. Glass production requires fuel, raw ingredients, a skilled craftsman, and a need or demand for the finished product. In the case of glass, we make a distinction between glass production from raw ingredients and glass processing to blow or form a final product.

In Roman times we know for instance that glass production was early and successfully established in Gaul. Three of the requirements must have been more or less in place (fuel sources, raw ingredients, and demand), needing only some immigrant glassworkers to start the industry. In Africa on the contrary, we find a comparatively low population density, and some of that nomadic, and hence a low demand for fragile glass. There may also have been a problem with identifying appropriate raw ingredients. Thus if a glassworker had tried to establish himself at, say, Adulis or Mundu, he probably would have found too few people to want many of his goods—if he could locate raw ingredients or import enough raw glass in the first place. It is perhaps noteworthy that the Africans of the first and second centuries imported as much glass as they did, not that they did not produce it themselves.

The Indian kingdoms of the first and second centuries however valued a variety of products of the Greek and Roman world and did import people with special skills, such as architects and singers. Some of the kingdoms even adopted coinage, from Hellenistic or Roman models, on a limited scale, with all that implies for government control and recognized units of exchange. Raw glass was imported for local processing, but a full-blown glass industry may have faced problems with identifying good raw ingredients. There may have been a limited local demand as well. One of the best pieces of evidence for manufacture of glass in India comes from some chemical analyses of Indian glass samples, some of which fall into the first–second century range. Some of the samples have a low-lime high-alumina formula most unlike the typical Mediterranean soda-lime glasses. It has been suggested that crushed obsidian was used for silica. This produces a stiff, dark glass suitable for beads, bracelets, and fake stones, but difficult for glassblowing (Brill 1987: 5). Indeed there are no certain examples of glass vessels blown in India in this period. It has also been suggested that the native Indian brass industry filled many of the household needs that glass met in the Mediterranean area. Thus we seem to have some imported glass vessels, some local processing from imported raw glass, and some local production of low-lime high-alumina glasses. The pattern here may be somewhat like that of glassworking in New Kingdom Egypt. It started abruptly about the time of Amenhotep II, flourished during the New Kingdom but apparently depended on imported raw glass. In the Late period contacts eastwards fell off, and presumably imports such as glass ingots as well. The Egyptian glass industry declined concomitantly and did not revive until the Ptolemaic period. In India, glass, whether imported or local, becomes so rare after about A.D. 200 that one of the leading Indian authorities on glass calls the next centuries a "Dark Age" for Indian glass (Dikshit 1969). The first attempt at establishing glassworking in India seems to have failed, though it succeeded later.

In the thirteenth–fourteenth centuries the glass distribution picture is augmented by the series of Islamicized towns down the eastern coast of Africa. By this time glass-blowing had been an established industry in the Mediterranean for well over a thousand years, rather than possessing the novelty it had in the first and second centuries. If the residents of the African towns had wanted a local glass house, they had had ample time in which to establish one. Nonetheless, the situation in Africa, as far as glass production is concerned,

is similar to the Roman period: imports still suffice. In medieval India, glass is still used primarily for beads, bracelets, and ornaments, and there is still a flourishing brass industry. There is better evidence for glass making or processing kilns, though again bracelets and beads seem to be the main product (Dikshit 1969: 68), perhaps due in part to cultural restrictions on vessels made of glass used for eating. Such chemical analyses as there are still show the characteristic low-lime high-alumina formula. It should be emphasized, however, how few such analyses there are. Archaeologically recovered and reported glass is even more sparse than in the Roman period.

One new feature is the production of glass bracelets at Aden, as attested by kilns, wasters, slag, and large numbers of glass sherds. Production of raw glass is not so certain; fuel might have been a problem. As for demand, however, the far-flung Adenese trade connections could reach bracelet buyers almost anywhere.

The third question is whether we can detect any differences in trade patterns in the two periods on the basis of one body of archaeological data, in this case the glass. The answer seems to be: to an extent, or, what evidence there is does not contradict the historical information. One would however like to see the results bolstered by further studies. For this question we have to start with what is known about the history of the Mediterranean and Indian Ocean trade and the respective political situations, then plot out the archaeological material. In this case, we are resting the archaeologically recovered glass on a historical background. Whether one can take a body of archaeological data with similar patterns, namely trade distributions, and go the other direction, namely inference of political or other boundaries, would be another study altogether.

In the Roman period, Leucos Limen lay at the farthest edge of the empire, a post maintained with difficulty and at no time self-sufficient. Beyond this point the Roman legions rarely ventured and never conquered, though Greek was at least one trade language in the Indian Ocean region. Beyond Leucos Limen and Berenice the cultures and kingdoms were alien and exotic, barbarian in the Roman sense. Thus we find the Roman glass exports consisting almost entirely of luxury items rather than day-to-day household goods. The foreign households were presumably too different to need the same sort of everyday goods, although status items or personal ornaments were more readily incorporated.

By the thirteenth–fourteenth century, Mediterranean trade was once again largely in the hands of European merchants. Islamic traders therefore looked mainly to the Indian Ocean and beyond for long-range trade ventures. The entire region from southern India to the Arabian peninsula and down the eastern coast of Africa, plus the Persian Gulf and the Red Sea, shared much of the same Arabic culture. The language, religion, and many features of material culture (including most crafts) were at least recognized if not universally embraced throughout the Indian Ocean periphery. The whole vast region could be considered interlinked, though not homogenized. In this case we find household glassware such as bottles and cups far outnumbering elaborately decorated luxury wares. With the exception of the small, fancy perfume or kohl vials, bracelets (except in East Africa), and a few enameled sherds, the elegant Mamluk glass vessels (cf. Atil 1981) are lacking. Ordinary

household vessels on the other hand were needed, fitted into daily usage, and imported by one means or another in considerable quantity. The manufacture of glass at Aden, especially the bracelets, is but another feature of the economic and cultural linkage of the whole region. Here we should emphasize the fact that this interpretation rests almost entirely on the Red Sea and East African data. In comparing and contrasting trade in the two periods, we hope that other reports from Quseir al-Qadim on the textiles, amphorae and their plugs, ceramics, porcelains and celadons, and textual material will complement, and perhaps even contradict, the interpretation of the glass corpus. Beyond that, we hope that studies from other sites in Arabia, Africa, and especially in India will help fill out this admittedly uneven sketch of trade patterns.

Other researchers will ask other questions of the Quseir al-Qadim glass. Therefore we have attempted to present the raw data as completely as possible, in a form useful to other workers. Beyond that, however, we have tried to use the glass corpus to answer some archaeological questions. Because Quseir al-Qadim was a port that lived and died by the Red Sea trade, the questions are trade-related. Because we happen to have two periods separated by over a thousand years, we have the opportunity to compare and contrast the trade patterns. The success of the attempt to use a glass corpus for investigating some specific archaeological questions will be judged in part by the response.

CORPUS OF GLASS SHERDS

The first section (A) lists details for all the illustrated sherds. The first column indicates the vessel or sherd number that is used throughout the text. The second column denotes the vessel type, which is either a generally accepted label such as "ribbed bowl" or the simplest possible descriptive label. Further definition, if needed, is given in *Chapter 2* or *4* in the discussion of the vessel type. Some of the pieces have been published previously as, for example, "bowl a" or "decoration t." This scheme was rejected for the final report because a label such as "faceted beaker" or "mosaic glass" conveys more information more readily. The fifth and sixth columns give the locus date and style date respectively. Both are given because it is quite possible for a sherd in an Islamic context to be of Roman manufacture. The seventh column notes the color, as it is seen in light transmitted through the sherd. Munsell colors are not used because the color of a vessel may vary from spot to spot or change due to weathering. The eighth column, "Quality," gives a brief description of the surface weathering and glass fabric. Most ancient glass has a few irregularities, but a sherd is not listed as having bubbles or impurities unless they are immediately noticeable features.

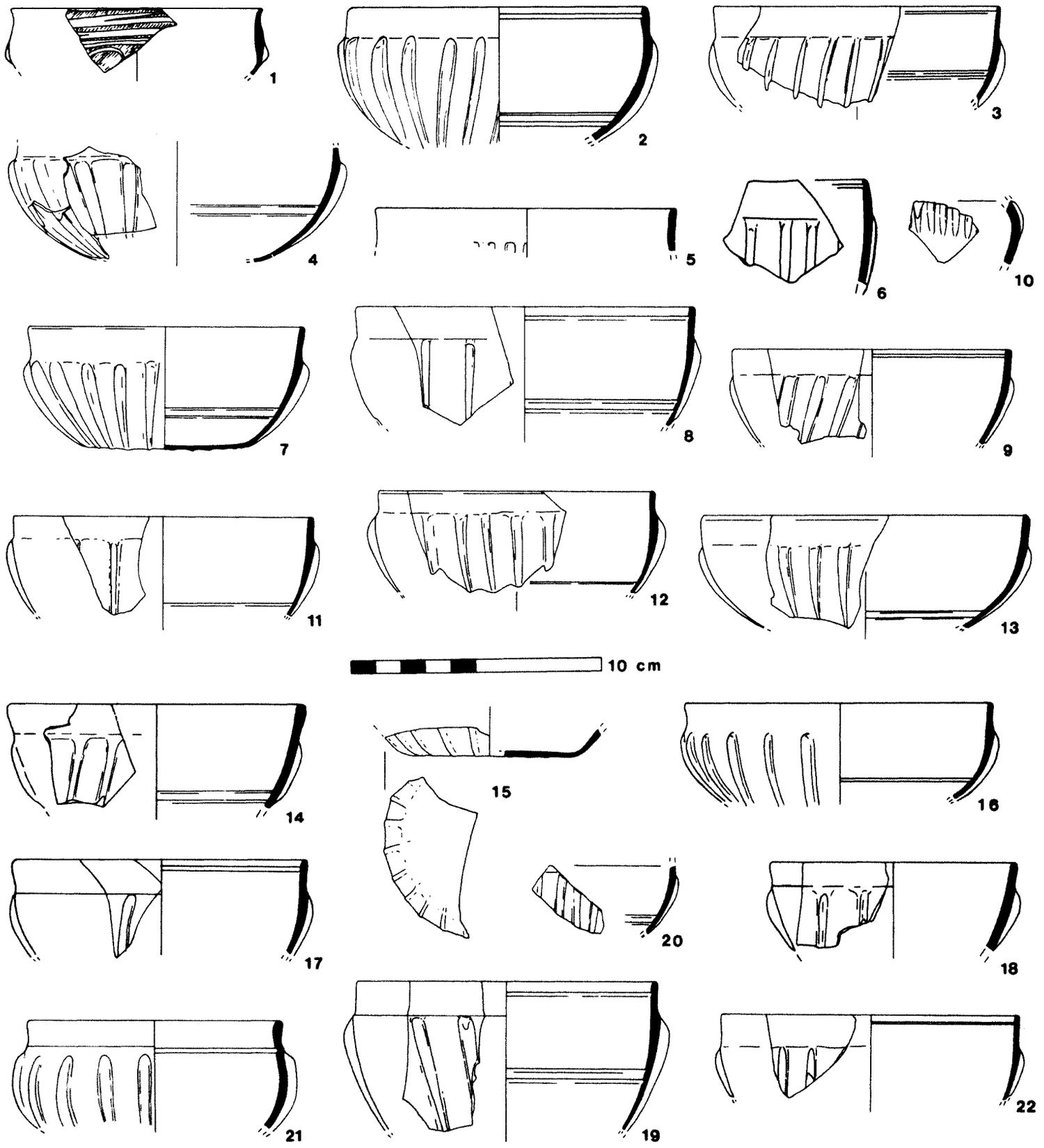
The second section (B) lists glass sherds that were drawn in the field, inked, counted with their vessel type in the text, but not included in the illustrations, usually because they are repetitive. Lacking only a reference number, they are listed in the same format and order as the illustrated sherds and some are specifically compared to an almost identical illustrated piece.

ABBREVIATIONS

1979	Whitcomb and Johnson 1979 (1978 season)
1982	Whitcomb and Johnson 1982 (1980 season)
1983	Whitcomb 1983 (some of the Islamic glass from the 1980 and 1982 seasons)
bk.	black
bl.	blue
br.	brown(ish)
bubl.	bubbles
cent.	central
cm	centimeter
d.	diameter
dec.	decoration
dk.	dark
ext.	exterior
frag(s).	fragment(s)
gr.	green
gy.	gray
Hell.	Hellenistic
I	Islamic
impur.	impurities
int.	interior
irid.	iridescent, as a peacock's tail or oil film
lg.	large
lt.	light
M	Mixed
opal.	opalescent (-ce), as white opal
opaq.	opaque, not possible to see through the sherd
R	Roman
rd.	red
slt.	slight(ly)
sm.	small
surf.	surface
tint	transparent, with some slight color tint
transluc.	translucent, possible to see light through the sherd
transp.	transparent, possible to see color through the sherd
turq.	turquoise
v.	very
w/	with
weath.	weathering (-ed)
wt.	white
yl.	yellow(ish)

A. ILLUSTRATED GLASS SHERDS

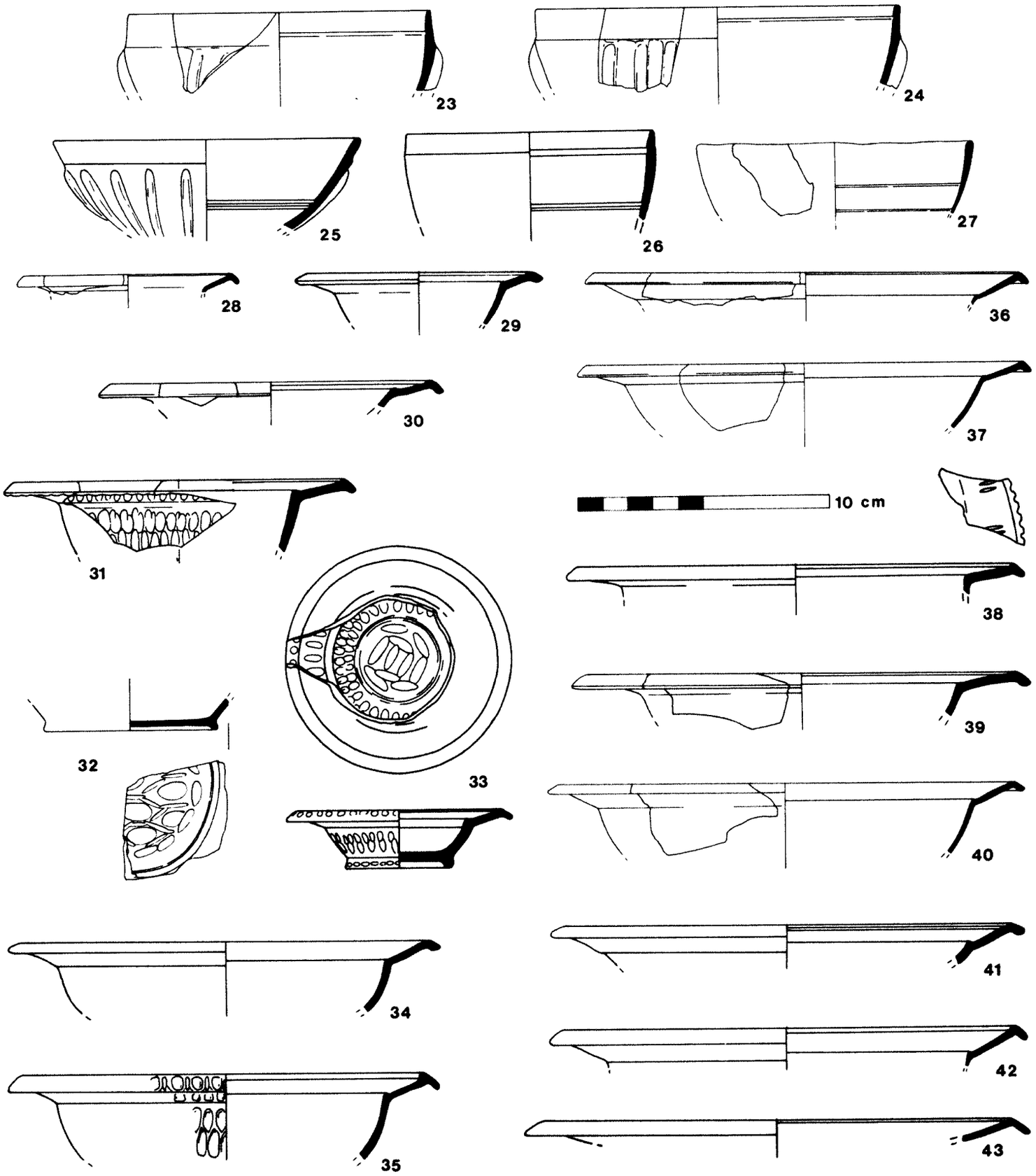
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
1	Ribbed bowl	C4c-2	78/355	R/M	R	Transluc. amber w/wt. trails	Not noted	1979, pl. 53i	—
2	Ribbed bowl	C4c-2	78/355	R/M	R	Deep amber	Not noted	1979, pl. 53f	—
3	Ribbed bowl	H10 surf.	78/681	Surf.	R	Amber	Slt. wt. weath.	1979, pl. 65h	Rim ground
4	Ribbed bowl	C4c-9	78/355	R/M	R	Amber	Slt. wt. weath.	—	Rim ground, d. estimated
5	Ribbed bowl	C4c-4	78/355	R/M	R	Dk. amber	Not noted	1979, pl. 54m	Shallow ribs tooled rim?
6	Ribbed bowl	K9b-67	82/376	I	R	Amber	Not noted	—	—
7	Ribbed bowl	E6b-4	78/343	R	R	Lt. yl.-gr.	Yellowish & bk. weath., opal.	1979, pl. 57e	Many frags., some old breaks, rim ground back?
8	Ribbed bowl	D4b-1	78/683	Top	R	Lt. yl.-gr.	Bubl.	—	Rim ground back
9	Ribbed bowl	E7a-2	78/356	M	R	Lt. yl.-gr.	Tough yl. & bk. weath.	1979, pl. 57g	Rim ground back?
10	Ribbed bowl	E6b-44	80/76	R	R	Lt. yl.-gr.	Bk. & yl. weath.	—	—
11	Ribbed bowl	D4b-3	78/359	M	R	Yl.-gr.	Impur., some bubl.	1979, pl. 56b	2 sherds, no join; uneven rim, tooled?
12	Ribbed bowl	D4b-1	78/683	Top	R	Lt. gr.	Bubl.	—	Tooled rim?
13	Ribbed bowl	F6 surf.	78/—	Surf.	R	Bl.-gr.	Some bubl., slt. wt. weath.	—	Tooled rim?
14	Ribbed bowl	E6a-9	80/64	Top	R	Gr.-bl.	Bubl.	1982, pl. 55a	Tooled above ribs, then rim ground
15	Ribbed bowl	F8d-13	82/367	M	R	Bl.-gr.	Slt. wt. weath.	—	—
16	Ribbed bowl	F10a-1	78/347	Top	R	Lt. turq.	Wt. weath.	1979, pl. 58b	Tooled rim?
17	Ribbed bowl	C4c-4	78/355	R/M	R	Lt. bl.-gr.	Wt. weath., opal.	1979, pl. 54o	—
18	Ribbed bowl	E7c-14	80/55	R?	R	Lt. bl.-gr.	Tough yl. weath.	1982, pl. 56a	Tooled rim?
19	Ribbed bowl	C4c-10	78/355	R/M	R	Dk. purple	Little opal.	1979, pl. 52c	Rim ground
20	Ribbed bowl	C4c-3	78/355	M	R	Dk. purple, almost opaq.	No weath.	—	—
21	Ribbed bowl	C4c-9	78/355	R/M	R	Dk. bl.	Not noted	1979, pl. 52a	—
22	Ribbed bowl	C4c-3	78/355	M	R	Dk. bl.	No weath.	—	Rim ground



Roman Ribbed Bowls

A. Illustrated Glass Sherds (*cont.*)

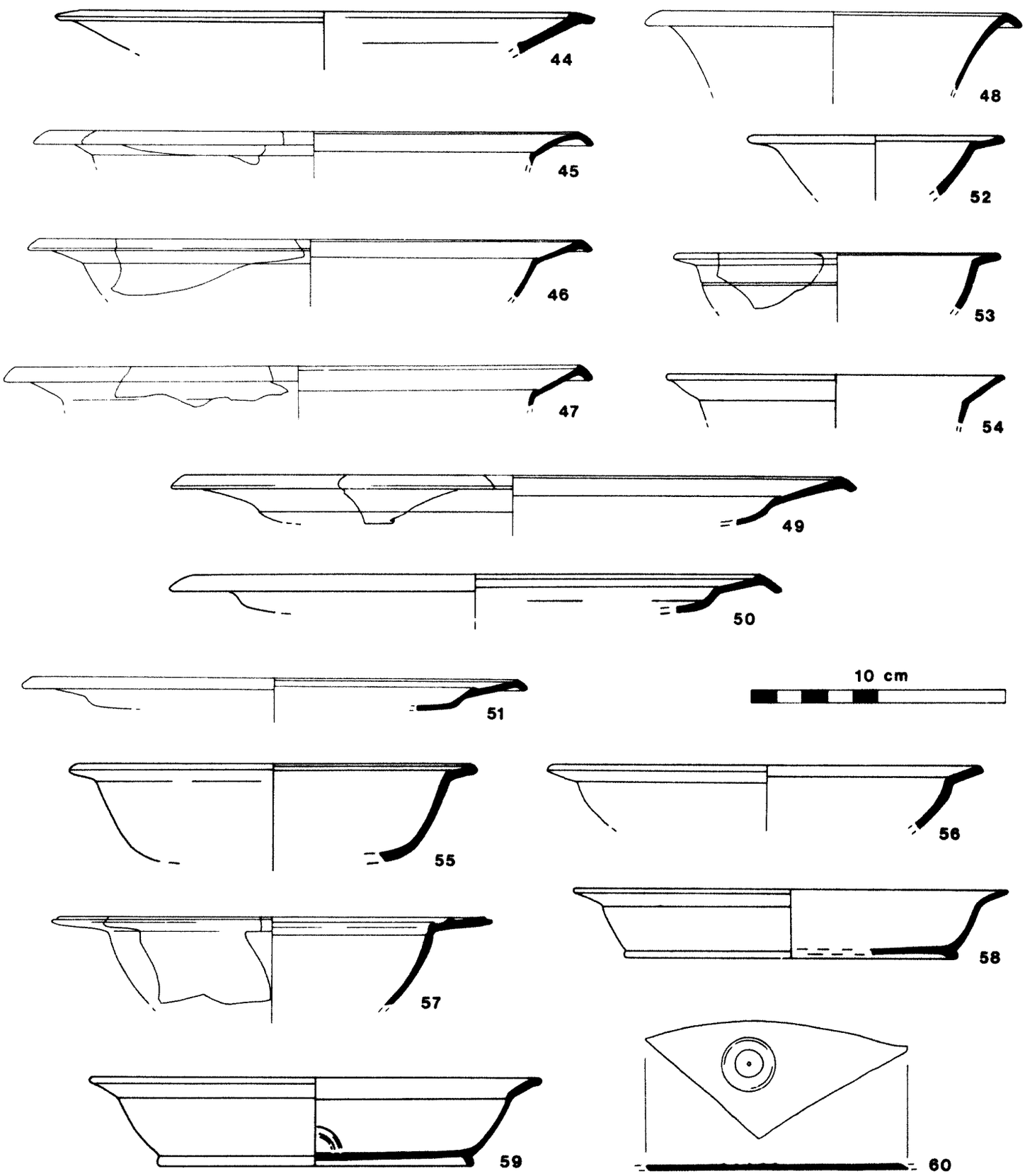
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
23	Ribbed bowl	C4c-9	78/355	R/M	R	Yl.-gr. tint	Slt. wt. weath., opal.	1979, pl. 52b	Rim ground
24	Ribbed bowl	C4c-4	78/355	R/M	R	Yl.-gr. tint	Slt. opal.	1979, pl. 54q	Rim ground
25	Ribbed bowl	E6b-4	78/343	R	R	Clear?	Weath.	1979, pl. 57f	—
26	Linear cut bowl	F8d-15	82/369	R/M	R	Transp.	Not noted	—	—
27	Linear cut bowl	E6a-1	80/64	Top	R	Br.-gy.	Bubl., slt. crazed surf.	—	Rim v. irreg. tooled ext. ?
28	Bowl with overhung rim	G8d-1	78/346	Top	R	Transp.	No weath.	1979, pl. 59c	—
29	Bowl with overhung rim	G8a-7	82/372	R/M	R	Transp.	Dull	—	—
30	Bowl with overhung rim	E7a-12	80/55	Top	R	Transp.	Not noted	1982, pl. 56c	—
31	Bowl with overhung rim	E6a-5	80/64	R	R	Transp.	Not noted	1982, pl. 55d	Cut dec. also under rim
32	Base	Surf.	78/609	Surf.	R	Transp.	No weath.	—	Cut dec. ext.
33	Bowl with overhung rim	F8d-34	82/369	R	R	Transp.	Not noted	—	Cut dec. ext.
34	Bowl with overhung rim	F8d-6	78/344	R	R	Transp.	Not noted	1979, pl. 58 l	—
35	Bowl with overhung rim	J7 surf.	78/681	Surf.	R	Transp.	Not noted	1979, pl. 64e	Cut dec.
36	Bowl with overhung rim	Sllb-4	78/352	R	R	Transp.	Slt. yl.-wt. weath.	—	—
37	Bowl with overhung rim	F8d-4	78/394	R	R	Transp.	No weath.	—	—
38	Bowl with overhung rim	G8b-32	82/375	M	R	Transp.	Not noted	—	Cut dec. on top of rim
39	Bowl with overhung rim	H8a-1	80/69	Top	R	Transp.	Wt. weath.	1982, pl. 56dd	—
40	Bowl with overhung rim	G8b-20	82/375	M	R	Transp.	Wt. weath., bubl.	—	2nd sherd stacks
41	Bowl with overhung rim	F7 surf.	78/356	Surf.	R	Transp.	Not noted	1979, pl. 64d	—
42	Bowl with overhung rim	Sllb-2	78/352	I	R	Transp.	Not noted	1979, pl. 60a	—
43	Bowl with overhung rim	G8b-20	82/375	M	R	Transp.	Slt. wt. weath.	—	—



Roman Mold-formed and Mold Cast Vessels

A. Illustrated Glass Sherds (*cont.*)

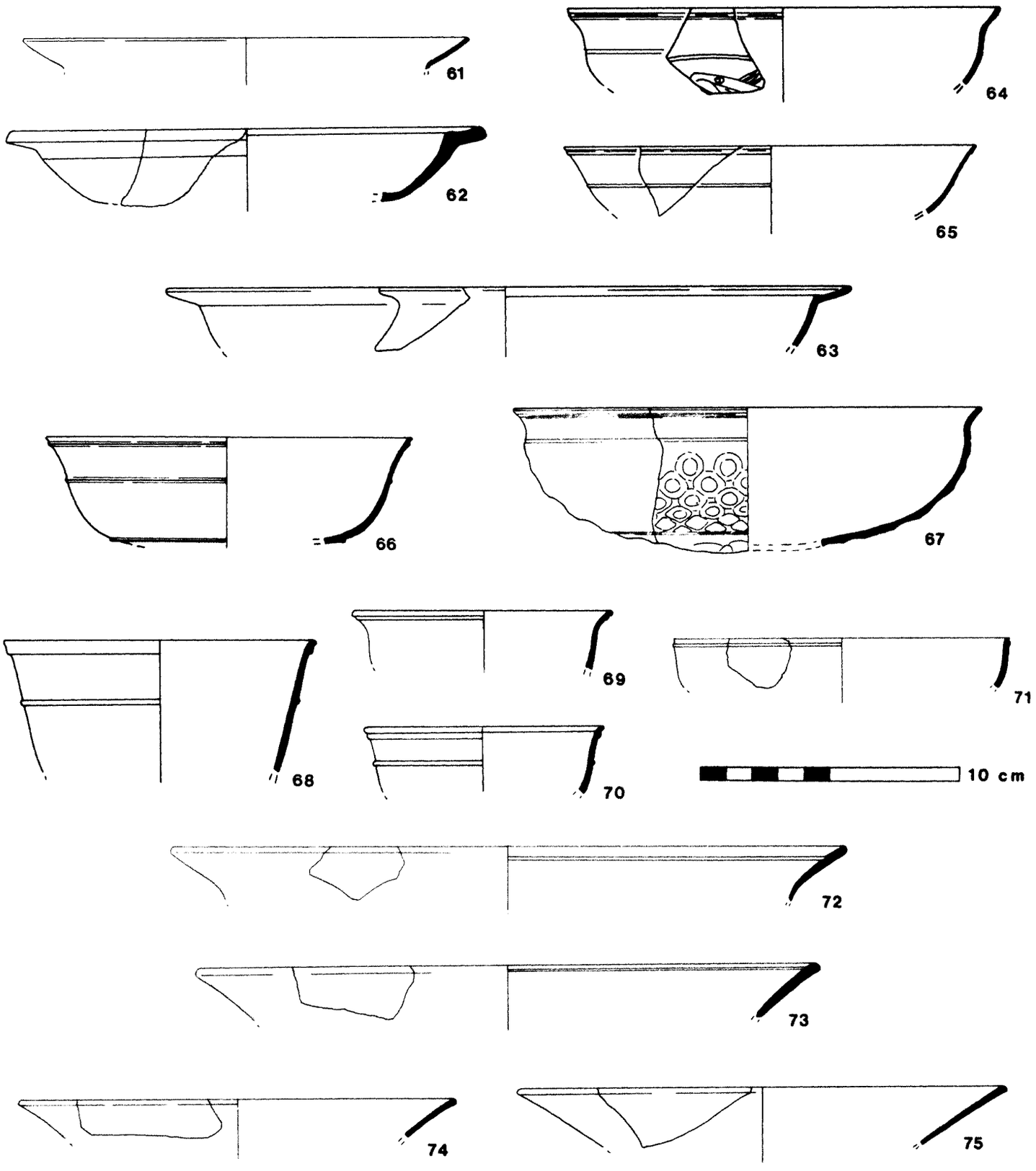
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
44	Bowl with overhung rim	G8a-10	82/372	R	R	Transp.	Not noted	—	—
45	Bowl with overhung rim	E7a-20	80/55	R	R	Transp.	Some pitting	1982, pl. 56b	—
46	Bowl with overhung rim	K/L4 surf.	78/356	Surf.	R	Transp.	Dull, pitted	1979, pl. 64b	—
47	Bowl with overhung rim	G8a-4	80/73	I?	R	Transp.	No weath.	1982, pl. 56ee	—
48	Bowl with overhung rim	L8c-18	82/379	I/M	R	Transp.	Slt. wt. weath.	—	Angle correct
49	Plate, overhung rim	E6a-1	80/64	Top	R	Transp.	Slt. crazed	1982, pl. 55e	—
50	Plate, overhung rim	F8d-34	82/369	R	R	Transp.	No weath.	—	—
51	Plate, overhung rim	G8b-1	80/73	Top	R	Transp.	Slt. dull	—	—
52	Bowl with broad rim	F8d-6	78/344	R	R	Transp.	Not noted	1979, pl. 58m	—
53	Bowl with broad rim	C4c-4	78/355	R/M	R	Transp.	No weath.	1979, pl. 54 l	Cut groove & molded rim
54	Bowl with broad rim	C4c-2	78/355	R/M	R	Pink-gy. tint	No weath.	1979, pl. 53e	—
55	Bowl with broad rim	G8a-24	82/372	R	R	Transp.	Not noted	—	—
56	Bowl with broad rim	G8d-1	78/346	Top	R	Transp.	Not noted	1979, pl. 59e	—
57	Bowl with broad rim	NW surf.	78/681	Surf.	R	Yl. tint	Dull	1979, pl. 64a	—
58	Bowl with broad rim	F7a-1	80/65	Top	R	Transp.	Not noted	1982, pl. 56r	—
59	Bowl with broad rim	F8d-31	82/363	M	R	Gy.-br.	Slt. wt. weath. finely crazed	—	—
60	Base, bowl or plate	F10a-4	78/347	I	R	Transp.	Slt. wt. weath.	—	—



Roman Mold Cast Bowls and Plates

A. Illustrated Glass Sherds (*cont.*)

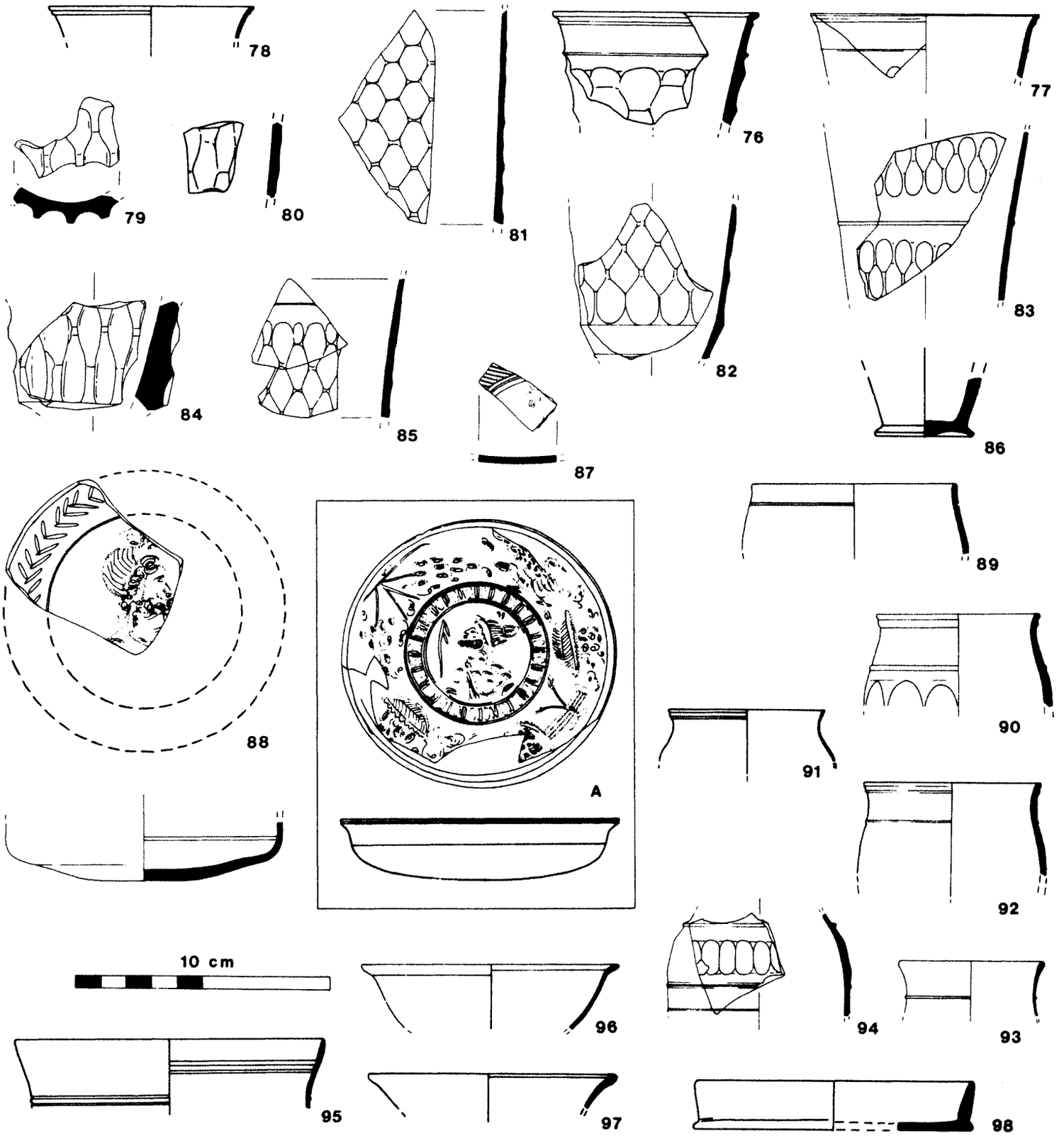
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
61	Bowl with broad rim	G8b-42	82/375	R	R	Transp.	Dull	—	Variant
62	Bowl with broad rim	F7a-1	80/65	Top	R	Transp.	Not noted	1982, pl. 56n	—
63	Bowl with broad rim	G8a-4	82/372	R/M	R	Transp.	Not noted	—	D. ?
64	Large bowl, cut decoration	G8a-2	82/372	M	R	Lt. gr. tint	Not noted	—	—
65	Large bowl, cut decoration	F8d-21	82/369	R	R	Transp.	Not noted	—	—
66	Large bowl, cut decoration	G8b-32	82/375	M	R	Transp.	Not noted	—	—
67	Large bowl, cut decoration	F7a-3	80/65	M	R	Transp.	Not noted	1982, pl. 56q	—
68	Small bowl, cut decoration	F9c-24	82/370	I	R	Transp.	Not noted	—	—
69	Small bowl, cut decoration	S12c-1	78/350	Top	R	Transp.	Not noted	1979, pl. 60n	—
70	Small bowl, cut decoration	C4c-2	78/355	R/M	R	Transp.	Not noted	1979, pl. 53j	—
71	Small bowl, cut decoration	D4b surf.	78/681	Surf.	R	Cobalt bl.	No weath.	1979, pl. 56a	Cut ridge
72	Large bowl, flaring rim	G8d-1	78/346	Top	R	Transp.	No weath.	1979, pl. 59a	Cut int. groove
73	Large bowl, flaring rim	G8d-1	78/346	Top	R	Transp.	No weath.	1979, pl. 59b	Cut groove
74	Large bowl, flaring rim	F7a-1	80/66	Top	R	Transp.	Dull	—	—
75	Large bowl, flaring rim	L7d-1	82/377	Top	R	Transp.	Dull	—	—



Roman Mold Cast Vessels

A. Illustrated Glass Sherds (*cont.*)

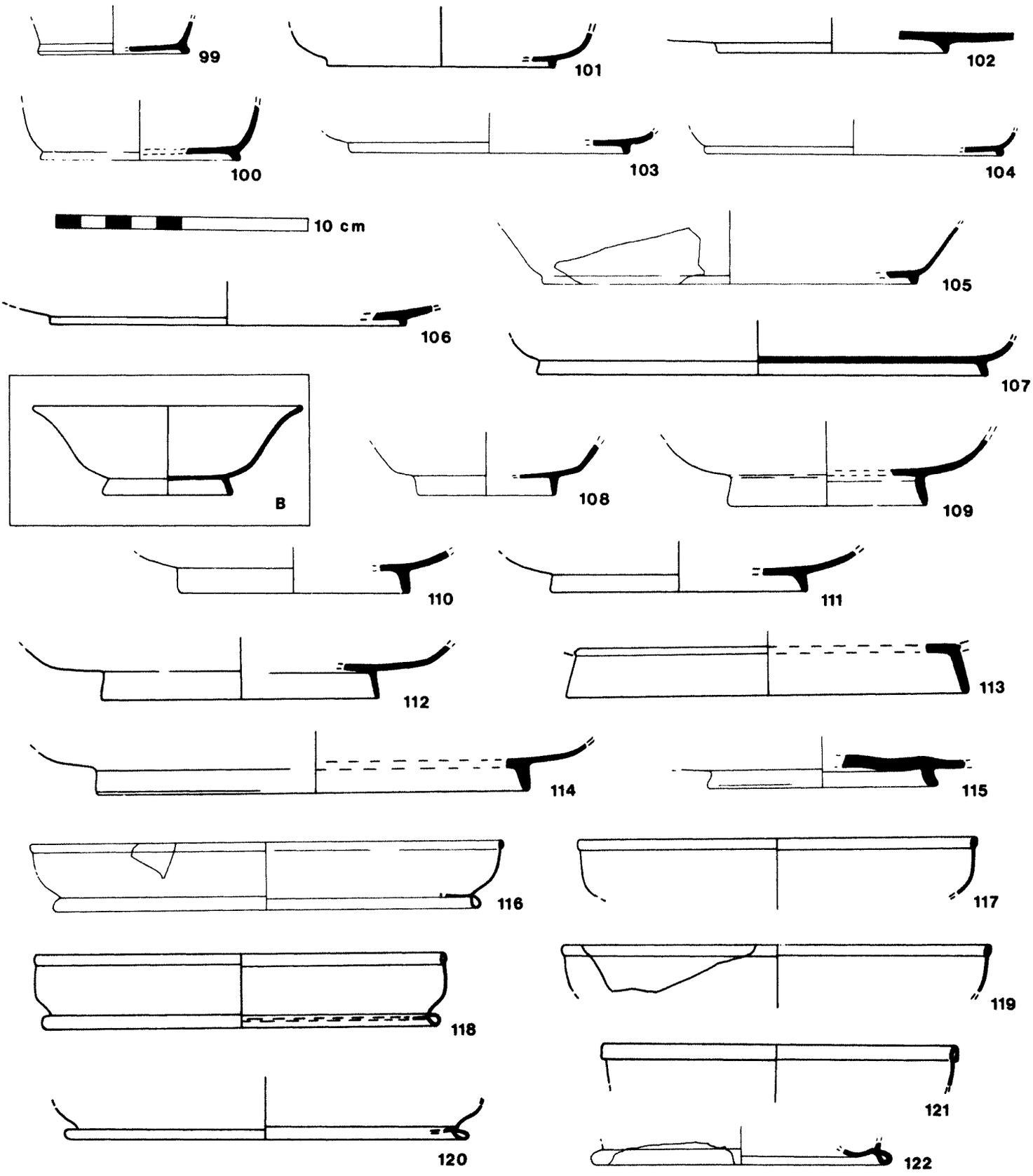
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
76	Faceted beaker	D6d-1	80/71	Top	R	Transp.	Not noted	1982, pl. 55g	—
77	Faceted beaker	C4c-2	78/355	R/M	R	Transp.	Slt. wt. weath.	—	—
78	Faceted beaker?	G8b-32	82/375	M	R	Transp.	Not noted	—	—
79	Faceted beaker	G8a-1	80/73	Top	R	Transp.	Bk. weath.	—	Vertical striations seen in cells
80	Faceted beaker	F8d-10	82/369	I	R	Transp.	Not noted	—	Int. d. ca. 6 cm
81	Faceted beaker	C4c-2	78/355	R/M	R	Transp.	Slt. wt. weath.	1979, pl. 53m	—
82	Faceted beaker	C4c-8	78/355	R/M	R	Transp.	Yl. surf. much cracked	1979, pl. 55r	—
83	Faceted beaker	B7 surf.	78/681	Surf.	R	Transp.	Dull, pitted	1979, pl. 64h	—
84	Faceted beaker	E7c-5	80/56	M	R	Lt. gr. tint	Not noted	1982, pl. 56x	—
85	Faceted beaker	C4c-2	78/355	R/M	R	Transp.	Slt. wt. weath.	1979, pl. 53 l	—
86	Beaker base?	G8b-26	82/361	M	R	Transp.	Not noted	—	—
87	Mythological cup	H8 surf.	78/681	Surf.	R	Transp.	Dull, pitted	1979, pl. 64i	—
88	Mythological cup	F9a-13	82/365	R/M	R	Crystal clear	No weath.	—	—
A	Mythological cup	Cologne, Römisch-Germanische Museum Koln, Inv. Nr. 342; Fremersdorf 1951: 13–14							
89	Jar/beaker w/cut decoration	E6b-5	78/343	R/M	R	Bl.	Not noted	1979, pl. 57b	Cut groove
90	Jar/beaker w/cut decoration	C4c-4	78/355	R/M	R	Transp.	No weath.	1979, pl. 54j	—
91	Jar/beaker w/cut decoration	G8b-49	82/375	R	R	Transp.	No weath.	—	2 grooves under rim
92	Jar/beaker w/cut decoration	D6d-1	80/71	Top	R	Transp.	Not noted	1982, pl. 55f	—
93	Jar/beaker w/cut decoration	G8b-20	82/375	M	R	Transp.	Wt. weath.	—	Cut thread
94	Jar/beaker w/cut decoration	B4a-3	78/354	R/M	R	Transp.	No weath.	1979, pl. 56d	—
95	Bowl? rim	G8b-27	82/375	R	R	Cobalt bl.	Not noted	—	Cast
96	Bowl rim	C4c-2	78/355	R/M	R	Transp.	Not noted	1979, pl. 53d	Cast
97	Bowl? rim	G8b-34	82/375	R/M	R	Transp.	Dull	—	Cast
98	Plate	E7c-7	80/56	R?	R	Transp.	Not noted	1982, pl. 56p	—



Roman Facet Cut Beakers and Cut Vessels

A. Illustrated Glass Sherds (*cont.*)

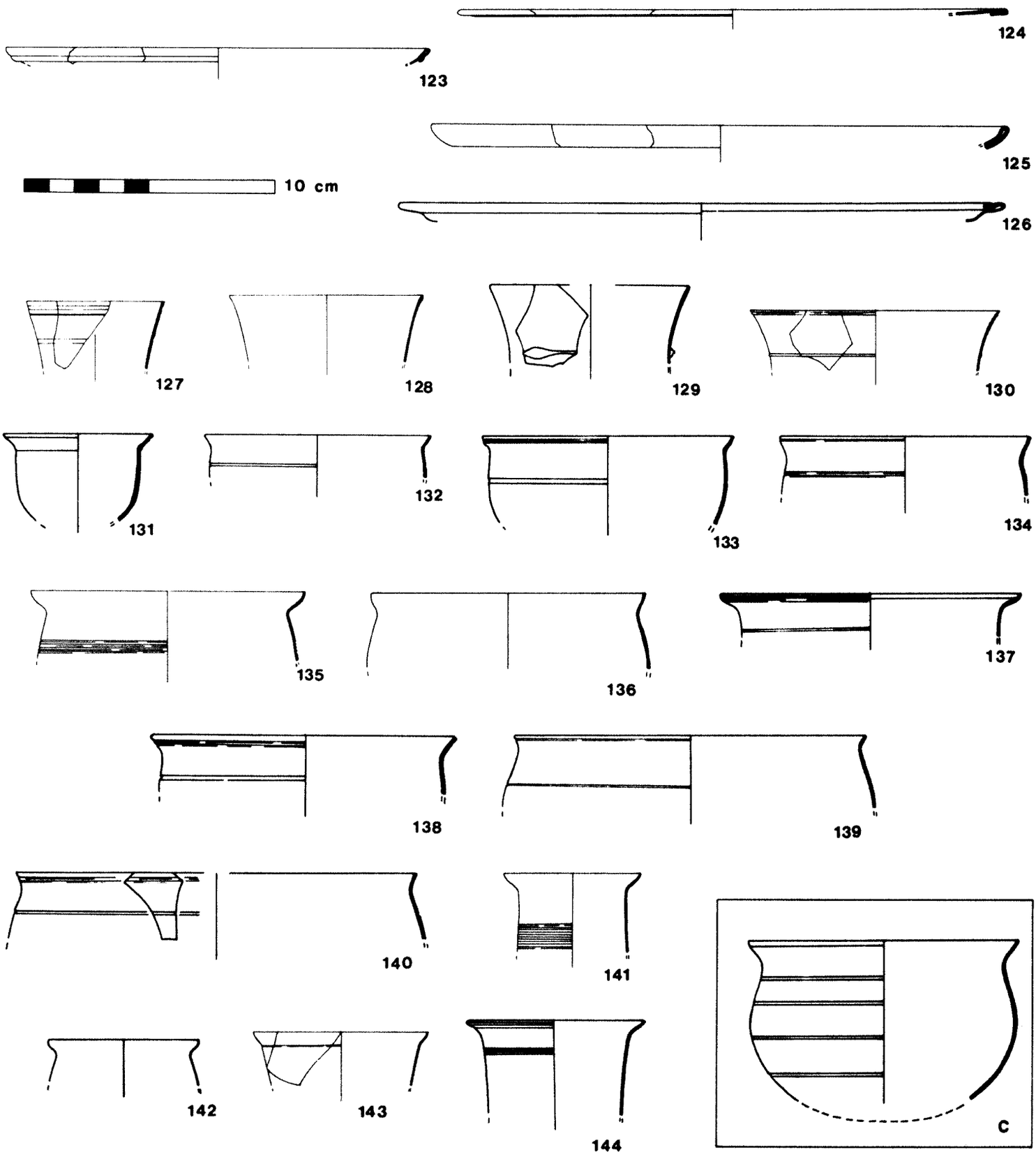
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
99	Ring base	E6a-15	80/76	R	R	Emerald	Yl.-br. weath., slt. opal., pitted	1982, pl. 55bb	Base ring cut
100	Ring base	E6a-1	80/64	Top	R	Transp.	Wt. weath.	1982, pl. 55cc	—
101	Ring base	G8b-20	82/375	M	R	Transp.	Few bubl.	—	—
102	Ring base	E6b-4	78/343	R	R	Gr.	Not noted	1979, pl. 57q	—
103	Ring base	F8b-4	82/371	I	R	Rich dk. bl.-gr.	No weath.	—	Not cobalt, cut groove at base
104	Ring base	C4c-11	78/355	R/M	R	Transp.	Dull	1979, pl. 52k	—
105	Ring base	G8b-19	80/73	R	R	Transp.	Slt. dull	—	—
106	Ring base	J9d-3	82/374	I/M	R	Transp.	Not noted	—	—
107	Ring base	G8b-32	80/375	M	R	Transp.	Not noted	—	—
108	High base	E6b-2	80/59	?	R	Transp.	Wt. weath., pitted	—	—
B	High base	Karanis, No. 304, fabric 1, colorless; Harden 1936: 117–18, pl. 14							
109	High base	E6a-9	80/64	Top	R	Transp.	Slt. wt. weath.	1982, pl. 55dd	—
110	High base	G8d-1	78/346	Top	R	Transp.	Dull	1979, pl. 59m	—
111	High base	L7d-1	82/377	Top	R	Gr. tint	No weath.	—	—
112	High base	G8b-27	82/375	R	R	Transp.	Not noted	—	—
113	High base	G8b-32	82/375	M	R	Transp.	Dull	—	—
114	High base	G8a-2	82/372	M	R	Transp.	No weath.	—	—
115	High base	F7 Surf.	78/356	Surf.	R	Transp.	Wt. weath., pitted	1979, pl. 64s	—
116	Bowl w/loop rim and base	F8d-30	82/369	M	R	Transp.	Slt. wt. weath. & bubl.	—	V. thin, many frags., only one rim frag.
117	Bowl w/loop rim and base	F8d-32	82/369	M	R	Transp.	Not noted	—	—
118	Bowl w/loop rim and base	F8d-31	82/369	M	R	Transp.	Not noted	—	—
119	Bowl w/loop rim and base	F8d-31	82/369	M	R	Transp.	Not noted	—	—
120	Bowl w/loop rim and base	G8b-32	82/375	M	R	Lt. br.	Not noted	—	—
121	Bowl w/loop rim and base	J9d-3	82/374	I/M	R	Gr.	Not noted	—	—
122	Bowl w/loop rim and base	G8b-32	82/375	M	R	Transp.	Bubbly	—	—



Roman Mold Cast Bases and Blown Dishes

A. Illustrated Glass Sherds (*cont.*)

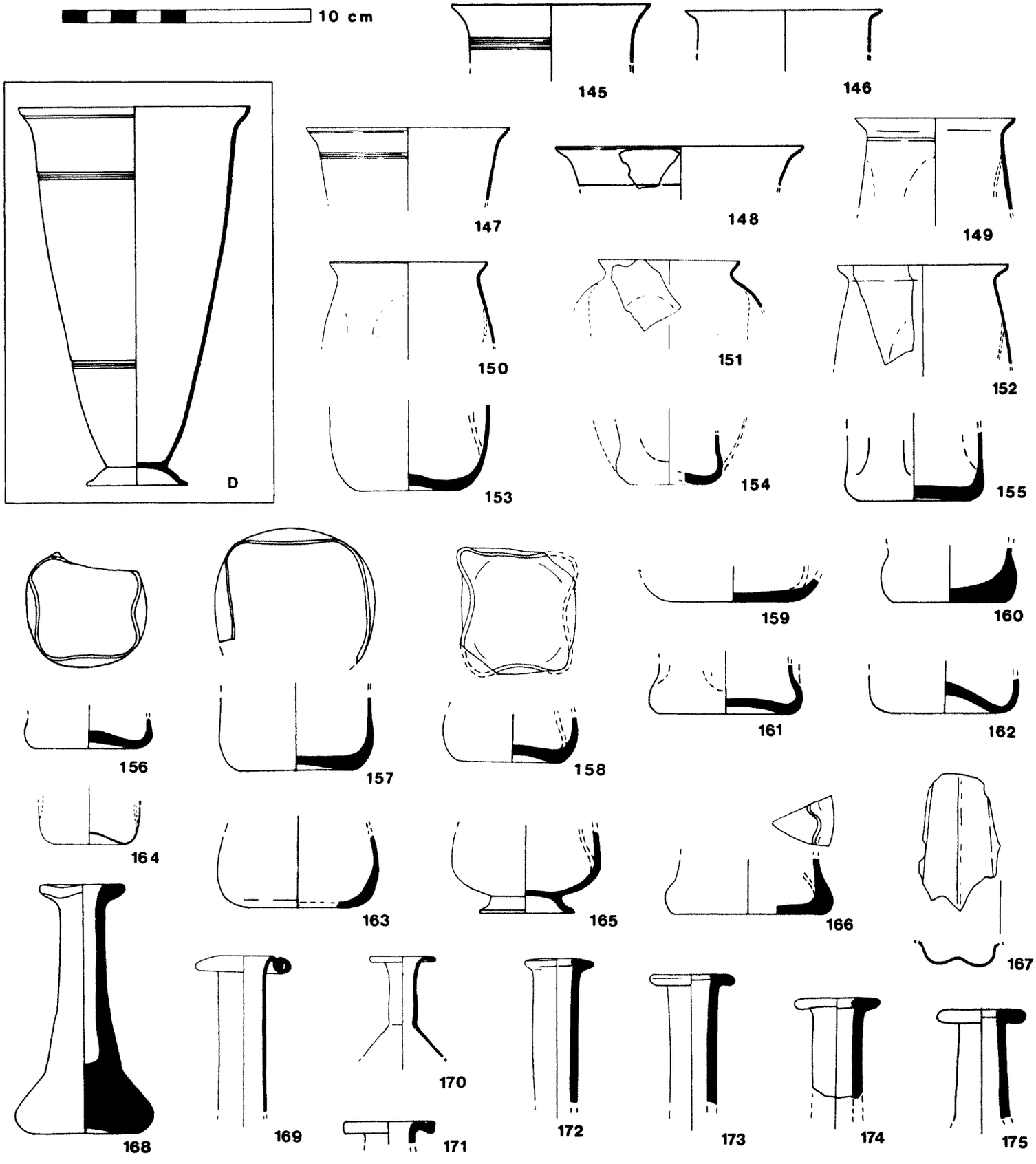
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
123	Looped rim, plate?	G8a-3	82/372	M	R	Transp.	Dull	—	—
124	Looped rim, plate?	G8b-29	82/375	R	R	Gr. tint	No weath.	—	—
125	Looped rim, plate?	G8b-34	82/375	R/M	R	Transp.	Wt. weath. in spots	—	—
126	Looped rim, plate?	G8b-27	82/375	R	R	Transp.	Not noted	—	—
127	Beaker, slight flaring rim	E6b-31	80/76	R	R	Transp.	Thick wt. weath., opal.	—	Cut lines
128	Beaker, slight flaring rim	H8c-1	80/69	Top	R	Pinkish tint	Yl.-br. weath., opal.	—	Cf. Mamluk beakers
129	Beaker, slight flaring rim	G8b-36	82/375	R	R	Yl.-gr. tint	Bubbly, opal.	—	Trailed dec.
130	Beaker, slight flaring rim	D4b-1	78/683	Top	R	Transp.	Not noted	—	—
131	Bowl, everted rim	G8b-27	82/375	R	R	Transp.	Not noted	—	—
132	Bowl, everted rim	G8a-5	82/372	M	R	Transp.	Not noted	—	—
133	Bowl, everted rim	L7d-1	82/377	Top	R	Transp.	Slt. yl. weath., crazed	—	2 lines on rim, shallow body groove
134	Bowl, everted rim	G8a-2	82/372	M	R	Pink tint	Not noted	—	Cut dec.
135	Bowl, everted rim	G8b-26	82/375	M	R	Transp.	Wt. weath.	—	Square rim; 4 cut grooves
136	Bowl, everted rim	G8d-1	78/346	Top	R	Transp.	Wt. weath.	1979, pl. 59i	—
137	Bowl, everted rim	G8b-28	82/375	M	R	Transp.	No weath.	—	2 cut lines at rim; 1 on body
138	Bowl, everted rim	G8b-26	82/375	M	R	Transp.	Not noted	—	—
139	Bowl, everted rim	G8a-8	82/372	I	R	Transp.	Wt. weath., pitting	—	—
C	Bowl, everted rim	Karanis, No. 330, colorless; Harden 1936: 122–23, pl. 15							
140	Bowl, everted rim	G8a-2	82/372	M	R	Transp.	Slt. opal.	—	D. ?
141	Beaker, everted rim	L7d-1	82/377	Top	R	Transp.	Slt. wt. weath.	—	Square rim, 2 cut grooves, 8 lines
142	Beaker, everted rim	G8a-7	82/372	R/M	R	Transp.	Not noted	—	—
143	Beaker, everted rim	D4b-3	78/359	M	R	Bl.	No weath.	1979, pl. 56d	Thin cut line
144	Beaker, everted rim	G8a-3	82/372	M	R	Transp.	Not noted	—	Cut lines



Roman Blown Plates, Beakers, and Bowls

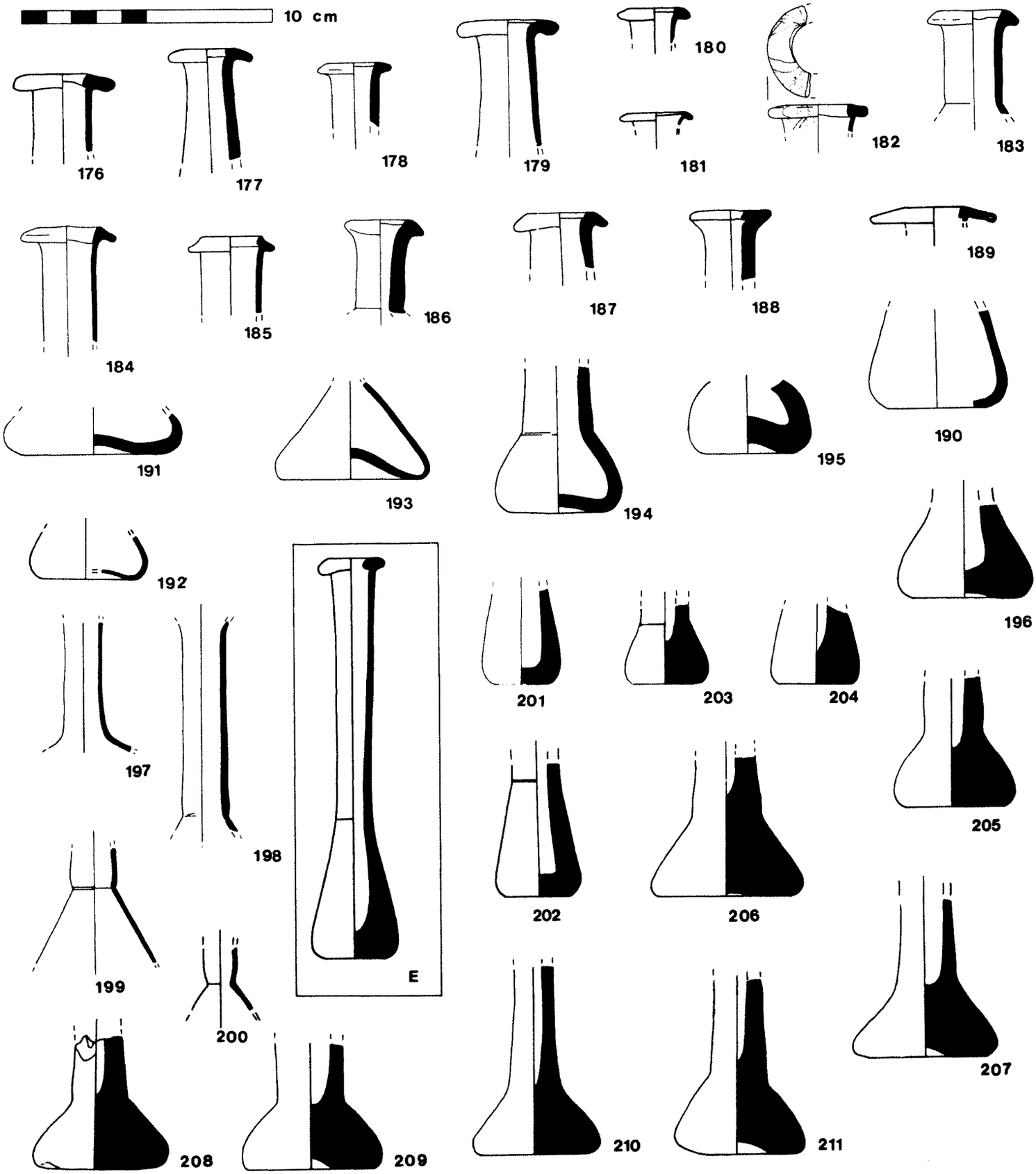
A. Illustrated Glass Sherds (*cont.*)

No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
145	Beaker, everted rim	G8b-33	82/375	I/M	R	Transp.	Not noted	—	—
146	Beaker, everted rim	K9b-36	82/352	I/M	R	Transp.	Not noted	—	—
D	Beaker, everted rim	Karanis, No. 408, colorless; Harden 1936: 149, pl. 15							
147	Beaker, everted rim	G8b-36	82/375	R	R	Transp.	Wt. weath.	—	3 narrow cut grooves
148	Beaker, everted rim	G8a-5	82/372	M	R	Transp.	Not noted	—	—
149	Indented beaker	E6b-18	80/76	R/M	R	Transp.	Slt. yl. weath.	—	Ground rim, slt. cut line under rim
150	Indented beaker	G8b-32	82/375	M	R	Transp.	Slt. wt. weath.	—	Square rim
151	Indented beaker	E6a-2	80/59	R	R	Transp.	Yl.-wt. weath., dull	—	Ground rim, angle uncertain
152	Indented beaker	G8b-32	82/375	M	R	Transp.	Wt. weath.	—	V. thin
153	Indented beaker	C4c-2	78/355	R/M	R	Transp.	Not noted	1979, pl. 53w	Thick
154	Indented beaker	G8b-34	82/375	R/M	R	Lt. yl.-gr. tint	Few bubl.	—	—
155	Indented beaker	F9a-14	82/368	R/M	R	Transp.	Not noted	—	—
156	Indented beaker	G8a-4	82/372	R/M	R	Transp.	Not noted	—	—
157	Indented beaker	G8a cleaning	82/372	—	R	Transp.	Not noted	—	—
158	Indented beaker	G8d-1	78/346	Top	R	Gr. tint	Not noted	1979, pl. 59 l	—
159	Indented beaker	B4a-4	78/354	R	R	Transp.	Not noted	1979, pl. 56m	—
160	Indented beaker	C4c-3	78/355	M	R	Transp.	Not noted	1979, pl. 55f	—
161	Indented beaker	G8b-30	82/355	R	R	Transp.	Not noted	—	—
162	Indented beaker	G8b-5	80/73	I	R	Gr. tint	Bubl., impur.	1982, pl. 56mm	8-sided
163	Indented beaker	E6b-14	80/76	R/M	R	Transp.	Wt. weath.	1982, pl. 55ii	Pinched to square
164	Indented beaker	F10a-12	78/347	R	R	Transp.	Wt. weath.	1979, pl. 58g	V. thin, no pontil scar
165	Indented beaker	C3 surf.	78/356	Surf.	R	Transp.	Not noted	1979, pl. 65p	—
166	Indented beaker	G8d-1	78/346	Top	R	Gr. tint	Not noted	1979, pl. 59k	Many indents
167	Indented beaker?	D4b-2	78/672	M	R	Transp.	Bubl.	—	—
168	Unguentarium w/folded-out rim	E6b-29	80/68	R	R	Lt. gr.	Not noted	1982, pl. 55u	—
169	Unguentarium w/rolled-up rim	C4c-7	78/355	M	R	Bl.-gr.	Bubl., impur., thin wt. weath.	1979, pl. 55k	Irregular rim
170	Unguentarium w/rolled-up rim	E6b-29	80/76	R	R	Transp.	Thick wt. weath., opal.	1982, pl. 55o	—
171	Unguentarium w/rolled-up rim	G8d-1	78/346	Top	R	Lt. turq.	Not noted	1979, pl. 59g	—
172	Unguentarium w/folded-in rim	C4c-11	78/355	R/M	R	Dk. gr.	Bubl., impur.	1979, pl. 52j	—
173	Unguentarium w/folded-in rim	K/L4 surf.	78/356	Surf.	R	Dk. olive	Bubl., many impur.	1979, pl. 65d	Irregular
174	Unguentarium w/folded-in rim	E6b-35	80/76	R?	R	Olive gr.	Bubl., some wt. weath.	1982, pl. 56i	—
175	Unguentarium w/folded-in rim	E6c-1	80/67	Top	R	Dk. gr.	Impur., dull	—	—



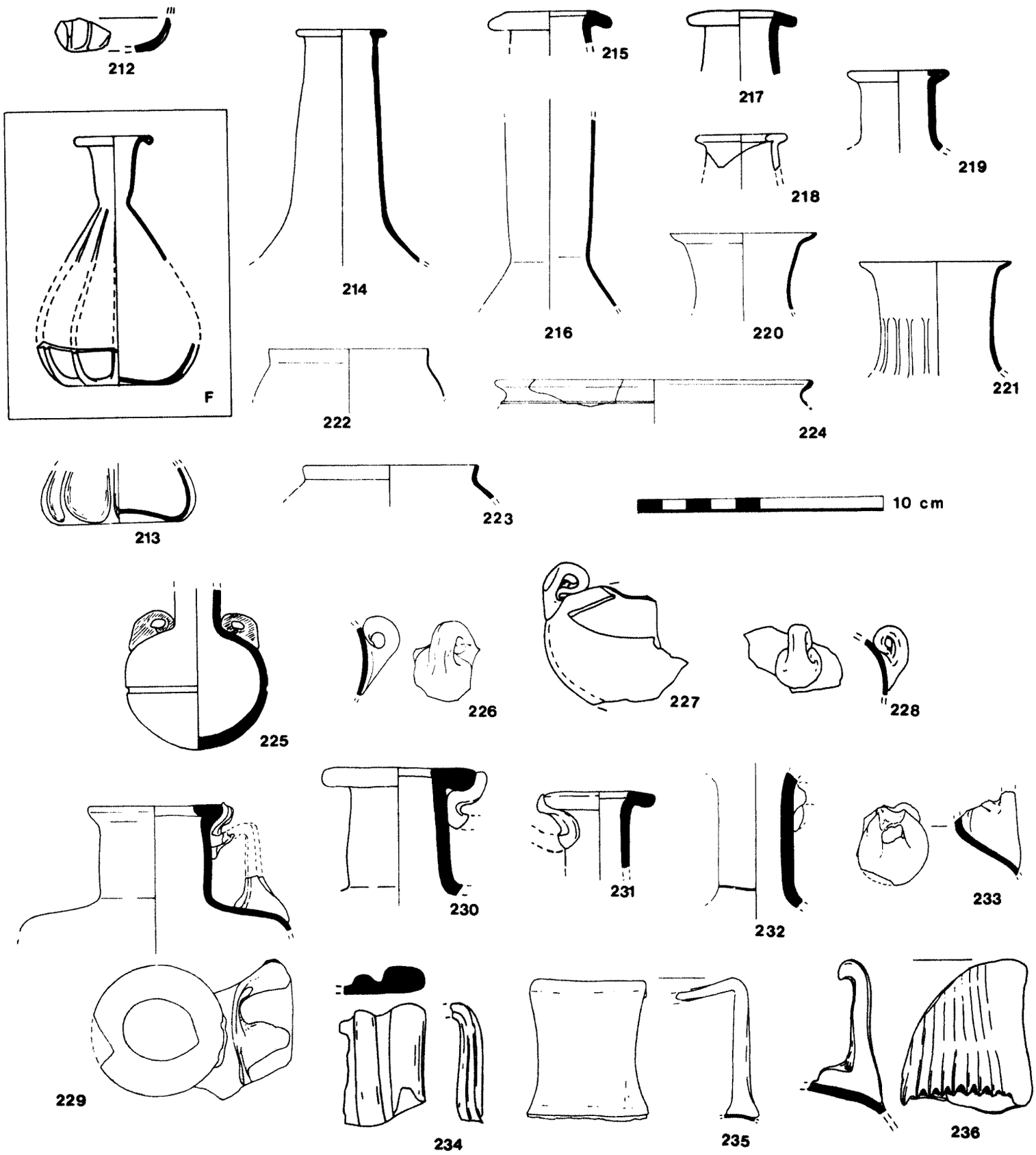
Roman Blown Beakers, Indented Beakers, and Unguentaria

No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
176	Unguentarium w/folded-in rim	E6c-1	80/67	Top	R	Lt. bl.-gr.	Not noted	1982, pl. 55w	—
177	Unguentarium w/folded-in rim	H8a-1	80/69	Top	R	Gr.	Bubl., wt. weath., opal.	1982, pl. 56gg	—
178	Unguentarium w/folded-in rim	F7 surf.	78/356	Surf.	R	Bl.-gr.	Bubl., dull, pitted	—	—
179	Unguentarium w/folded-in rim	E6b-35	80/76	R?	R	Lt. bl.-gr.	Wt. weath., some opal.	1982, pl. 56i	—
180	Unguentarium w/folded-in rim	G8b-34	82/375	R/M	R	Gr.	Not noted	—	—
181	Unguentarium w/folded-in rim	G8a-8	82/372	I	R	Gr.	Not noted	—	—
182	Unguentarium w/folded-in rim	C4c-10	78/355	R/M	R	Dk. gr. w/wt. opaq. marvered	No weath.	1979, pl. 52i	—
183	Unguentarium w/folded-in rim	E6c-3	80/67	?	R	Bl.-gr.	Bubl., impur.	1982, pl. 55p	—
184	Unguentarium w/folded-in rim	F7 surf.	78/356	Surf.	R	Bl.-gr.	Bubl., dull	—	—
185	Unguentarium w/folded-in rim	F7 surf.	78/356	Surf.	R	Lt. gr.	Not noted	1979, pl. 65e	—
186	Unguentarium w/folded-in rim	E6c-1	80/620	Top	R	Color?	Bk. & wt. mottled weath., irid.	—	Lopsided
187	Unguentarium w/folded-in rim	E7c-11	80/55	R	R	Gr.	Not noted	1982, pl. 56h	—
188	Unguentarium w/folded-in rim	E7c-1	80/56	Top	R	V. dk. gr. = opaq. bk.	No weath.	1982, pl. 56aa	—
189	Unguentarium w/folded-in rim	G8b-36	82/375	R	R	Lt. yl.-gr.	Bubl., impur.	—	—
190	Unguentarium w/hollow base	F10a-1	78/347	Top	R	Gr.	Not noted	1979, pl. 58f	—
191	Unguentarium w/hollow base	F7 surf.	78/356	Surf.	R	Gr.	Not noted	—	—
192	Unguentarium w/hollow base	G8b-32	82/375	M	R	Transp.	Weath.	—	—
193	Unguentarium w/hollow base	E6b-8	78/343	R/M	R	Lt. gr.	Not noted	1979, pl. 57k	—
194	Unguentarium w/hollow base	E6b-25	80/76	M	R	V. dk. gr. = opaq. bk.	Thick bk. weath., some opal.	1982, pl. 55z	—
195	Unguentarium w/hollow base	J6 surf.	78/681	Surf.	R	Gr.	Not noted	1979, pl. 65 l	—
196	Unguentarium w/hollow base	G8a-28	82/372	R	R	Gr.	Not noted	—	—
197	Unguentarium w/hollow base	C4c-4	78/355	R/M	R	Bl.-gr.	Not noted	1979, pl. 54d	—
198	Unguentarium w/hollow base	C4c-10	78/355	R/M	R	Bl.-gr.	Bubl., impur.	1979, pl. 52h	Tooled groove
199	Unguentarium w/hollow base	C4c-3	78/355	M	R	Bl.-gr.	Bubl.	—	—
200	Unguentarium w/hollow base	F9c-30	82/370	R	R	Transp.	No weath.	—	—
E	Unguentarium, hollow base	Karanis, No. 834, fabric 9, dk. gr.; tooled groove; Harden 1936: 277, pl. 20							
201	Unguentarium w/hollow base	F10a-3	78/347	I	R	Dk. bl.-gr.	Bubl.	1979, pl. 58h	Pontil scar



Roman Unguentaria

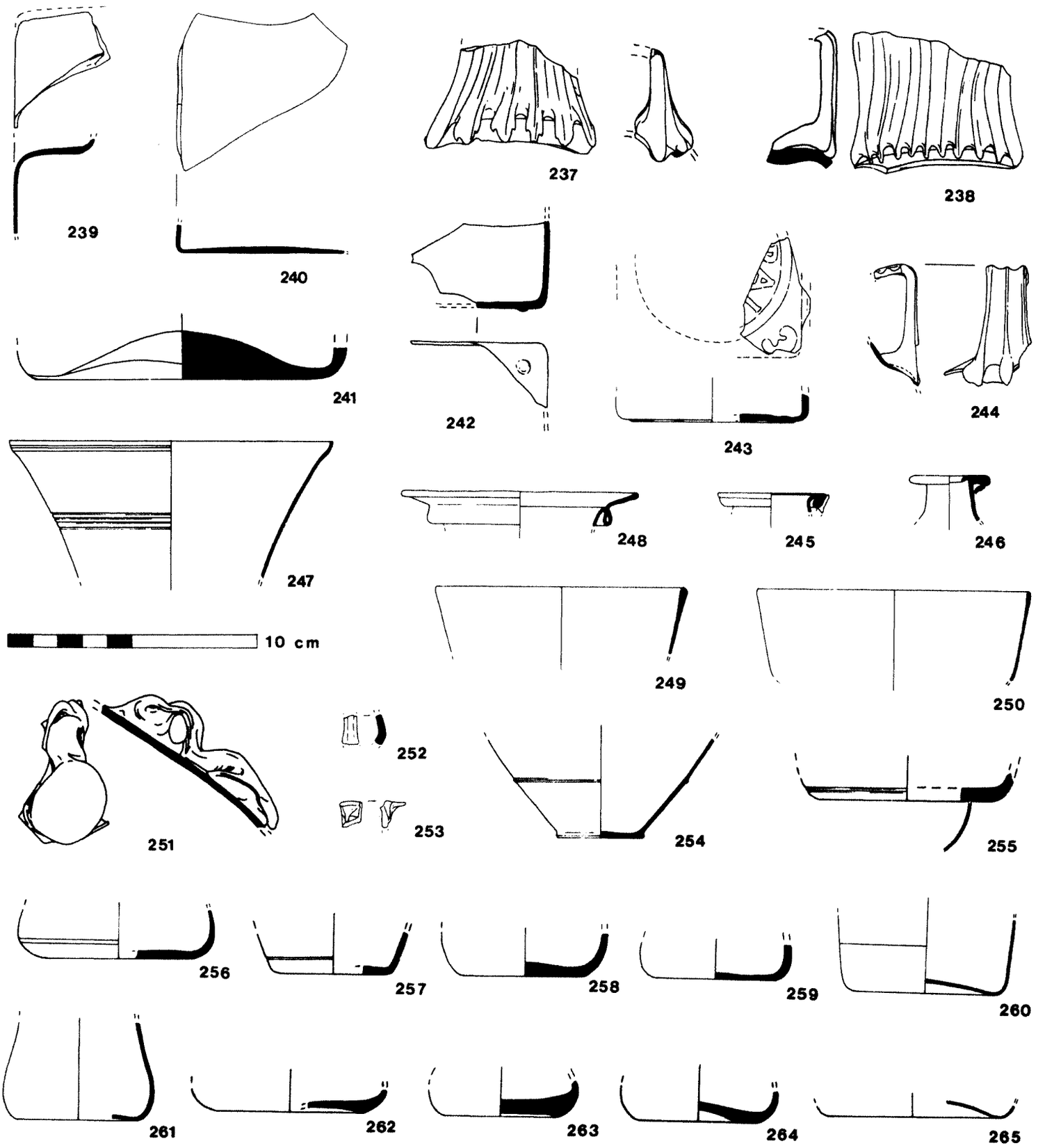
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
202	Unguentarium w/hollow base	G8a-15	82/372	I	R	Gr.	Not noted	—	—
203	Unguentarium w/solid base	E6b-22	80/76	R?	R	Opaq. bk. (color?)	Thick bk. weath., some opal.	1982, pl. 55x	Pontil scar
204	Unguentarium w/solid base	C4c-2	78/355	R/M	R	Dk. gr.	Not noted	1979, pl. 53q	—
205	Unguentarium w/solid base	B4a-4	78/354	R	R	Smokey gr.	Not noted	1979, pl. 56k	—
206	Unguentarium w/solid base	E6b-49	80/76	R	R	Opaq. bk. (= v. dk. gr.)	Bubl.	1982, pl. 55aa	—
207	Unguentarium w/solid base	E7a-16	80/55	R?	R	Opaq. bk. (= v. dk. gr.)	Not noted	1982, pl. 56 l	—
208	Unguentarium w/solid base	E6c-1	80/67	Top	R	Opaq. bk. (= v. dk. gr.?)	Irid.	—	—
209	Unguentarium w/solid base	E6b-10	78/343	R/M	R	Bk. (= v. dk. amber or gr.)	Not noted	1979, pl. 57n	—
210	Unguentarium w/solid base	E7a-2	78/356	R/M	R	Lt. gr.	Thick opal. weath., pitted	1979, pl. 57 l	—
211	Unguentarium w/solid base	E6c-1	80/67	Top	R	Opaq. (= v. dk. gr.)	Thick wt. weath., irid.	1982, pl. 55y	No pontil
212	Ribbed flask	G8a-2	82/372	M	R	Transp.	No weath.	—	—
213	Ribbed flask	C4c-8	78/355	R/M	R	Transp.	Wt. weath.	1979, pl. 55w	—
F	Ribbed flask	Karanis, No. 545, fabric 8, greenish; raised ribs; Harden 1936: 200–01, pl. 17							
214	Bottle	B4a-5	78/354	R	R	Pale gr.	Not noted	1979, pl. 56i	—
215	Bottle	H8a-1	80/69	Top	R	Dk. gr.	Not noted	1982, pl. 56ff	—
216	Bottle	B4a-5	78/354	R	R	Bl.-gr.	Many impurit.	—	—
217	Bottle	G8b-39	82/375	R	R	Lt. bl.-gr.	Bubl., v. streaky, slt. opal.	—	—
218	Bottle	E6a-1	80/64	Top	R	Gr.	Not noted	—	—
219	Bottle	E6b-4	78/343	R	R	Transp.	Not noted	1979, pl. 57h	—
220	Jar	G8b-32	82/375	M	R	Transp.	Bubl.	—	Square rim
221	Jar	F8d-8	78/344	R	R	Transp.	No weath.	1979, pl. 58n	Square rim
222	Jar	D4b-1	78/359	Top	R	Transp.	Opal.	1979, pl. 56f	V. thin
223	Jar	C4c-4	78/355	R/M	R	Bl.	Not noted	1979, pl. 54k	—
224	Jar	E6a-13	80/64	R	R	Transp.	Yl.-wt. weath.	—	Eggshell thin, thread trailed on
225	Aryballos	E6b-9	78/343	R	R	Lt. gr. handles	Not noted	1979, pl. 57d	Cut groove
226	Aryballos	Q2b-3	78/358	R/M	R	Lt. gr.	Bubl.	1979, pl. 63b	—
227	Aryballos	F8d-31	82/350	M	R	Lt. gr.	Bubl.	—	—
228	Aryballos	F8d-34	82/369	R	R	Lt. gr.	Bubl., impur.	—	—
229	Flagon	F8d6+2	78/344	I	R	Transp.	Bubbly	1979, pl. 58c	Strap handle
230	Flagon	E6c-2	80/67	M	R	Gr.	Bubl., impur. little weath.	1982, pl. 55q	Strap handle
231	Flagon	E6a-9	80/64	Top	R	Gr.	Bubl., opal., pitted	1982, pl. 55r	Strap handle
232	Flagon	E6b-29	80/63	R	R	Gr.	Yl.-wt. & bk. weath., some opal.	—	Tooled neck; handle attachment v. damaged
233	Flagon handle?	E6b-16	80/63	R/M	R	Transp.	Badly fractured	—	—
234	Flagon handle	G8a-10	82/372	R	R	Gr.	Not noted	—	—



Roman Bottles, Jars, Aryballoi, and Flagons

A. Illustrated Glass Sherds (*cont.*)

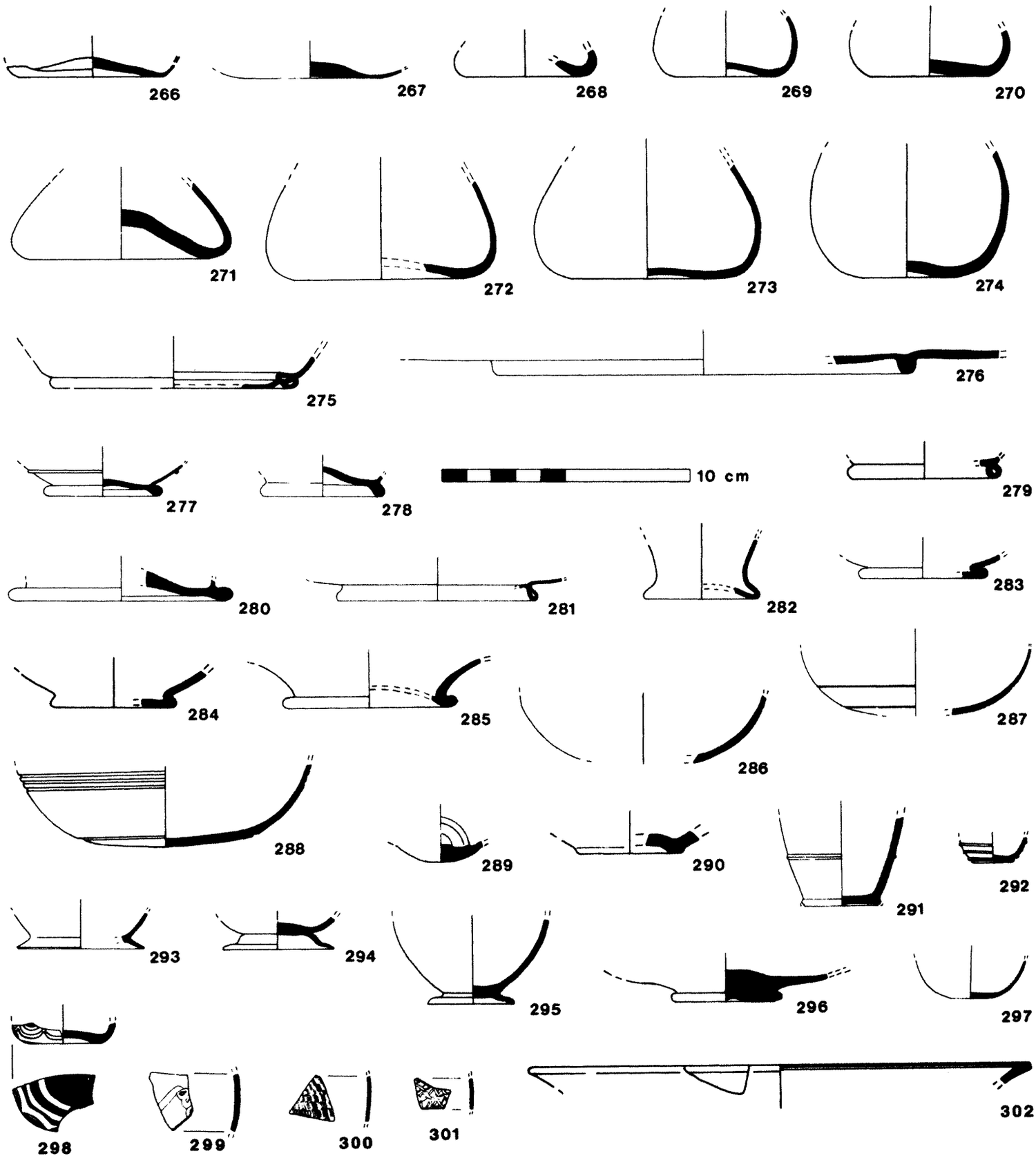
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
235	Flagon handle	K/L4 surf.	78/356	Surf.	R	Transp.	V. bubbly	1979, pl. 65k	—
236	Flagon handle	E6a-10	80/64	R	R	Dk. bl.-gr.	Thick wt. weath., pitted, irid.	1982, pl. 55s	—
237	Flagon handle	E7c-14	80/55	R?	R	Lt. gr.	Not noted	1982, pl. 56g	—
238	Flagon handle	F9c surf.	78/345	Surf.	R	Bl. gr.	Not noted	1979, pl. 58d	—
239	Flagon shoulder	E7a-7	80/55	R	—	Bl.-gr.	Dull, some bubl.	—	—
240	Flagon side	E6b-44	80/63	R	R	Lt. gr.	Bk. & wt. weath., opal.	—	—
241	Flagon base	G12c-6	80/58	M	R	Yl.-gr.	Bk. & wt. mottled weath.	—	Rectangular base
242	Flagon base	E6b-49	80/76	R	R	Bl. tint	Opal.	1982, pl. 55t	—
243	Flagon base	G8a-4	80/73	I?	R	Lt. bl.-gr.	Little wt. weath., opal.	1982, pl. 56kk	—
244	Ewer handle?	F7 surf.	78/356	Surf.	R	Pink tint	Pitted	1979, pl. 65j	—
245	Ewer	G8b-26	82/375	M	R	Transp.	Wt. weath.	—	Rim rolled under, angled
246	Ewer	E7c-3	80/54	I	R	Transp.	Wt. weath.	—	Mouth off center
247	Rim	S12a-5	78/352	R	R	Transp.	No weath.	1979, pl. 60f	Square rim, 3 lines at rim; 4 grooves
248	Rim	C4c-2	78/355	R/M	R	Gy. tint	Pitted	1979, pl. 53t	Cut-out loop
249	Bowl rim	F8d-34	82/369	R	R	Gy. tint	V. bubbly, impur.	—	3 sherds, rim variable
250	Bowl rim	E7a-11	80/53	Top	R	Transp.	Crazed	—	—
251	Handle	Surf.	82/380	Surf.	R	Lavender-gy.	Bubbly, impur.	—	—
252	Handle	N7	78/681	Surf.	R	Opaq. turq.	No weath.	—	—
253	Handle	G8a-7	82/372	M/R	R?	Transp.	Opal.	—	Kantharos handle?
254	Flat base	K/L4	78/356	Surf.	R	Transp.	Dull	1979, pl. 65s	—
255	Flat base	L8c-25	82/379	I/M	R	Transp.	Not noted	—	—
256	Flat base	G8b-32	82/375	M	R	Gr. tint	No weath.	—	2 cut lines
257	Flat base	G8b-49	82/375	R	R	Transp.	Slt. crazing	—	—
258	Flat base	C4c-2	78/355	R/M	R	Dk. bl.-gr.	Bubbly	1979, pl. 53v	—
259	Flat base	C4c-4	78/355	R/M	R	Pink tint	Not noted	1979, pl. 54f	—
260	Kick-up base	F8d-17	82/369	R/M	R	Yl.-gr. tint	Bubl.	—	Thin line, scratched on
261	Kick-up base	C4c-15	78/355	R	R	Lt. bl.-gr.	Bubl., dull	1979, pl. 52 l	—
262	Kick-up base	G8a-12	82/372	M	R	Transp.	Slt. opal.	—	Molded
263	Kick-up base	E7a-20	80/55	R	R	Transp.	Wt. weath.	1982, pl. 56k	—
264	Kick-up base	G8b-21	82/375	I/M	R	Transp.	Not noted	—	—
265	Kick-up base	B4a-2	78/354	R/M	R	Transp.	Not noted	1979, pl. 56g	—



Roman Flagons, Ewers, Rims, Handles, and Bases

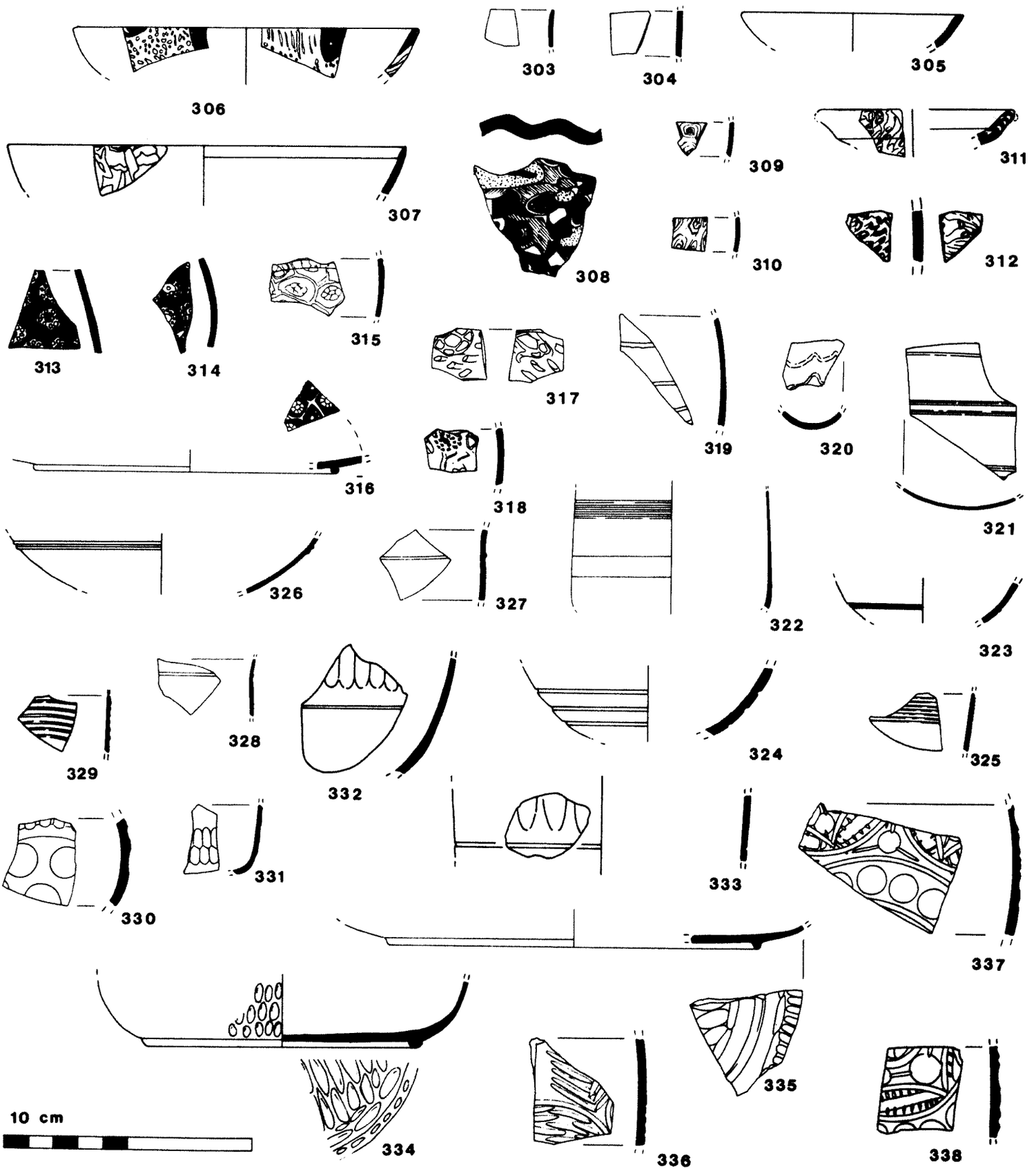
A. Illustrated Glass Sherds (*cont.*)

No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
266	Kick-up base	G8a-2	82/372	M	R	Gr. tint	Dull	—	—
267	Kick-up base	E7c-2	80/54	Top	R	Transp.	Wt. weath., bubl.	—	—
268	Kick-up base	G8a-2	82/372	M	R	Lt. gr.	Bubbly	—	—
269	Kick-up base	E6b-11	78/343	R/M	R	Lt. gr.	Not noted	1979, pl. 57s	—
270	Kick-up base	G8b-32	82/375	M	R	Gr.	Not noted	—	—
271	Kick-up base	E6a-9	80/64	Top	R	Bl.-gr.	Slt. wt. weath. bubl., opal.	1982, pl. 55kk	Pontil scar
272	Kick-up base	E6a-1	80/64	Top	R	Gr.	Not noted	—	—
273	Kick-up base	E6c-1	80/67	Top	R	Gr.	Not noted	1982, pl. 55 ll	—
274	Kick-up base	E6b-4	78/343	R	R	Lt. gr.	Wt. weath., opal	1979, pl. 57t	No pontil scar
275	Looped base	E6a-9	80/64	Top	R	Transp.	Lt. yl. weath.	1982, pl. 55hh	—
276	Looped base	L9c-1	78/358	Top	R	Transp.	No weath.	1979, pl. 63c	Not K9b-16
277	Looped base	Cent. surf.	78/352	Surf.	R	Transp.	Wt. weath., dull, pitted	1979, pl. 65r	Thread trailed on
278	Looped base	E6b-9	78/343	R	R	Transp.	Wt. weath., opal.	1979, pl. 57m	—
279	Looped base	G8a-11	82/372	R	R	Color?	Not noted	—	—
280	Looped base	G7 surf.	78/—	Surf.	R	Gr. tint	Dull	—	—
281	Looped base	E7a-11	80/53	Top	R	Lt. bl.-gr.	Dull	—	—
282	Looped base	E6a-8	80/76	Top	R	Lt. yl.-gr.	Not noted	—	—
283	Looped base	C4c-4	78/355	R/M	R	V. dk. gr.	No weath.	1979, pl. 54a	Good glass
284	Looped base	G8b-43	82/375	R	R	Gy. tint	Bubl.	—	—
285	Looped base	E6a-1	80/64	Top	R	Pale bl.	Some opal., pitting	1982, pl. 55gg	—
286	Round base	E6b-5	78/343	R/M	R	Transp.	Not noted	1979, pl. 57p	—
287	Round base	E6b-44	80/63	R	R	Transp.	Wt. weath., opal.	—	Cut ridge and groove
288	Round base	J6 surf.	78/681	Surf.	R	Transp.	Not noted	1979, pl. 65v	Cut grooves
289	Base	E6a-13	80/64	R	R	Cobalt bl.	Irid.	1982, pl. 55b	Molded
290	Base	G8a-25	82/372	R	R	Cobalt bl.	Wt. weath., opal.	—	—
291	Base	E8b-3	80/73	R?	R	Crystal clear	No weath.	1982, pl. 56jj	Cut ridge
292	Base	F7a-2	80/65	M	R	Lt. yl.-gr. w/ yl. threads	Not noted	—	Trailed threads
293	Base	G8c-2	80/57	?	R	Transp.	Yl.-wt. weath.	—	—
294	Base	S12c-4	78/350	I	R	Transp.	Not noted	1979, pl. 60r	—
295	Base	J4 surf.	78/681	Surf.	R	Transp.	Not noted	1979, pl. 65o	—
296	Base	E6a-13	80/64	R	R	Gy. tint	Bubl., v. pitted	1982, pl. 55ff	—
297	Base	G8a-7	80/75	R?	R	Olive gr.	Bubbly, opal.	—	—
298	Marvered and dragged decoration	Surf.	78/609	Surf.	Hell.?	Opaq. dk. bl. w/yl. & turq. coils	No weath.	—	—
299	Inlaid	C7 surf.	78/681	Surf.	Hell.?	Transp., wt. opaq. band, rd., wt., rd. dots w/yl. centers	No weath.	1979, pl. 64p	Int. dec.
300	Lace mosaic	E6a-16	80/59	R	Hell.?	Transp., yl. opaq. coils	No weath.	—	Hellenistic?
301	Lace mosaic	C4c-2	78/355	R/M	Hell.?	Transp., wt. opaq. coils	No weath.	1979, pl. 53h	Hellenistic?
302	Opaque	G8b-20	82/375	M	R	Tangerine	Not noted	—	—



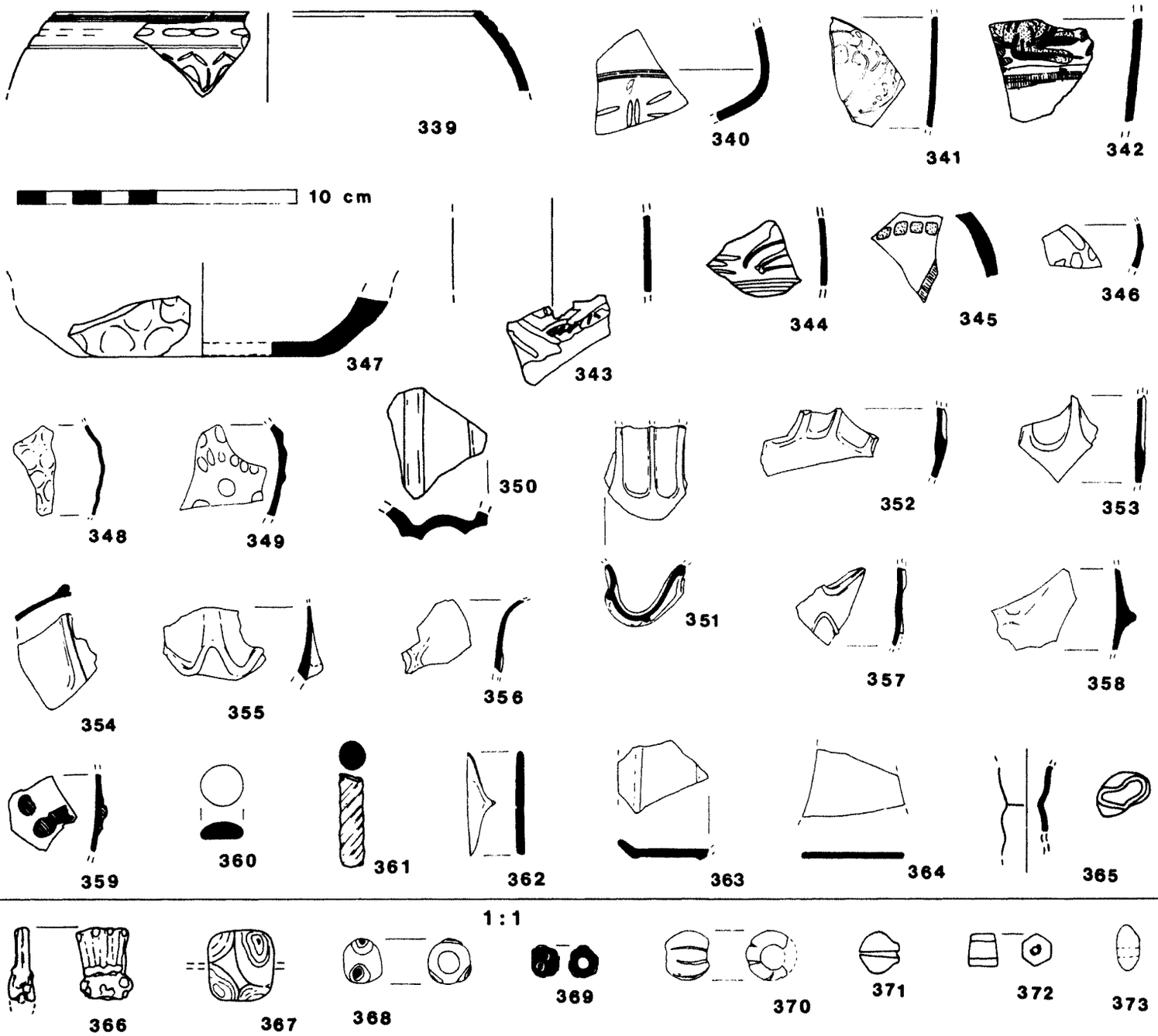
A. Illustrated Glass Sherds (*cont.*)

No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
303	Opaque	G8b-33	82/375	I/M	R?	Aqua	No weath.	—	Rim angle uncertain
304	Opaque	K9b-22	78/586	I	R?	Rd.	Gr. crust in spots	—	Grinding, = plate bottom?
305	Opaque	C4c-2	78/355	R/M	R	Dk. magenta	Not noted	1979, pl. 53c	—
306	Marbled?	E7 surf.	78/352	Surf.	R	See text	Not noted	1979, pl. 57a	—
307	Marbled?	K9b-56	82/376	I/M	R	See text	Not noted	—	—
308	Mosaic	E6b-10	78/345	R/M	R	See text	Not noted	1979, pl. 57o	—
309	Mosaic, coils	C4c-9	78/355	R	Hell.?	See text	Not noted	1979, pl. 52f	—
310	Mosaic, coils	E6b-14	80/63	R/M	Hell.?	See text	Dull	—	—
311	Mosaic, coils	F7a-2	80/65	M	R	See text	Not noted	1982, pl. 56o	—
312	Mosaic, coils	L8c-25	82/379	I/M	R	See text	Not noted	—	—
313	Millefiore	C4c-4	78/355	R/M	R	See text	Not noted	1979, pl. 54r	—
314	Millefiore	C4c-2	78/355	R/M	R	See text	Not noted	1979, pl. 53g	—
315	Millefiore	D4b surf.	78/71	Surf.	R	See text	No weath.	—	Bowl?
316	Millefiore	C4c-18	78/355	R	R	See text	Not noted	1979, pl. 52n	—
317	Millefiore	G12c-2	80/58	Top	R	See text	No weath.	—	—
318	Millefiore	E6a-13	80/64	R	R	See text	No weath.	1982, pl. 55k	—
319	Marvered	G8b-26	82/375	M	R?	Transp., wt. opaq. lines	Dull	—	—
320	Marvered	NW surf.	78/681	Surf.	R?	Transp., wt. opaq. lines	No weath.	1979, pl. 64o	—
321	Cut lines	E6a-1	80/64	Top	R	Transp.	No weath.	—	6 cut grooves
322	Cut lines	F7a-4	80/66	Top	R	Transp.	Slt. wt. weath.	—	2 grooves plus lines
323	Cut lines	B4a-2	78/354	R/M	R	Transp.	Not noted	1979, pl. 56a	—
324	Cut lines	B4a-2	78/354	R/M	R	Transp.	Not noted	1979, pl. 56b	—
325	Cut lines	B4a-3	78/354	R/M	R	Transp.	Thin wt. weath.	1979, pl. 56 l	—
326	Cut ridges	C4c-4	78/355	R/M	R	Bl.	Not noted	1979, pl. 54n	—
327	Cut ridges	F7 surf.	78/356	Surf.	R	Transp.	Dull	—	—
328	Cut ridges	E6a-7	80/59	Top	R	Dk. turq.	Slt. opal., v. pitted	—	Not cobalt bl.
329	Cut ridges	G8b-34	82/375	R/M	R	Transp.	Wt. weath.	—	—
330	Cut decoration	F7a-1	80/66	Top	R	Transp.	Dull	—	—
331	Cut decoration	S12c-8	78/350	R	R	Transp.	No weath.	1979, pl. 60w	—
332	Cut decoration	G8a-1	82/372	Top	R	Color?	Not noted	—	—
333	Cut decoration	G8a-14	82/372	I	R	Transp.	Not noted	—	—
334	Cut decoration	South cent. surf.	78/681	Surf.	R	Transp.	Not noted	1979, pl. 64m	Deep bowl
335	Cut decoration	South cent. surf.	78/681	Surf.	R	Transp.	Dull	1979, pl. 64n	Deep cut ovals
336	Cut decoration	Surf.	78/—	Surf.	R	Transp.	Pitted, dull	—	Deep cut ovals
337	Cut decoration	G8a-4	80/73	I?	R	Transp.	No weath.	1982, pl. 56hh	Deeply cut
338	Cut decoration	G8b-39	82/375	R	R	Transp.	Some wt. weath., crazed	—	—



Roman Decorative Techniques

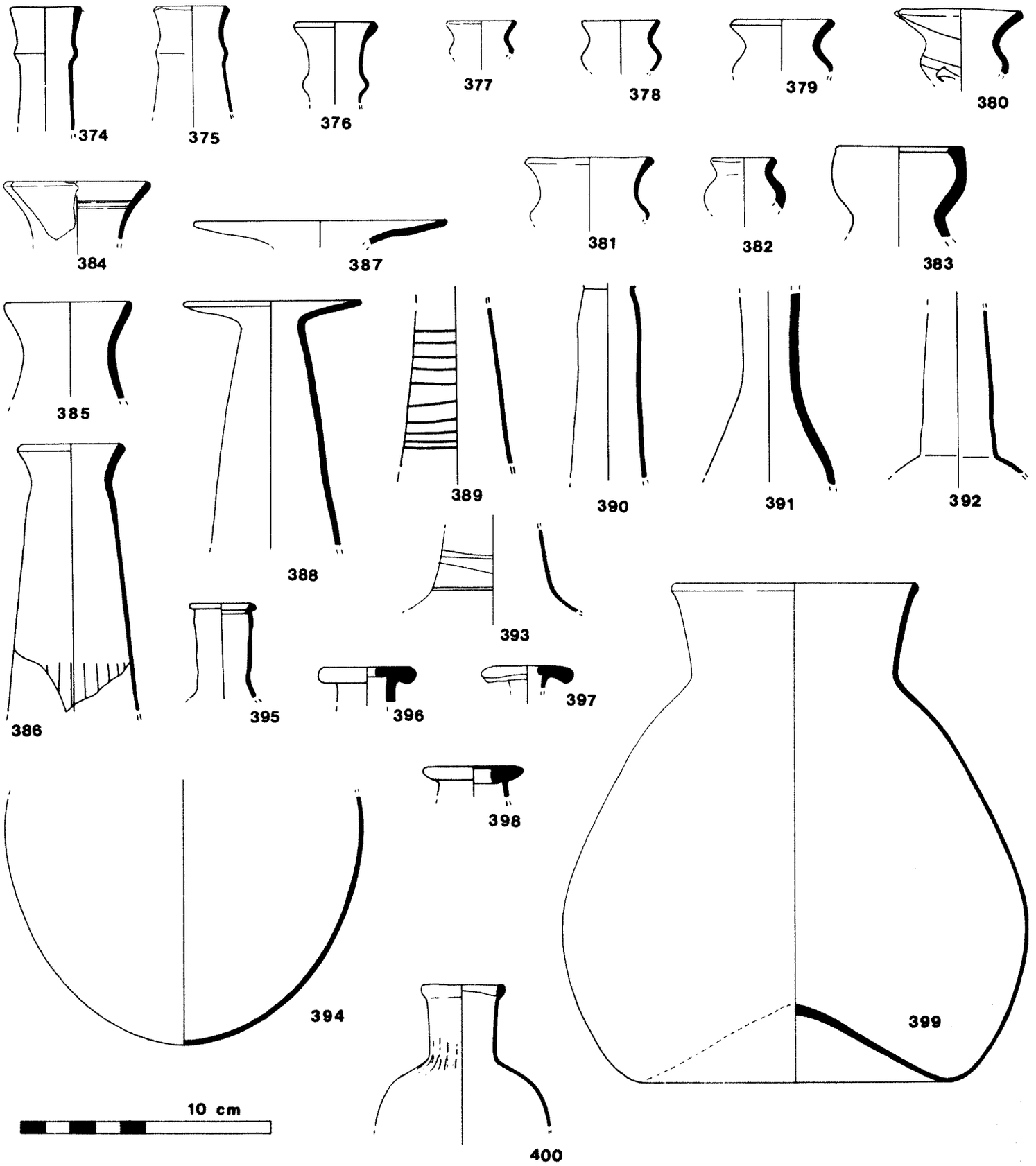
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
339	Cut decoration	G8a-7	82/372	R/M	R	Transp.	Wt. weath.	—	D. uncert., rim angle ok
340	Cut decoration	E6a-1	80/64	Top	R	Transp.	Some pitting	1982, pl. 55 l	"J" old, scratched in
341	Painted decoration	B6 surf.	78/—	Surf.	R	See text	No weath.	—	Floral
342	Painted decoration	E6a-1	80/64	Top	R	See text	No weath.	1982, pl. 55m	Animal paw
343	Painted decoration	G8a-4	82/372	R/M	R	See text	No weath.	—	Floral?
344	Painted decoration	G8b-20	82/375	M	R	See text	No weath.	—	—
345	Painted decoration	C4c-4	78/355	R/M	R	Dk. emerald, 4 yl. blobs, rd. line	Bubbly	1979, pl. 54i	—
346	Painted decoration	C4c-4	78/355	R/M	R	Transp.; 3 yl. dots; yl.-gr. line	Little opal.	1979, pl. 54h	Paint thick blobs
347	Molded decoration	E6a-9	80/64	Top	R	Transp.	Dull	1982, pl. 55ee	V. thick
348	Molded decoration	G8b-42	82/375	R	R	Transp.	No weath.	—	Optic blown
349	Molded decoration	F9c-20	78/358	R	R	Gr. tint	No weath.	1979, pl. 58o	Mold blown
350	Molded decoration	G8a-27	82/372	R	R	Transp.	Wt. weath., slt. opal.	—	—
351	Tooled decoration	D4b-1	78/683	Top	R	Transp.	Pitted	—	—
352	Tooled decoration	E7c-14	80/55	R?	R	Transp.	Crazed surf.?	—	—
353	Tooled decoration	F10a-3	78/347	I	R	Transp.	Few bubl.	1979, pl. 58i	—
354	Tooled decoration	C4c-2	78/355	R/M	R	Dk. bl.	No weath.	—	—
355	Tooled decoration	F8b-5	82/371	M	R	Transp.	Dull	—	Deep tooling
356	Tooled decoration	G8b-42	82/375	R	R	Transp.	Dull	—	Pinched up
357	Tooled decoration	G8d-1	78/346	Top	R	Transp.	No weath.	—	—
358	Tooled decoration	E7a-2	80/55	—	R?	Transp.	No weath.	—	Nipped
359	Prunts	E6a-12	80/64	R	R	Transp. w/bl. blobs	Bubl.	1982, pl. 55j	—
360	Game piece	E6b-24	80/76	R	R	Color? opaq. bk.	No weath.	—	Bottom ground almost smooth
361	Stirring rod	F8d-30	82/369	M	R	Transp. w/ purple streaks	Thin wt. weath.	—	Spiraled
362	Inlay?	Surf.	78/—	Surf.	R?	Gr., opaq. from bubl.	No weath.	—	Cast? opus sectile?
363	Unidentified	G8a-10	82/372	R	R	Transp.	Wt. weath.	—	—
364	Unidentified	G8b-25	82/375	M/I	R?	Transp.	No weath.	—	2 sides smooth, curve in a little
365	Waster?	K9b-27	82/376	I	R?	Transp.	Wt. weath.	—	Unguentarium?
366	Amulet	G8b-3	80/80	I	R	Turq. w/ yl.-gr. dots	Not noted	1982, pl. 59g	Bes?
367	Bead	D6d-7	80/71	R	R	Gr. base, wt. & bk. circles	Not noted	1982, pl. 59f	—
368	Bead	F8d-32	82/388	M	R	Gr. opaq., 3 wt. blobs, bl. circle & bl. dot	No weath.	—	—
369	Bead	C4c-3	78/139	M	R	Opaq. dk. bl. w/bl. on wt. dots	No weath.	1979, pl. 68a	—
370	Bead	F8d-36	82/384	M/R	R	Opaq. turq.	No weath.	—	Tooled
371	Bead	G8b-6	80/73	I?	R	Opaq. rd.	No weath.	1982, pl. 59n	Coiled
372	Bead	E7c-10	80/55	Top	R?	Turq. gr.	Not noted	1982, pl. 59 l	—
373	Bead	G8a-7	80/73	R?	R	Opaq. bl.	Not noted	—	—



Roman Decorative Techniques, Non-Vessel Fragments, and Beads

A. Illustrated Glass Sherds (*cont.*)

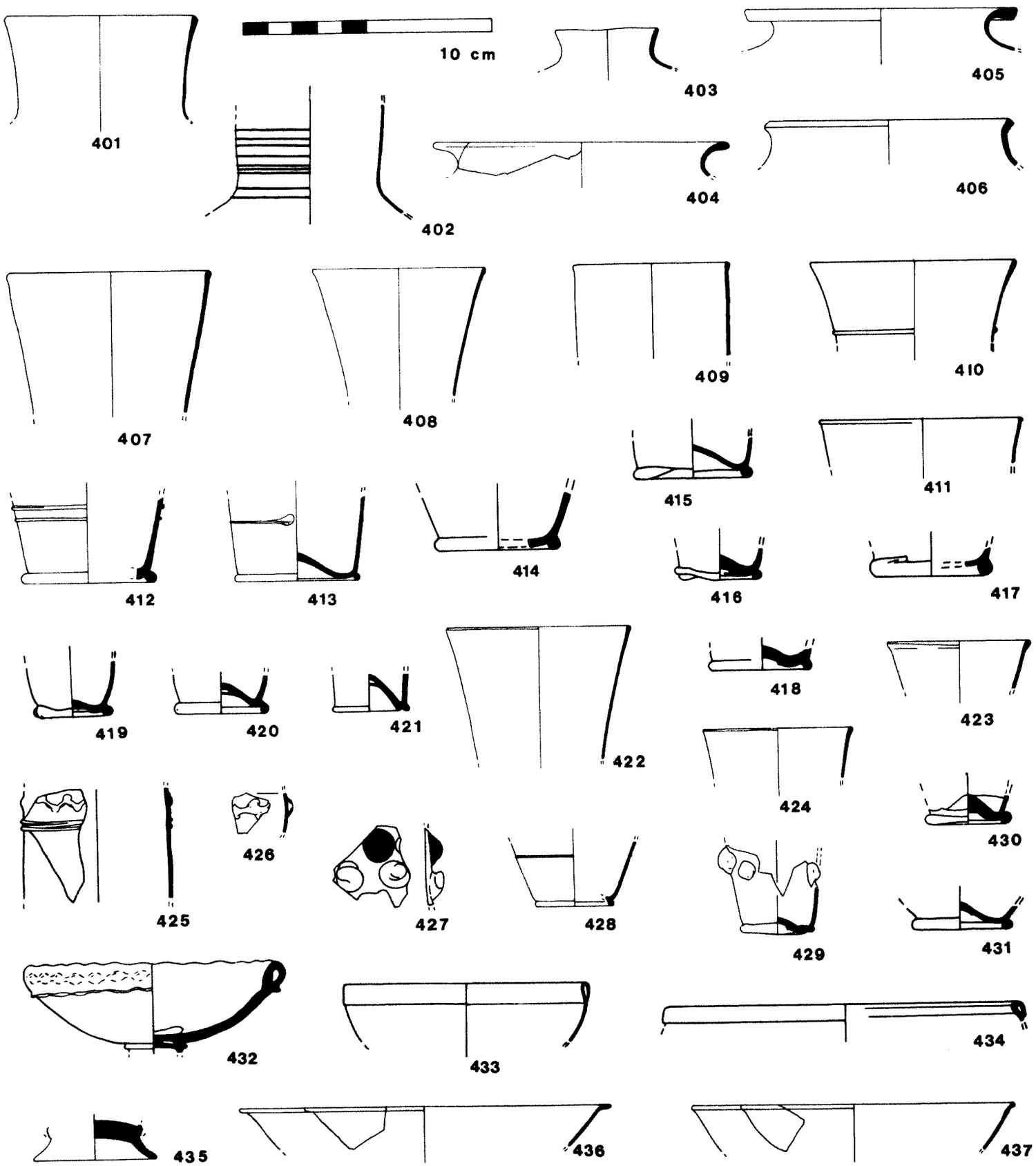
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
374	Bubble neck bottle	E18d-14	80/77	I	I	Gr.	Not noted	1982, pl. 58z 1983, fig. 2z	—
375	Bubble neck bottle	NW surf.	78/681	Surf.	I	Olive	Impur.	1979, pl. 65a	—
376	Bubble neck bottle	E18c-3	80/78	I	I	Lt. gr.	Not noted	1982, pl. 58aa 1983, fig. 2aa	—
377	Bubble neck bottle	F9c-28	82/370	I	I	Yl.-gr. tint	Bubl.	—	—
378	Bubble neck bottle	E18a-5	80/77	I	I	Gr.	Not noted	1982, pl. 58 l 1983, fig. 2 l	—
379	Bubble neck bottle	P8a-9	78/351	I	I	Yl.-gr.	Not noted	1979, pl. 61a	—
380	Bubble neck bottle	Surf.	78/609	Surf.	I	Dk. gr.	Bubl., impur.	—	Trailed thread
381	Bubble neck bottle	K10a-8	82/373	I	I	Dk. amber	Bubl.	—	—
382	Bubble neck bottle	F9c-1	78/345	Top	I	V. dk. olive br.	Bubl.	1979, pl. 58e	—
383	Bubble neck bottle	E18c-13	80/621	I	I	Dk. amber	Bubbly, slt. wt. weath.	1982, pl. 58v 1983, fig. 2v	V. thick
384	Bottle, slight flaring mouth	J8c-1	80/69	Top	I	Olive	Bubbly	—	2 tooled? grooves int.
385	Bottle, slight flaring mouth	S12c-7	78/350	I	I	Dk. yl.-olive	Bubbly	1979, pl. 60v	—
386	Bottle, slight flaring mouth	E18b-2	80/77	I	I	Lt. yl.-gr.	Not noted	1982, pl. 58hh 1983, fig. 2hh	—
387	Bottle, v. flaring rim	K/L4 surf.	78/356	Surf.	I	Lt. gr.	Not noted	1979, pl. 64f	—
388	Bottle, v. flaring rim	K9b-16	78/348	I/M	I	Gr. tint	Purple streaks?	1979, pl. 63d	Not pl. 63f
389	Bottle neck	K9b-70	82/376	I	I	Yl.-gr. tint	Wt. weath., opal.	—	Trailed threads
390	Bottle neck	K/L9 surf.	78/356	Surf.	I	Gr.	Bubl.	—	—
391	Bottle neck	A22d-3	78/353	I	I	Lt. gr.-bl.	Not noted	1979, pl. 63b	—
392	Bottle neck	D4b-1	78/683	Top	I	Lt. gr.	Bubl., impur.	—	—
393	Bottle neck	L8c-50	82/379	I/M	I	Olive	Bubl.	—	Trailed threads
394	Bottle bottom	A22d-1	78/353	Top	I	Lt. bl.-gr.	No weath.	—	Slt. swirl at base
395	Bottle	E19c-3	80/74	I	I?	Dk. br.	Not noted	1982, pl. 58x	Folded-in rim
396	Sprinkler bottle	F7a-3	80/65	M	I	Transp.	Not noted	1982, pl. 56z	—
397	Sprinkler bottle	K10a-3	82/373	I/M	I	Transp.	Dull	—	—
398	Sprinkler bottle	E18a-16	80/78	I	I	Transp.	Not noted	1982, pl. 58y 1983, fig. 2y	—
399	Jar, tall neck	J10a-9	82/382	I/M	I	Lt. gr.	Not noted	—	V. fragmentary
400	Jar, tall neck	K9b-71	82/376	I	I	Transp.?	Yl. weath., bk. surf.	1983, fig. 3j	Neck slt. ribbed or tooled



Islamic Bottles and Jars

A. Illustrated Glass Sherds (*cont.*)

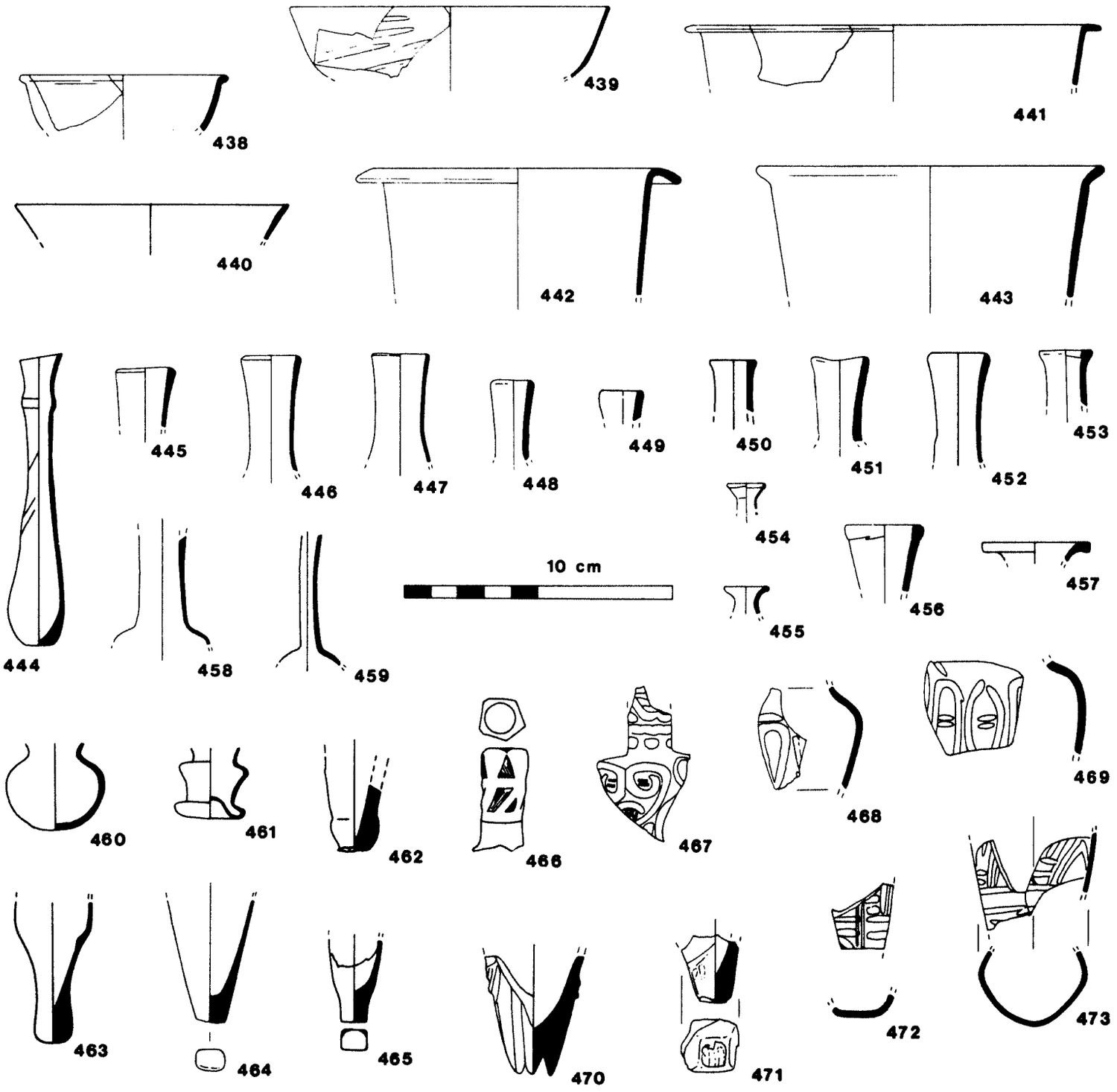
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
401	Jar, tall neck	Surf.	82/380	Surf.	I	V. dk. amber almost opaq.	No weath.	—	—
402	Jar, tall neck	K9b-70	82/376	I	I	Transp.	Not noted	—	Trailed threads
403	Jar, short neck	L7d-1	82/377	Top	I	Lt. gr.	V. bubbly, impur.	1983, fig. 4f	—
404	Jar, short neck	S12a-3	78/352	Top	I	Dk. olive	Bubl.	1979, pl. 60b	—
405	Jar, short neck	L7d-2	82/377	I	I	Dk. olive	Bubl.	1983, fig. 4c	—
406	Jar, short neck	S12c-6	78/350	I	I	Dk. gr.	Bubbly	1979, pl. 60p	—
407	Beaker	P8b-5	78/349	I	I	Pink tint	Not noted	1979, pl. 61h	—
408	Beaker	P8b-5	78/349	I	I	Lt. purple tint	Bubl.	1979, pl. 61i	Possibly 3 more
409	Beaker	P8b-6	78/349	I	I	Pink tint	Not noted	1979, pl. 61j	—
410	Beaker	G8b-33	82/375	I/M	I	Lt. gr.	Not noted	—	Trailed thread
411	Beaker	G8b-20	82/375	M	I	Transp.	Not noted	—	—
412	Coil base	K9b-28	82/376	I/M	I	Transp.	Slt. dull	1983, fig. 3p	Trailed threads
413	Coil base	Surf.	78/609	Surf.	I	Lt. gr.	Bubl.	—	Trailed thread
414	Coil base	F9a-2	82/368	I	I	Transp.	Not noted	—	—
415	Coil base	K9b-56	82/376	I/M	I	Lt. gr.	Not noted	—	—
416	Coil base	K9b-69	82/376	I	I	Transp.	V. pitted, thick bk. on wt. weath, almost no glass	—	—
417	Coil base	L8c-52	82/379	I/M	I	Transp.	Not noted	—	—
418	Coil base	F9c-24	82/370	I	I	Lavender tint	Not noted	—	—
419	Coil base	K9b-36	82/352	I/M	I	Gr. tint	Bubl., slt. opal.	—	—
420	Coil base	E18c-2	80/77	I	I	Transp.	Not noted	1982, pl. 58vv 1983, fig. 2vv	—
421	Coil base	E18d-11	80/78	I	I	Transp.	Not noted	1982, pl. 58uu 1983, fig. 2uu	—
422	Beaker, blue rim	P8b-5	78/349	I	I	Transp. w/lt. bl. rim	Bubbly	—	—
423	Beaker, blue rim	P8 surf.	78/356	Surf.	I	Pink tint, dk. turq. rim	Bubl., impur.	1979, pl. 62c	—
424	Beaker, blue rim	P8a-10	78/351	I	I	Purple tint, turq. rim	No weath.	—	—
425	Beaker body	E18d-8	80/78	I	I	Transp.	Not noted	1982, pl. 58i 1983, fig. 2i	—
426	Beaker body	F9a-9	82/368	I	I	Transp.	No weath.	—	Pinched coil dec.
427	Beaker? decoration	E18d-7	80/77	I	I	Transp., 2 transp. & 1 bl. prunt	Not noted	1982, pl. 58h 1983, fig. 2h	—
428	Blue coil base	L8c-1	82/379	Top	I	Gr. tint, bl. coil base, lt. bl. thread	No weath.	—	—
429	Blue coil base	K9b-36	82/352	I/M	I	Gr. tint, dk. bl. coil, 2 lower blobs bl., upper clear	Bubbly	1983, fig. 3r	Kick, pontil scar
430	Blue coil base	E6a-1	80/64	Top	I	Transp., dk. bl. base	No weath.	—	Pontil scar
431	Blue coil base	J10c-15	82/357	I/M	I	Transp., bl. base	Not noted	—	—
432	"Fruitstand"	Cent. surf.	78/681	Surf.	I	Transp., smokey gy.	Not noted	1979, pl. 65i	Rim pinched, d. 12 cm
433	Looped rim	L8c-16	82/379	I/M	I	Pint tint	Few bubl.	—	Fruitstand?
434	Looped rim	G8a-14	82/372	I	I	Gr.	Not noted	—	Fruitstand?
435	Pedestal base	J9d-8	82/374	I	I	Transp.	V. pitted	—	2 parisons, fruitstand?
436	Green bowl	P8b-5	78/349	I	I	Dk. emerald	Little wt. & yl.-gr. weath.	—	—
437	Green bowl	K9b-64	82/376	I	I	Emerald	Slt. dull	—	—



Islamic Jars, Beakers, and Bowls

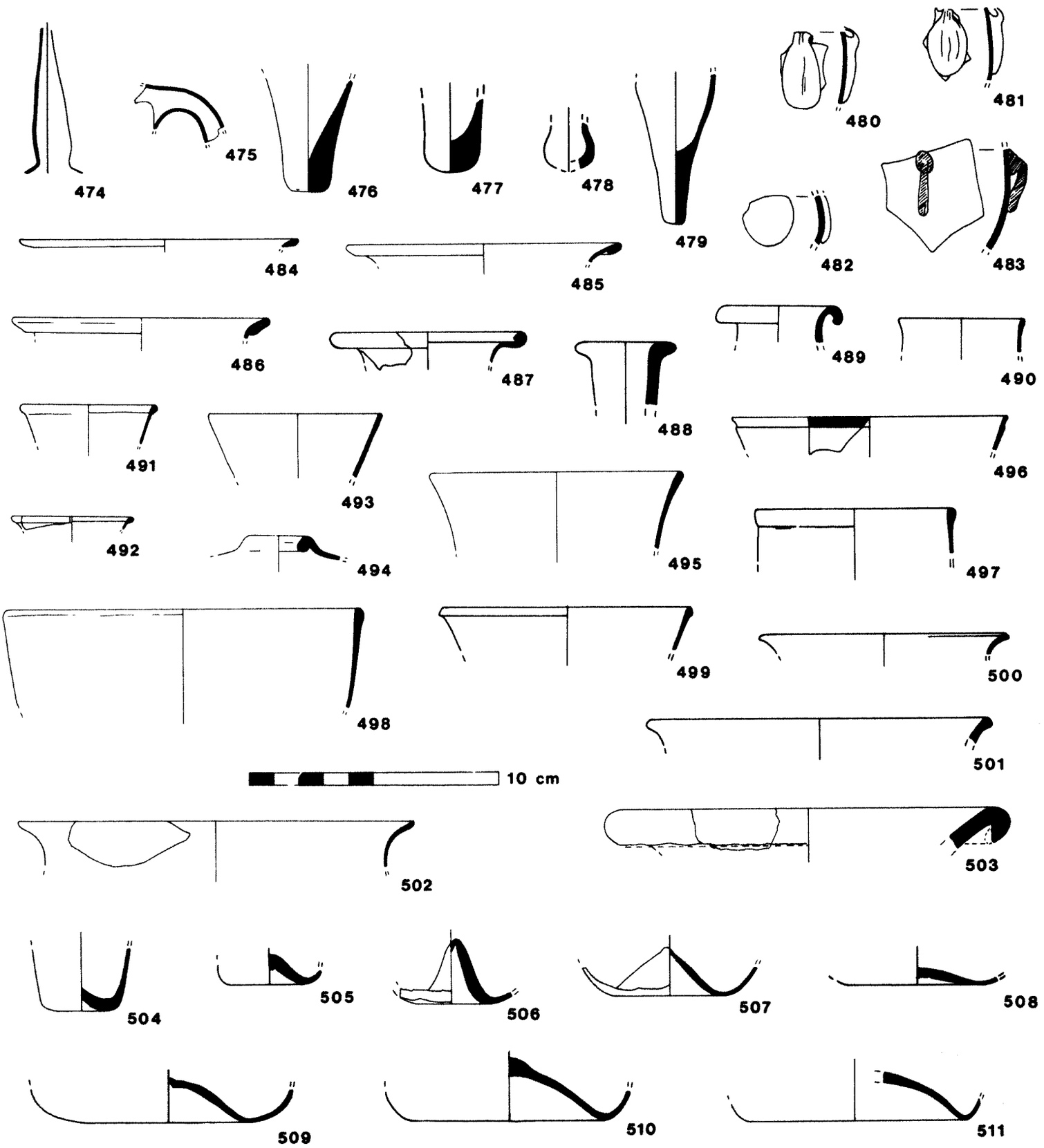
A. Illustrated Glass Sherds (*cont.*)

No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
438	Green bowl	C4c-3	78/355	M	I	Dk. gr.	Few bubl.	1979, pl. 55a	Good glass
439	Green bowl	F8d-10	82/369	I	I	Emerald	V. bubbly, impur.	—	Faint blown ribs?
440	Green bowl	G8b-33	82/375	I/M	I	Opaq. gr.	Not noted	—	—
441	Basket bowl	P8b-17	78/357	I	I	Yl.-gr. tint	Bubl., slt. wt. weath.	1979, pl. 62i	—
442	Basket bowl	P8b-8	78/357	I	I	Yl.-gy. tint	Bubl.	1979, pl. 62d	—
443	Basket bowl	N3 surf.	78/—	Surf.	I	Purple-gy. tint	V. bubbly, impur.	—	—
444	Vial	F18a-1	80/617	Top	I	Gr.	Not noted	1982, pl. 58 ll	—
445	Vial mouth	F8d-2	78/345	I	I	Lt. yl.-gr.	Wt. weath., bk. stain on rim	1979, pl. 58b	—
446	Vial mouth	K9b-71	82/376	I	I	Yl.-olive	Thick bk. on yl. weath., v. pitted	1983, fig. 3 l	—
447	Vial mouth	K9b-33	82/376	I	I	Lt. bl.-gr.	Bubl., slt. wt. weath.	1983, fig. 3h	—
448	Vial mouth	P8b-8	78/357	I	I	Bl.	Impur., slt. wt. weath.	1979, pl. 62e	Irregular
449	Vial mouth	F10a-1	78/347	I/M	I	Dk. amber	Bubl.	1979, pl. 58e	—
450	Vial mouth	L8c-20	82/379	I	I	Emerald	Some yl. weath.	—	—
451	Vial mouth	F10a-5	78/347	I	I	Dk. purple	Impur.	1979, pl. 58c	Lopsided
452	Vial mouth	E18c-3	80/78	I	I	Bk.	Not noted	1982, pl. 58bb 1983, fig. 2bb	—
453	Vial mouth	E6b-14	80/63	M/R	I	Dirty gr.	Bubl., impur.	—	—
454	Vial mouth	—	78/365	—	I	Lt. bl.	Irid.	—	—
455	Vial mouth	C4c-5	78/355	M	I	Magenta, gr., bl.	Badly corroded	1979, pl. 55 l	—
456	Vial mouth	Surf.	78/609	Surf.	I	Lt. yl.-gr. w/ dk. purple rim	Bubl.	—	Rim coiled on
457	Vial mouth	S12c-6	78/350	I	I	Deep gr.	Not noted	1979, pl. 60 l	—
458	Vial neck	L8c-52	82/379	I/M	I	Gr. tint	V. bubbly, slt. opal.	1983, fig. 4o	—
459	Vial neck?	E18c-2	80/77	I	I	Transp.	Not noted	1982, pl. 58g 1983, fig. 2g	Spout?
460	Vial base	E18c-2	80/78	I	I	Gr.-br.	Not noted	1983, pl. 58k 1983, fig. 2k	—
461	Vial base	E18d-12	80/77	I	I	Gr.	Not noted	1982, pl. 58j 1983, fig. 2j	—
462	Vial base	G8b-21	82/375	I/M	I	Bk.	Weath.	—	—
463	Vial base	E18b-4	80/77	I	I	Gr.	Not noted	1982, pl. 58xx 1983, fig. 2xx	—
464	Vial base	K9b-65	82/376	I	I	Cobalt bl.	Bubbly, irid.	1983, fig. 3t	—
465	Vial base	G8b-5	80/73	I?	I	Dk. gr.	Not noted	—	Base snapped off? V. irregular
466	Molar/square flask	E18b-4	80/77	I	I	Dk. bl.	Not noted	1982, pl. 58ff 1983, fig. 2ff	Cut dec.
467	Molar/square flask	F8d-10	82/366	I	I	Dk. bl.	Not noted	1983, fig. 4p	Cut dec.
468	Molar/square flask	Surf.	78/681	Surf.	I	Cobalt bl.	Bubl.	1979, pl. 65g	Cut dec.
469	Molar/square flask	K4 surf.	78/356	Surf.	I	Dk. bl.	Bubl.	1979, pl. 65f	Cut dec.
470	Molar/square flask	F8d-10	82/366	I	I	Dk. bl.	Not noted	1983, fig. 4r	Cut dec.
471	Molar/square flask	G8b-5	80/73	I	I	Dk. bl.	V. bubbly	—	Lopsided, base snapped off, 2 broad scratches
472	Molar/square flask	J9d-2	82/374	I	I	Bl.	Not noted	—	Cut dec.
473	Molar/square flask	K9b-28	82/376	I/M	I	Dk. cobalt bl.	Bubbly	1983, fig. 3q	Cut dec.



Islamic Bowls and Vials

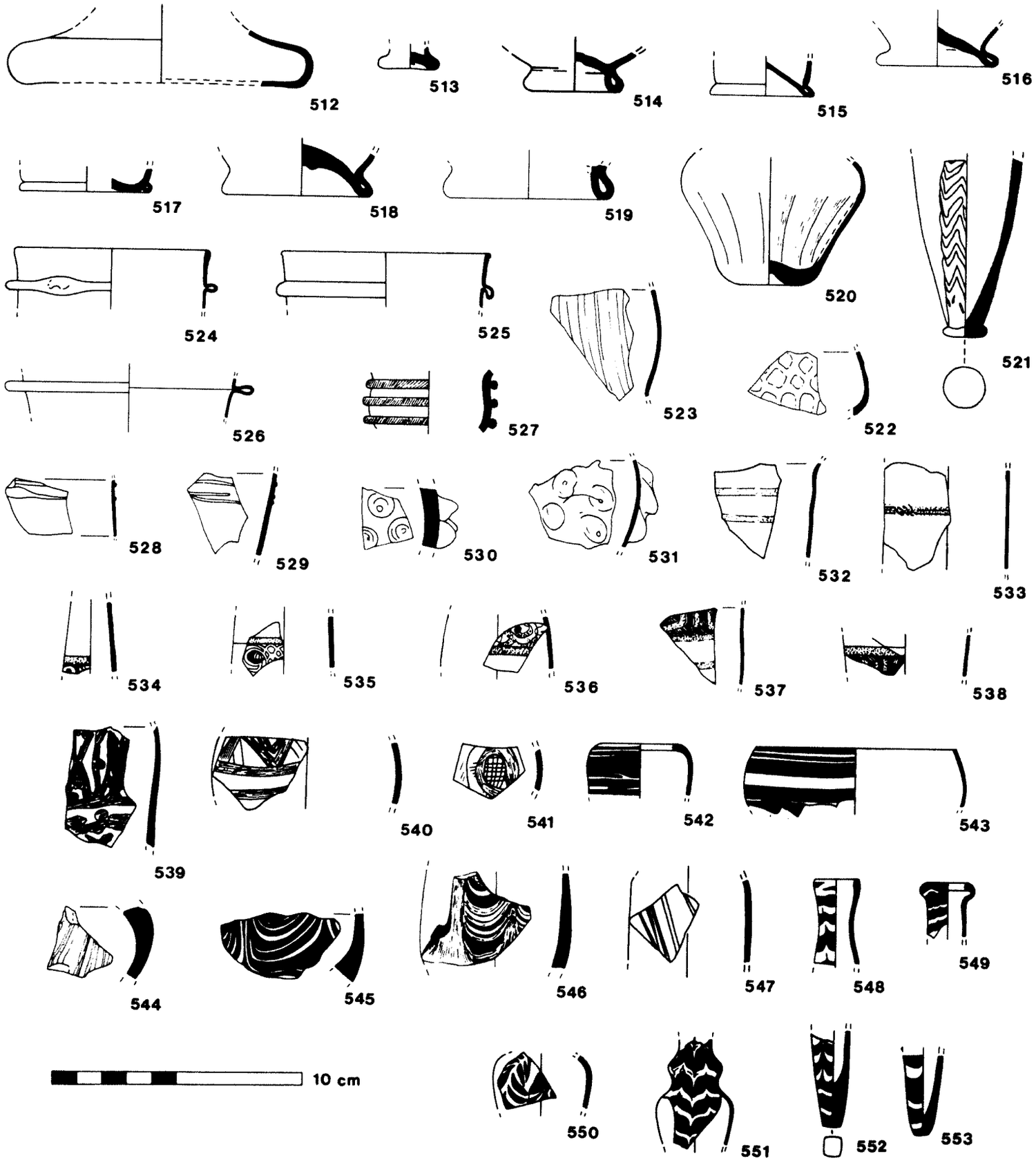
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
474	Spout?	F18a-4	80/74	I	I	Gr.	Not noted	1982, pl. 58f 1983, fig. 2f	Or vial?
475	Alembic spout?	G8b-25	82/353	I/M	I	Transp.	Wt. weath., bubl.	—	—
476	Hollow stem lamp	K9b-8	78/678	I	I	Dirty gr.	Bubl., slt. wt. weath.	—	Pontil scar
477	Hollow stem lamp	L8c-23	82/379	I/M	I	Gr.	Wt. weath., bubl.	—	—
478	Hollow stem lamp?	L8c-51	82/379	I	I	Dk. olive	Bubbly	—	—
479	Hollow stem lamp?	E18a-16	80/78	I	I	Br.	Not noted	1982, pl. 58ww 1983, fig. 2ww	Or vial?
480	Mosque lamp	S12c-3	78/350	I	I	Gr.	Not noted	1979, pl. 60s	—
481	Mosque lamp	S12c-6	78/350	I	I	Yl.-gr.	Bubbly	1979, pl. 60u	—
482	Mosque lamp	S12a-3	78/352	Top	I	Transp., dk. bl. handle	Not noted	1979, pl. 60h	—
483	Mosque lamp	P8b-6	78/349	I	I	Gy.-gr. tint, dk. bl. handle	Not noted	1979, pl. 61k	—
484	Looped-out rim	C4c-8	78/355	M/R	I	Dirty gr.	No weath.	1979, pl. 55s	—
485	Looped-out rim	L7d-9	82/377	I/M	I	Lt. yl.-gr.	Wt. weath.	—	—
486	Looped-out rim	S12a-1	78/358	Top	I	Lt. yl.-olive tint	Bubl., impur.	1979, pl. 60e	—
487	Rolled-in rim	E18a-15	80/77	I	I	Gy. tint	Not noted	1982, pl. 58w 1983, fig. 2w	—
488	Rim	G8a-1	82/372	Top	I?	Color?	Not noted	—	—
489	Rolled-over rim	E18a-14	80/78	I	I	Gr.	Not noted	1982, pl. 58ii 1983, fig. 2ii	—
490	Rim	F18a-6	80/77	I	I	Amber	Not noted	1982, pl. 58c 1983, fig. 2c	Jar?
491	Looped-in rim	C4c-8	78/355	M/R	I	Transp.	Dull	1979, pl. 55q	Jar or bottle?
492	Looped-in rim	G8b-26	82/375	M	I	Lt. bl.-gr.	No weath.	—	Thin, jar or bottle?
493	Rim, flaring	C4c-7	78/355	M	I	Transp.	Not noted	1979, pl. 55g	Jar?
494	Rim, very narrow	S12c-2	78/350	I	I	Emerald	Slt. weath.	1979, pl. 60m	—
495	Rim, sltightly flaring	K9b-71	82/376	I	I	Lt. yl.-gr.	Thick bk. on wt. weath., v. pitted	1983, fig. 3y	Probably kick-up base
496	Rim, blue decoration	E18b-2	80/77	I	I	Transp., bl. rim	Not noted	1982, pl. 58a 1983, fig. 2a	—
497	Thickened rim	G8b-32	82/375	M	I?	Transp.	Not noted	—	—
498	Bowl	D4b-1	78/683	Top	I	Dirty gy.-gr.	Bubl., impur.	—	—
499	Thickened rim	F9a-9	82/368	I	I	Transp.	Not noted	—	—
500	Thickened rim	G8b-32	82/375	M	I	Transp.	Not noted	—	—
501	Thickened rim	G8b-32	82/375	M	I	Gr.	Not noted	—	—
502	Rim, everted	G8a-4	80/73	I?	I	Lt. bl.-gr.	Opal.	—	—
503	Rim, very thick	P8b-18	78/357	I	I	Yl.-gr. tint	Bubl., impur.	1979, pl. 62j	—
504	Kick-up base	Surf.	82/380	Surf.	I?	Lt. gr., dirty	V. bubbly	—	Lamp?
505	Kick-up base	E18d-14	80/77	I	I	Gr.	Not noted	1982, pl. 58tt 1983, fig. 2tt	—
506	Kick-up base	F8d-11	82/369	I	I	Yl.-gr. tint	Bubl.	1983, fig. 4s	—
507	Kick-up base	G8b-31	82/360	I	I	Lt. bl.-gr.	Wt. weath., bubl.	1983, fig. 4t	—
508	Kick-up base	G8a-16	82/372	I	I	Gy. tint	Bubl.	—	—
509	Kick-up base	P8b-5	78/349	I	I	V. dk. gr., almost bk.	Not noted	1979, pl. 61o	—
510	Kick-up base	G8b-5	80/73	I	I	Lt. br.	V. bubbly	1982, pl. 56nn	Not Roman
511	Kick-up base	J9d-6	82/374	I	I	Purple-gy. tint	Bubl.	—	—



Islamic Spouts, Lamps, Rims, and Bases

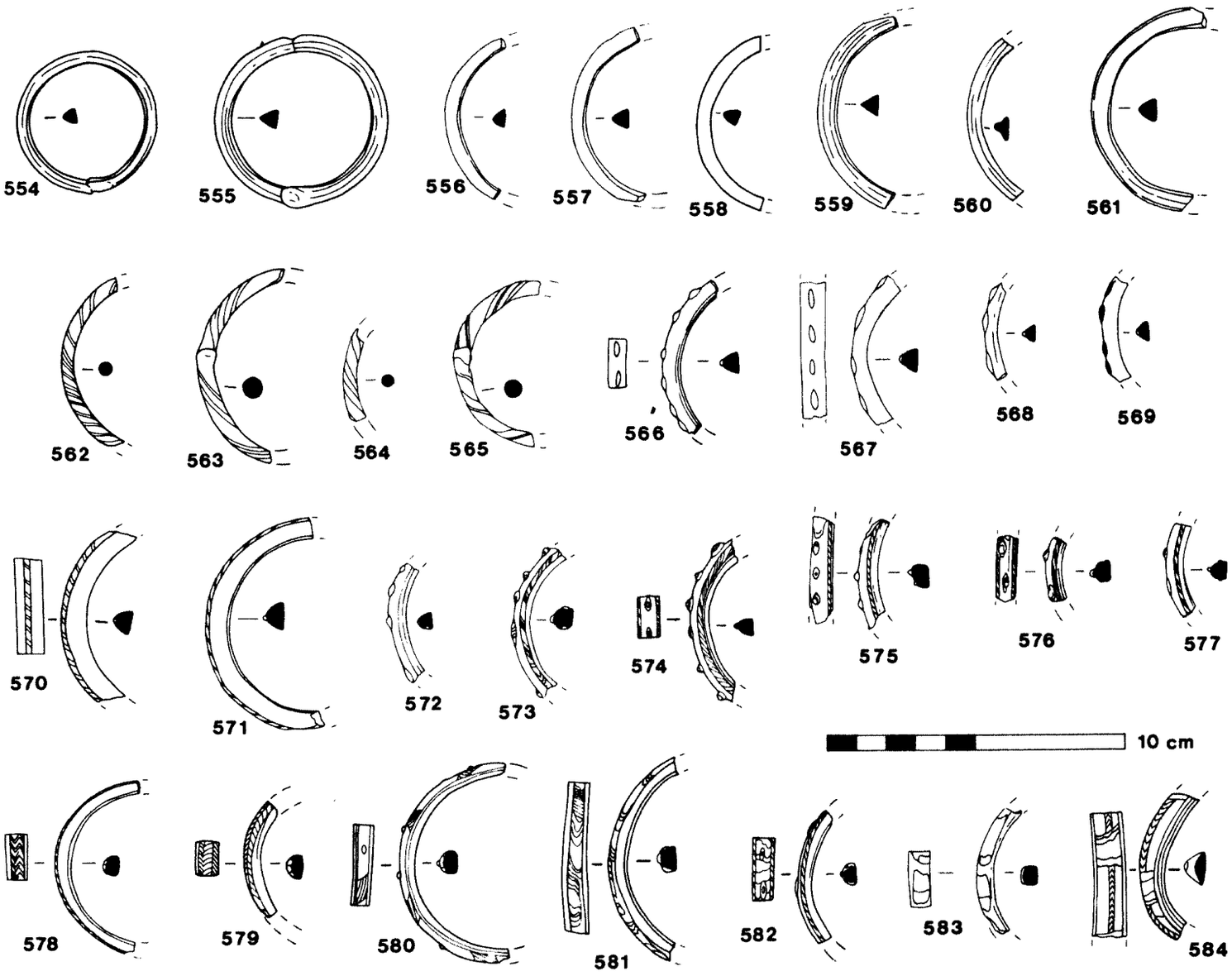
A. Illustrated Glass Sherds (*cont.*)

No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
512	Kick-up base?	E18d-7	80/77	I	I	Amber	Not noted	1982, pl. 58rr 1983, fig. 2rr	—
513	Looped base	E19c-6	80/79	I	I	Dk. gr.	Not noted	1982, pl. 58ss 1983, fig. 2ss	Vial base?
514	Looped base	K9b-36	82/354	I/M	I	Gr. tint	Bubl.	—	Pontil scar
515	Looped base	P8b-6	78/349	I	I	Purplish	Not noted	1979, pl. 61n	—
516	Looped base	E18c-14	80/619	I	I	Dirty gr.	Wt. weath., bubl., impur.	—	—
517	Looped base	F9c-5	78/345	I	I	Gr.	Not noted	1979, pl. 58g	Cf. coiled bases
518	Looped base	P8c-4	78/358	I	I	Transp.	Not noted	1979, pl. 61d	—
519	Looped base	K9b-25	82/376	I/M	I	Yl. tint	Bubl.	—	—
520	Molded bottle	P8a surf.	78/351	Surf.	I?	Smokey gy.	Not noted	1979, pl. 62a	—
521	Molded vial	E19c-10	80/79	I	I	Dk. br.	Not noted	1982, pl. 58qq 1983, fig. 2qq	Squared body
522	Molded decoration	K9b-57	82/376	I/M	I	Pink tint	Bubl.	—	—
523	Molded decoration	P8b-3	78/349	I	I	Dk. gr.	Not noted	1979, pl. 61g	Slt. rippled
524	Cut-out loops	E18a-3	80/78	I	I	Lt. gr.	Not noted	1982, pl. 58d 1983, fig. 2d	—
525	Cut-out loops	E18c-2	80/78	I	I	Gr.	Not noted	1982, pl. 58e 1983, fig. 2e	—
526	Cut-out loops	A22d-3	78/353	I	I	Transp.	Dull	1979, pl. 63d	—
527	Trailed-on coil	P8b-1	78/357	Top	I	Pink tint, bl. coils	Not noted	1979, pl. 61b	—
528	Trailed threads	J7 surf.	78/681	Surf.	I	Pink tint, bl.-gr. threads	No weath.	—	—
529	Trailed threads	F9c-8	78/345	I	I	Transp.	No weath.	1979, pl. 58j	V. thin
530	Prunt decoration	A22d-1	78/353	Top	I	Lt. yl.-gr.	Not noted	1979, pl. 63e	V. thick
531	Prunt decoration	NW surf.	78/681	Surf.	I	Transp., smoley pink prunts	Not noted	1979, pl. 64j	—
532	Painted decoration	E18b-4	80/77	I	I	Transp., gold w/rd., outline	Not noted	1982, pl. 58s 1983, fig. 2s	—
533	Painted decoration	E18d-10	80/78	I	I	Transp., gold w/rd. outline	Not noted	1982, pl. 58r 1983, fig. 2r	—
534	Painted decoration	E18a-15	80/77	I	I	Transp., gold & bl. w/rd. outline	Not noted	1982, pl. 58m 1983, fig. 2m	—
535	Painted decoration	E18a-13	80/77	I	I	Transp., wt., gold, rd., w/rd. outline	Not noted	1982, pl. 58n 1983, fig. 2n	—
536	Painted decoration	E18a-13	80/77	I	I	Transp., gr., gold yl. w/rd. outline	Not noted	1982, pl. 58o 1983, fig. 2o	—
537	Painted decoration	E18b-4	80/77	I	I	Transp, gold, bl. w/rd. outline	Not noted	1982, pl. 58q 1983, fig. 2q	—
538	Painted decoration	E18a-11	80/77	I	I	Transp, gold, bl. w/rd. outline	Not noted	1982, pl. 58p 1983, fig. 2p	—
539	Cut decoration	E18d-7	80/77	I	I	Bl.	Not noted	1982, pl. 58gg 1983, fig. 2gg	—
540	Cut decoration	E18d-8	80/78	I	I	Transp.	Not noted	1982, pl. 58t 1983, fig. 2t	Vial?
541	Cut decoration	E18d-8	80/78	I	I	Transp.	Not noted	1982, pl. 58u 1983, fig. 2u	—
542	Marvered decoration	E18a-3	80/77	I	I	Purple w/wt. marvered	Not noted	1982, pl. 58dd 1983, fig. 2dd	—
543	Marvered bowl	F18a-1	80/74	Top	I	Purple w/wt. marvered	Not noted	1982, pl. 58b 1983, fig. 2b	—
544	Marvered decoration	F5 surf.	78/681	Surf.	I?	Dk. bl.-gr. w/wt. opaq.	No weath.	—	Base?
545	Marvered decoration	C20 surf.	78/356	Surf.	I	Opaq. (= dk. bl.?) w/wt.	No weath.	1979, pl. 64 l	—



A. Illustrated Glass Sherds (*cont.*)

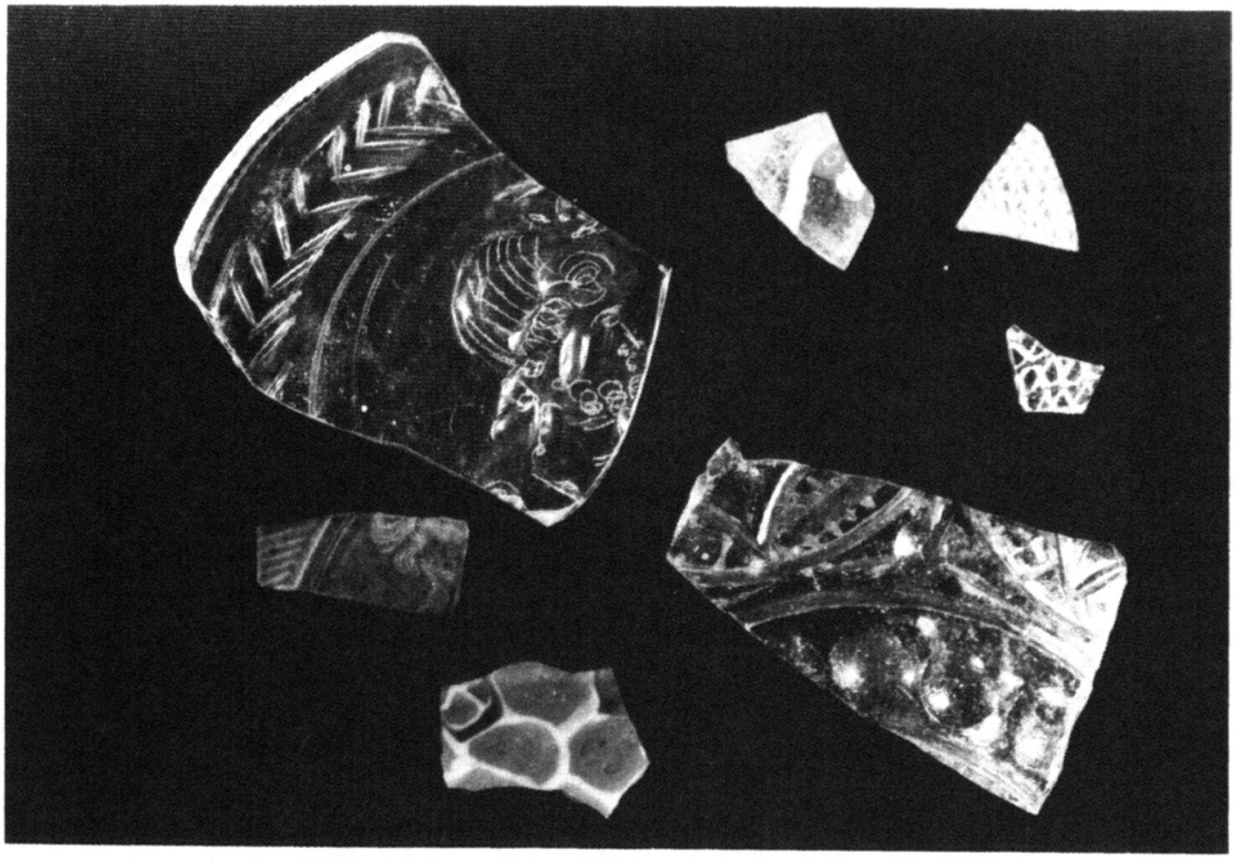
No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
546	Marvered decoration	NW surf.	78/4	Surf.	I	Opaq. dk. gr. w/yl. & wt. swirls	No weath.	1979, pl. 64k	—
547	Marvered decoration	G8a-8	82/372	I	I	Gr. w/wt. threads	Not noted	—	—
548	Marvered & dragged	E18a-13	80/77	I	I	Gr. w/wt. marvered	Not noted	1982, pl. 58cc 1983, fig. 2cc	Vial mouth
549	Marvered & dragged	E18a-3	80/78	I	I	Br. w/wt. marvered	Not noted	1982, pl. 58ee 1983, fig. 2ee	Vial mouth
550	Marvered & dragged	E18d-5	80/77	I	I	Gr. w/wt. marvered	Not noted	1982, pl. 58mm 1983, fig. 2mm	Vial shoulder
551	Marvered & dragged	E18b-2	80/77	I	I	Br. w/wt. marvered	Not noted	1982, pl. 58oo 1983, fig. 2oo	Vial
552	Marvered & dragged	E18c-8	80/77	I	I	Bk. w/wt. marvered	Not noted	1982, pl. 58nn 1983, fig. 2nn	Vial base
553	Marvered & dragged	E18a-3	80/78	I	I	Br. w/wt. marvered	Not noted	1982, pl. 58pp 1983, fig. 2pp	Vial base
554	Bracelet, plain	E18c-1	80/77	Top	I	Dk. turq.	Not noted	1982, pl. 59p 1983, fig. 5 l	D. greater?
555	Bracelet, plain	E18d-10	80/77	I	I	Turq.	Not noted	1982, pl. 59o 1983, fig. 5i	D. 4.7 cm
556	Bracelet, plain	E18b-3	80/77	I	I	Bl.	Not noted	—	Int. d. 5 cm
557	Bracelet, plain	E19c-6	80/79	I	I	Dk. bl.	Not noted	—	Int. d. 5 cm
558	Bracelet, plain	Surf.	78/—	Surf.	I	Gr.	Not noted	—	—
559	Bracelet, plain	E19c-7	80/79	I	I	Dk. bl.-gr.	Not noted	—	Int. d. 6 cm
560	Bracelet, plain	A22d-1	78/575	Top	I	Amber	Not noted	1979, pl. 69d	—
561	Bracelet, plain	E19c-7	80/79	I	I	Opaq. bk.	Not noted	—	Int. d. 6 cm
562	Bracelet, spiraled	F18a-1	80/74	Top	I	Wt. w/yl. & rd. stripes	Not noted	1982, pl. 59r 1983, fig. 5c	Int. d. 6 cm
563	Bracelet, spiraled	E18d-10	80/77	I	I	Yl. & bl.-gr.	Not noted	1982, pl. 59q 1983, fig. 5f	D. 6 cm
564	Bracelet, spiraled	E19c-6	80/79	I	I	Bl. w/wt. spirals	Not noted	—	Int. d. 8 cm
565	Bracelet, spiraled	E18d-10	80/77	I	I	Wt. w/dk. gr. & bk. spirals	Not noted	—	Int. d. 5 cm
566	Bracelet w/prunts	E18a-6	80/79	I	I	Yl. w/rd., dots	Not noted	1982, pl. 59w 1983, fig. 5k	D. 6 cm
567	Bracelet w/prunts	F19a-1	80/74	Top	I	Dk. bl. w/wt. dots	Not noted	—	Int. d. 6 cm
568	Bracelet w/prunts	E18c-3	80/77	I	I	Bk. w/wt. dots	Not noted	—	Int. d. 5 cm
569	Bracelet w/prunts	F19a-4	80/74	I	I	Yl. w/bk. dots	Not noted	—	Int. d. 8 cm
570	Bracelet w/cane dec.	F19a-4	80/74	I	I	Bl. w/rd., & wt. cane	Not noted	1982, pl. 59s 1983, fig. 5j	D. 6 cm
571	Bracelet w/cane dec.	F18 surf.	78/—	Surf.	I	Bk. (= v. dk. bl.) w/rd., & wt. cane	No weath.	—	—
572	Bracelet, polychrome	E18a-4	80/77	I	I	Bk. w/yl. dots & gr. stripes	Not noted	—	—
573	Bracelet, polychrome	E18a-10	80/78	I	I	Bk.; rd., yl. & wt. canes, dots rd. w/yl. & wt. stripes	Not noted	—	—
574	Bracelet, polychrome	E18d-4	80/78	I	I	Bk.; yl.-br. stripes; yl., br., turq. dots	Not noted	1982, pl. 59y 1983, fig. 5e	—
575	Bracelet, polychrome	E18a-15	80/77	I	I	Bk.; wt. & br. canes; dots yl., turq., & br.	Not noted	—	Int. d. 7 cm
576	Bracelet, polychrome	E18b-3	80/77	I	I	Bl.; rd. & yl. canes; turq., yl., wt. & bk. dots	Not noted	—	Int. d. 6 cm
577	Bracelet, polychrome	Surf.	78/-	Surf.	I	Yl.-gr.; yl. on top; rd. & wt. canes; wt. on rd. dots	Not noted	—	—
578	Bracelet, polychrome	E19c-6	80/79	I	I	Gr.; 3 rd. & yl. canes to herringbones	Not noted	—	Int. d. 5 cm
579	Bracelet, polychrome	E19c-7	80/79	I	I	Gr.; br. stripes	Not noted	1982, pl. 59v 1983, fig. 5a	D. 6 cm



Islamic Bracelets and Beads

A. Illustrated Glass Sherds (*cont.*)

No.	*Vessel Type*	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
580	Bracelet, polychrome	E19c-9	80/79	I	I	Gr., yl., wt., rd., bk.	Not noted	1982, pl. 59x 1983, fig. 5h	D. 6 cm
581	Bracelet, polychrome	E19d-5	80/77	I	I	Yl., gr., yl., lt. bl., rd. stripes	Not noted	1982, pl. 59t 1983, fig. 5g	—
582	Bracelet, polychrome	E18c-3	80/77	I	I	Dk. bl., yl., br., wt. stripes & dots	Not noted	1982, pl. 59z 1983, fig. 5b	D. 5 cm
583	Bracelet, polychrome	E19c-6	80/79	I	I	Opaq. bk.; rd. & yl., rd. & bl. dots	Not noted	—	Int. d. 6 cm
584	Bracelet, polychrome	E18d-17	80/77	I	I	Bl., yl., rd. & wt.	Not noted	1982, pl. 59u 1983, fig. 5d	—
585	String of beads	G8b-2	80/81	I	I	Rd. & yl. alternating, bl. on end	Not noted	1982, pl. 59e	—
586	Bead	G8b-32	82/375	M	I?	Turq.	Not noted	—	—
587	Bead	E6a-1	80/64	Top	I?	Turq.	Not noted	—	—
588	Bead	G8b-5	80/73	I	I?	Opaq. turq.	Not noted	—	—
589	Bead	G8b-18	80/73	I	I?	Dk. cobalt bl.	No weath.	—	—
590	Bead	E18b-3	80/77	I	I	Gr.	Not noted	—	—
591	Bead	F7a-5	80/65	M	I?	Gold-color	Not noted	—	—
592	Bead	J8a-1	80/69	Top	I	Opaq. yl.	Not noted	—	Coiled
593	Bead	G12c-1	80/58	Top	I	Opaq. bk.	No weath.	1982, pl. 59i	Coiled
594	Bead	F7a-5	80/65	M	I	Bk.	Not noted	1982, pl. 59j	—
595	Bead	E18d-8	80/77	I	I	Bk. w/yl. trail	Not noted	1982, pl. 59h	—



Roman and Hellenistic Decorated Glass. (*Left*) Mythological Cups, Nos. 88 and 87; (*Upper Right*) Inlaid, No. 299; Lace Mosaic, Nos. 300 and 301; (*Lower Center*) Millefiore, No. 315; (*Lower Right*) Cut Decoration, No. 337

Hellenistic, Roman, and Mamluk Decorated Glass. (*Top Row*) Marbled Unguentarium, No. 182; Marvered and Dragged, No. 298; Mosaic Glass, Nos. 309, 310, and 317; (*Middle Row*) Millefiore, No. 318; Painted, Nos. 341, 342, and 345; (*Bottom Row*) Vial Rim, No. 456; Vial with Cut Decoration, No. 469; Marbled Decoration, Nos. 544 and 546

B. GLASS SHERDS NOT ILLUSTRATED

Vessel Type	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
Ribbed bowl	E7c-4	80/56	M	R	Amber	Slt. wt. weath.	—	—
Ribbed bowl	G8a-4	80/73	I?	R	Amber	Slt. purple weath.	—	Rim ground
Ribbed bowl	C4c-8	78/355	R/M	R	Amber	Not noted	1979, pl. 55t	—
Ribbed bowl	C4c-18	78/355	R	R	Amber	Not noted	1979, pl. 52m	—
Ribbed bowl	P8b-5	78/349	I	R	Lt. yl.-olive	Not noted	1979, pl. 61 l	Thick
Ribbed bowl	P8b-7	78/349	I	R	Lt. yl.-olive	Not noted	1979, pl. 62h	—
Ribbed bowl	C4c-10	78/355	R	R	V. lt. gr.	Not noted	1979, pl. 52d	—
Ribbed bowl	E6a-1	80/64	Top	R	Gr.	Not noted	—	—
Ribbed bowl	G8a-27	82/372	R	R	Gr.	Not noted	—	—
Ribbed bowl	C4c-4	78/355	R/M	R	Gr.	Not noted	—	—
Ribbed bowl	D4b-1	78/683?	Top	R	Dk. gr.	Some bubl.	—	—
Ribbed bowl	C4c-4	78/355	R/M	R	Turquoise	Not noted	1979, pl. 54b	—
Ribbed bowl	H8c-1	80/69	Top	R	Dk. purple	Not noted	—	—
Ribbed bowl	F7a-6	80/65	M	R	Bl.	Not noted	1982, pl. 56m?	—
Ribbed bowl	C4c-2	78/355	R/M	R	Bl.	Not noted	—	—
Ribbed bowl	C4c-2	78/355	R/M	R	Bl.	Not noted	—	—
Ribbed bowl	C4c-3	78/355	M	R	Dk. bl.	Not noted	1979, pl. 55b	—
Ribbed bowl	C4c-7	78/355	M	R	Dk. bl.	Not noted	1979, pl. 55h	—
Ribbed bowl	C4c-10	78/355	R/M	R	Transp.	Not noted	1979, pl. 52e	—
Ribbed bowl	E7a-2	78/356	M/R	R	Transp.	Not noted	—	—
Ribbed bowl	C4c-3	78/355	M	R	Pink tint	Not noted	—	—
Ribbed bowl	C4c-2	78/355	R/M	R	Transp.	Not noted	—	—
Bowl with overhung rim	F8d-10	82/369	I	R	Transp.	Not noted	—	—
Bowl with overhung rim	S12c-3	78/352	I	R	Transp.	Not noted	1979, pl. 60i	—
Bowl with overhung rim	Surf.	78/621	Surf.	R	Transp.	Not noted	—	—
Bowl with overhung rim	K/L4	78/356	Surf.	R	Transp.	Not noted	—	—
Bowl with overhung rim	None	78/356	None	R	Transp.	Dull	—	—
Bowl with overhung rim	G8b-32	82/375	I/M	R	Transp.	Not noted	—	—
Bowl with overhung rim	G8b-39	82/375	R	R	Transp.	Wt. weath.	—	—
Bowl with overhung rim	G8b-34	82/375	R	R	Transp.	Slt. wt. weath.	—	—
Bowl with overhung rim	C4c-2	78/355	R/M	R	Transp.	Not noted	1979, pl. 53a	—
Bowl with overhung rim	S12c-5	78/350	I	R	Transp.	Not noted	1979, pl. 60j	—
Bowl with overhung rim	G8b-49	82/375	R	R	Transp.	Not noted	—	—
Bowl with overhung rim	G8a-1	82/372	Top	R	Transp.	Not noted	—	—
Bowl with overhung rim	G8b-34	82/375	R	R	Transp.	Not noted	—	—
Plate with overhung rim	F7	78/356	Surf.	R	Transp.	Not noted	1979, pl. 64c	—
Bowl with broad rim	C4c-4	78/355	R/M	R	Transp.	Not noted	1979, pl. 54p	—

Vessel Type	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
Bowl with broad rim	F10a-4	78/347	I/M	R	Transp.	Not noted	1979, pl. 58a	—
Bowl with broad rim	G8a-5	82/372	M	R	Greenish	Not noted	—	—
Bowl with broad rim	G8b-43	82/375	R	R	Transp.	Wt. weath.	—	—
Bowl with broad rim	G8d-1	78/346	Top	R	Transp.	Not noted	1979, pl. 59f	—
Bowl with broad rim	E6b-14	80/76	R/M	R	Transluc.	Dull	1982, pl. 55c	—
Small bowl, cut dec.	S12c-6	78/350	I	R	Transluc.	Dull	1979, pl. 60o	—
Small bowl, cut dec.	C5 surf.	78/681	Surf.	R	Transp.	Not noted	1979, pl. 64g	—
Large bowl, flaring rim	G8b-43	82/375	R	R	Transp.	Not noted	—	—
Large bowl, flaring rim	C4c-2	78/355	R/M	R	Transp.	Not noted	1979, pl. 53b	—
Faceted beaker	G8b-32	82/375	I/M	R	Transp.	Dull	—	—
Faceted beaker	G8a-8	82/372	M	R	Transp.	Not noted	—	—
Faceted beaker	F8d-31	82/369	M	R	Transp.	Not noted	—	—
Jar/beaker w/cut dec.	C4c-2	78/355	R/M	R	Transp.	Not noted	—	—
Jar/beaker w/cut dec.	C4c-3	78/355	M	R	Transp.	Not noted	1979, pl. 55c	—
Ring base	G8b-32	82/375	M	R	Transp.	Not noted	—	—
Ring base	C4c-2	78/355	R/M	R	Transp.	Not noted	1979, pl. 53s	—
Ring base	G8a-1	82/372	Top	R	Not noted	Not noted	—	—
Ring base	F9c-15	78/345	I	R	Transp.	Not noted	1979, pl. 58k	—
Ring base	G8a-4	80/73	I?	R	Transp.	Not noted	1982, pl. 56ii	Int. ground smooth
Ring base	G8b-32	82/375	M	R	Transp.	Not noted	—	—
Ring base	F10a-3	78/347	I	R	Transp.	Not noted	—	—
High base	E7a-11	80/55	Top	R	Transp.	Not noted	1982, pl. 56d	—
High base	G8b-22	82/375	M	R	Transp.	Not noted	—	—
High base	G8a-8	82/372	M	R	Transp.	Not noted	—	—
High base	K4-L4	78/356	Surf.	R	Transp.	Not noted	1979, pl. 64q	—
High base	F7 surf.	78/356	Surf.	R	Transp.	Dull, pitted	1979, pl. 64r	—
High base	B4a-2	78/354	R	R	Transp.	Not noted	1979, pl. 56c	—
High base	E7c-5	80/56	M?	R	Transp.	Not noted	1982, pl. 56u	—
Bowl w/loop rim & base	G8d-1	78/346	Top	R	Transp.	Not noted	—	—
Bowl w/loop rim & base	E6a-1	80/64	Top	R	Gr.	Slt. wt. weath.	—	—
Looped rim	G8a-13	82/372	M	R	Transp.	Not noted	—	—
Beaker, slt. flaring rim	E6d-1	80/62	R	R	Not noted	Not noted	—	—
Beaker, slt. flaring rim	G8b-5	80/73	I	R	Gr. tint	Bubl., dull	1982, pl. 56cc	—
Bowl, everted rim	G8a-17	82/372	R	R	Transp.	Wt. weath., opal. crazed	—	—
Bowl, everted rim	G8b-38	82/375	R	R	Not noted	Not noted	—	—
Bowl, everted rim	G8a-9	82/372	M/R	R	Transp.	Not noted	—	—
Bowl, everted rim	D6d-1	80/71	Top	R	Transp.	Not noted	1982, pl. 55i	2 cut lines
Beaker, everted rim	E6b-8	78/343	R/M	R	Lt. gr.	Not noted	1979, pl. 57c	3 more frags.
Beaker, everted rim	G8b-3	80/73	I	R	Transluc.	Not noted	—	—
Beaker, everted rim	G8b-43	82/375	R	R	Transp.	Not noted	—	—
Beaker, everted rim	G8b-32	82/375	I/M	R	Transp.	Not noted	—	—
Indented beaker	B4a-2	78/354	R/M	R	Transp.	Not noted	1979, pl. 56h	—
Indented beaker	H8a-1	80/69	Top	R	Gr. tint	Bubl., wt. weath., slt. opal.	1982, pl. 56 ll	—
Indented beaker	C4c-2	78/355	R/M	R	Transp.	Not noted	1979, pl. 53u	—
Indented beaker	G8b-3	80/73	I	R	Lt. gr.	Bubl.	No pontil	—
Indented beaker	F7 surf.	78/356	Surf.	R	Transp.	Not noted	1979, pl. 65n	—

B. GLASS SHERDS NOT ILLUSTRATED (*cont.*)

Vessel Type	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
Indented beaker	C4c-7	78/355	M	R	Transp.	Not noted	1979, pl. 55p	—
Indented beaker	G8a-10	82/372	M/R	R	Transp.	Not noted	—	—
Indented beaker	E7a-12	80/55	Top	R	Transp.	Bubl.	1982, pl. 56f	—
Indented beaker	J6 surf.	78/681	Surf.	R	Transp.	Not noted	1979, pl. 65m	—
Indented beaker	E6b-12	78/358	R	R	Transp.	Not noted	1979, pl. 57r	—
Unguentarium w/folded-out rim	E7c-2	80/56	Top	R	Lt. bl.-gr.	Bubl., dull, impur.	1982, pl. 56y	—
Unguentarium w/folded-out rim	E7c-14	80/55	R	R	Gr.	Not noted	—	—
Unguentarium w/folded-in rim	E7a surf.	78/357	Surf.	R	Lt. gr.	Not noted	1979, pl. 57j	—
Unguentarium w/folded-in rim	C4c-3	78/355	M	R	Lt. gr.	Not noted	1979, pl. 55e	—
Unguentarium w/folded-in rim	J9d-9	82/374	I	R	Gr.	Not noted	—	—
Unguentarium w/folded-in rim	G8a-4	80/73	I?	R	Dk. gr.	Bubl., rd. stripe, impur.	—	—
Unguentarium w/folded-in rim	F7 surf.	78/356	Surf.	R	Gr.	Bubl.	1979, pl. 65c	—
Unguentarium w/folded-in rim	D4b-3	78/359	M	R	Gr.	Not noted	1979, pl. 56c	—
Unguentarium w/folded-in rim	C4c-2	78/355	M	R	Transp.	Not noted	1979, pl. 53n	—
Unguentarium w/folded-in rim	G8b-49	82/375	R	R	Gr.	Bubl., impur.	—	Uneven rim
Unguentarium w/folded-in rim	L10c-4	78/352	—	R	Bl.-gr.	Weath.	1979, pl. 63a	—
Unguentarium w/folded-in rim	B4a-5	78/354	R	R	Pale gr.	Opal.	1979, pl. 56j	—
Unguentarium w/folded-in rim	E6a-1	80/64	Top	R	Gr.	Bubl., dull	1982, pl. 55n	—
Unguentarium w/folded-in rim	G8b-27	82/375	R	R	Gr.	Not noted	—	—
Unguentarium w/folded-in rim	S12c-2	78/350	I	R	Bl.-gr.	Not noted	1979, pl. 60k	—
Unguentarium w/folded-in rim	G8d-1	78/346	Top	R	Pale gr. w/ wt. streaks	Not noted	1979, pl. 59h	Marbled appearance
Unguentarium	C4c-2	78/355	R/M	R	Gr.	Not noted	1979, pl. 53p	Neck only
Unguentarium	C4c-3	78/355	M	R	Transp.	Not noted	—	Neck only
Unguentarium	C4c-2	78/355	M	R	Bl.-gr.	Not noted	—	Neck only
Unguentarium	C4c-5	78/355	M	R	Gr.	Not noted	—	Neck only
Unguentarium	C4c-4	78/355	R/M	R	Dk. gr.	Not noted	1979, pl. 54e	Neck only
Unguentarium	C4c-2	78/355	M	R	Bl.-gr.	Not noted	1979, pl. 53o	Neck only
Unguentarium w/hollow base	G8b-32	82/375	M	R	Transp.	Bubbly	—	No pontil scar
Unguentarium w/hollow base	C4c-2	78/355	M	R	Dk. gr.	Not noted	—	—
Unguentarium w/hollow base	C4c-2	78/355	M	R	Gr.	Not noted	—	—
Unguentarium w/hollow base	C4c-7	78/355	M	R	Gr.	Not noted	1979, pl. 55o	—

Vessel Type	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
Unguentarium w/hollow base	G8d-1	78/346	Top	R	Transp.	Not noted	1979, pl. 59j	—
Unguentarium w/hollow base	Surf.	78/—	Surf.	R	Gr.	Not noted	—	—
Unguentarium w/solid base	B4a-2	78/354	R/M	R	Opaq.	Not noted	1979, pl. 56e	—
Unguentarium w/solid base	E6b-2	78/343	M	R	Gr.	Not noted	—	—
Bottle	E6b-4	78/343	R	R	Lt. gr.	Not noted	1979, pl. 57i	—
Bottle	H8a-1	80/69	Top	R	Lt. gr.	Bubl., impur.	—	—
Aryballos	C4c-9	78/355	R	R	Transp.	Crackled	1979, pl. 52g	—
Flagon	C4c-4	78/355	R/M	R	Pink tint	Not noted	1979, pl. 54c	—
Flagon	None	78/—	—	R	Not noted	Not noted	——	Reeded handle
Flagon	G8a-1	82/372	Top	R	Not noted	Not noted	—	Handle frag.
Flagon	G8a-15	82/372	I	R	Not noted	Not noted	—	Flat handle
Flagon	F8b-2	82/371	I/M	R	Gr.	Not noted	—	Strap handle
Flagon	E7a-7	78/356	Surf.	R	Gr.	Not noted	—	Shoulder
Flagon base	F8d-2	78/344	I	R	Transp.	Not noted	1979, pl. 58 a, b	Square corner
Flat base	C4c-2	78/355	M	R	Gr.	Not noted	1979, pl. 53r	—
Flat base	C4c-4	78/355	R/M	R	Gr.	Not noted	1979, pl. 54g	—
Flat base	C4c-8	78/355	R/M	R	Transp.	Not noted	1979, pl. 55u	—
Kick-up base	G8b-32	82/375	M	R	Transp.	Not noted	—	—
Kick-up base	M10 surf.	78/352	Surf.	R	Gr.	Not noted	1979, pl. 65q	—
Kick-up base	F7 surf.	78/356	Surf.	R	Gr.	Not noted	—	—
Kick-up base	E7c-10	80/55	Surf.	R	Transp.	Not noted	1982, pl. 56j	—
Kick-up base	E6b-4?	78/343	R	R	Transp.?	Not noted	—	—
Kick-up base	D4b-3	78/359	M	R	Gr.	Not noted	1979, pl. 56e	—
Kick-up base	E6b-2	78/343	M	R	Transp.	Not noted	—	—
Kick-up base	E6b-8	78/343	R/M	R	Transp.	Not noted	—	—
Looped base	G8b-21	82/375	I/M	R	Pink	Not noted	—	—
Looped base	G8a-1	82/372	Top	R	Not noted	Not noted	—	—
Looped base	F7a-1	80/65	Top	R	Transp.	Not noted	1982, pl. 56t	—
Cut lines	C4c-3	78/355	M	R	Transp.	Not noted	—	2 lines
Cut lines	C4c-2	78/355	M	R	Pink tint	Not noted	1979, pl. 53k	—
Cut ridge	P8b-8	78/357	M	R	Lt. bl.-gr.	Not noted	1979, pl. 62f	1 ridge
Cut ridge	L9d-2	78/358	M	R	Transp.	Not noted	1979, pl. 63b	—
Cut decoration	Q2b-7	78/358	M	R	Transp.	Not noted	1979, pl. 63a	2 rice grains
Painted decoration	G8c-2	80/57	M	R	Transp. w/ wt., pink, plum	Not noted	—	Floral?
Painted decoration	C4c-4	78/355	R/M	R	Dk. gr. w/ rd. streak, 3 yl. dots	Not noted	1979, pl. 54h	—
Tooled decoration	G8a-7	82/372	R	R	Transp.	Wt. weath., opal.	—	—
Tooled decoration	G8b-34	82/375	M	R	Transp.	Weath.	—	—
Tooled decoration	F7a-1	80/65	Top	R	Transp.	Not noted	1982, pl. 56v	Nipped
Prunts	Surf.	82/380	Surf.	R	Transp. w/ 2 bl. blobs	Not noted	—	Thin body sherd
Tessera	None	78/350	—	R	Bl.	V. bubbly	—	—

B. GLASS SHERDS NOT ILLUSTRATED (*cont.*)

Vessel Type	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
Bubble neck bottle	J10a-9	82/378	I	I	Emerald	Dirty wt. weath.	—	Mouth, neck & shoulder, body, base, too thin to draw
Bubble neck bottle	E18a-14	80/78	—	I	Gr.	Not noted	1982, pl. 88kk	—
Bubble neck bottle	Ea8a-14	80/77	—	I	Yl.-gr.	Not noted	1982, pl. 58jj	—
Bubble neck bottle	S12a-3	78/352	I	I	Olive	Bubl.	1979, pl. 60c	—
Bubble neck bottle	Surf.	80/609	Surf.	I	Olive	Not noted	—	—
Bottle neck	S12a-4	78/352	I	I	Pale turq.	Not noted	1979, pl. 60g	—
Bottle neck	C4c-5	78/355	M	I?	Lt. gr.	Not noted	1979, pl. 55m	—
Bottle neck	C4c-8	78/355	M	I?	Lt. bl.-gr.	Not noted	1979, pl. 55v	—
Bottle neck	P7d-6	78/358	I	I	Pale turq.	Not noted	1979, pl. 61f	—
Sprinkler bottle?	F8d-2	78/344	I	I	Pink	Not noted	1979, pl. 58a	Too wide?
Beaker	P8c-12	78/357	I	I	Pink tint	Not noted	1979, pl. 61c	—
Coil base	N12 surf.	78/681	Surf.	I	Lt. gr.	Not noted	1979, pl. 65u	—
Coil base	K10a-10	82/373	I/M	I	Lt. yl.-gr.	V. pitted	—	Pontil scar
Coil base	S12c-3	78/350	I	I	Transp.	Many impur.	1979, pl. 60q	—
Coil base	D12 surf.	78/681	Surf.	I	Pinkish	Not noted	1979, pl. 65t	—
Coil base	P8b-18	78/357	I	I	Yl.-gr. tint	Not noted	1979, pl. 62m	—
Beaker? dec.	F9c-2	78/345	I	I	Transp.	Not noted	1979, pl. 58i	1 prunt
"Fruitstand"	Surf.	78/—	Surf.	I?	Purple tint	Not noted	—	—
Green bowl	P8b surf.	78/349	Surf.	I	Dk. gr.	Not noted	1979, pl. 62b	—
Green bowl	F8d-1	78/344	Top	I	Dk. gr.	Not noted	1979, pl. 58f	—
Vial mouth	F10a-1	78/347	Top	I	Dk. bl.	Bubl.	1979, pl. 58d	—
Vial mouth	K10a-16	82/373	I	I	Emerald gr.	Impur., slt. wt. weath.	—	—
Vial mouth	A22d-1	78/353	Top	I	Gr.	Not noted	1979, pl. 63a	Thickened rim
Molar/square flask	L7d-10	82/377	I	I	Bl.	Bubbly	1983, fig. 4q	Cut dec, square X-section
Molar/square flask	G8b-32	82/375	M	I	Dk. bl.	Not noted	—	Cut dec.
Mosque lamp	S12c-5	78/350	I	I	Yl.-gr.	Bubbly	1979, pl. 60t	—
Looped-out rim	G8a-3	82/372	M	I	Transp.	Wt. weath.	—	—
Miscellaneous rim	G8d-1	78/346	Top	I?	Transp.	Not noted	1979, pl. 59d	Cf. #488
Miscellaneous rim	A22d-1	78/353	Top	I?	Lt. gr.	Not noted	1979, pl. 63c	Cf. #499
Miscellaneous rim	F9a-9	82/368	I	I	Lt. yl.-gr.	Bubbly	1983, fig. 4b	Cf. #502
Kick-up base	G8a-3	82/372	M	I?	Bl.-gr.	Wt. weath.	—	Vial base?
Kick-up base	G8a-8	82/372	I	I	Gr.	Not noted	—	—
Kick-up base	K/L4	78/356	Surf.	I	Yl.-olive	Not noted	—	High kick
Kick-up base	P8b-6	78/349	I	I	Dk. yl.-olive	Not noted	1979, pl. 61m	Pontil scar
Kick-up base	P8c-2	78/357	I	I	Gr. tint	Bubl.	1979, pl. 61e	Thick, lg.
Looped base	G8d-1	78/346	Top	I?	Transp.	Not noted	1979, pl. 59n	—
Looped base	F7a-3	80/65	M	I?	Transp.	Not noted	1983, pl. 56s	—
Molded decoration	C8 surf.	78/681	Surf.	I	Transp.	Not noted	—	Diamonds, optic blown?
Prunt decoration	P8b-17	78/357	I	I	Transp.	Not noted	1979, pl. 62k	—
Prunt decoration	P8b-18	78/357	I	I	Purple tint	Not noted	1979, pl. 62 l	—
Painted	K9b-3	78/5	Top	I	Transp. w/ bl., gr., wt., bk.	Not noted	1979, pl. 63e	Not pl. 63d
Cut decoration	F8d-32	82/369	M	I	Dk. bl.	Not noted	—	Curvilinear dec., square vial?

Vessel Type	*Locus*	*Registration Number*	*Locus Date*	*Style Date*	*Color*	*Quality*	*Published*	*Comments*
Cut decoration	J9d-4	82/374	I	I	Transp.	Frosted	—	Curvilinear
Cut decoration	F8d-1	78/344	Top	I	Transp.	Not noted	—	1 line
Cut decoration	C4c-7	78/355	M	I?	Transp.	Not noted	1979, pl. 55n	2 lines
Cut decoration	P8b-7	78/349	I	I	Transp.	Not noted	1979, pl. 62g	1 line
Cut decoration	G8b-20	82/375	M	I	Dk. cobalt	Not noted	—	Floral?
Marvered decoration	H9 surf.	78/—	Surf.	I	V. dk. purple w/wt. lines	Not noted	—	Cf. #543
Marvered decoration	Surf.	78/356	Surf.	I	Dk. gr. w/ rd. and wt.	Not noted	—	Cf. #544
Marvered decoration	C4c-5	78/355	M	I?	Opaq. bl. w/wt.	Not noted	1979, pl. 55j	Cf. #545
Marvered decoration	C4c-7	78/355	M	I?	Gr. w/wt.	Not noted	1979, pl. 55i	Cf. #547
Bracelet, plain	C20-E20	78/209	Surf.	I	Dk. bl.	Not noted	1979, pl. 69e	Triangular X-section
Bracelet, plain	C20-E20	78/209	Surf.	I	Lt. bl.	Not noted	—	Triangular X-section
Bracelet, plain	A22d-3	78/353	I	I	Dk. turq.	Not noted	—	Triangular X-section
Bracelet, plain	F19a-5	80/74	I	I	Dk. bl.	Not noted	—	Triangular X-section
Bracelet, plain	E18a-4	80/77	I	I	Turq.	Not noted	—	Int. d. 5 cm
Bracelet, plain	E19c-9	80/79	—	I	Turq.	Not noted	—	Int. d. 5 cm
Bracelet, plain	Surf.	78/—	Surf.	I	Bk.	Not noted	—	—
Bracelet, plain	E19a-4?	80/74	Surf.?	I	Opaq. bk.	Not noted	—	Triangular X-section
Bracelet, plain	Surf.	78/—	Surf.	I	V. dk. brown	Not noted	—	Triangular X-section
Bracelet, plain	E18a-4	80/77	I	I	Bk.	Not noted	—	Int. d. 5 cm
Bracelet, plain	Surf.	78/—	Surf.	I	Bl.-gr.	Not noted	—	Triangular X-section
Bracelet, spiraled	E18c-1	80/77	Top	I	Wt. w/bl. & purple	Not noted	—	Cf. #564
Bracelet, prunted	E18a-10	80/78	I	I	Yl. w/rd.	Not noted	—	Cf. #566
Bracelet, prunted	E18c-13	80/621	I	I	Yl. w/rd.	Not noted	—	Cf. #566
Bracelet, prunted	E18d-4	80/78	I	I	Bk. w. wt.	Not noted	—	Cf. #568
Bracelet, polychrome	F19c-3?	80/74	—	I	Gr., yl., rd.	Not noted	—	Cf. #572; int. d. 6 cm
Bracelet, polychrome	E18a-3	80/77	I	I	Br., 2 wt. side stripes, gr. top stripe, yl. & rd. cane	Not noted	—	Cf. #577
Bracelet, polychrome	F19a-1	80/74	Top	I	Gr. base, 2 wt. stripes, bl., bk. & wt. canes	Not noted	—	Cf. #578
Bracelet, polychrome	Surf.	78/—	Surf.	I	Gr. base, wt., rd., gr. over, 2 bk. & wt. canes, prunts	Not noted	—	Cf. #582
Bracelet, polychrome	E18d-8	80/—	I	I	Br. & wt. stripes, yl. & rd. blobs	Not noted	—	Cf. #580

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