

The Foreign Relations of the “Hyksos”

In Memoriam: Mrs. Joan Huntoon and Dr. Garman Harbottle

June 13, 2020: date of preprint on-line at
https://www.researchgate.net/profile/Patrick_Mcgovern4/projects and
https://www.penn.museum/sites/biomoleculararchaeology/?page_id=435

APPENDIX 4
AFTERWORD, PETROGRAPHIC ADDENDUM, AND POTTERY FIGURES

by
Patrick E. McGovern and Christopher Wnuk

to be appended to:

:

The Foreign Relations of the “Hyksos”: A Neutron Activation Study of Middle Bronze Age Pottery from the Eastern Mediterranean

by
Patrick E. McGovern, with a contribution by Tine Bagh
BAR International Series 888
Oxford: BAR, 2000

As explained in the Preface (p. iii) and the “Illustrations and Sample Data” guidelines (p. 98) to this book, Dr. Manfred Bietak was first given the opportunity to publish the line-drawing figures of the pottery analyzed by Neutron Activation Analysis (NAA) from Tell el-Dab`a (Appendix 1). He has now largely accomplished this in his ongoing multi-volume series devoted to the site’s excavation, viz., *Tell el-Dab`a, Untersuchungen der Zweigstelle Kairo des Österreichischen Archäologischen Instituts*, vols. V (1992), VIII (2012), XII (2004), XX (2010), XXIII (2013), et al., *Denkschriften der Gesamtakademie, Austrian Academy of Sciences, Vienna*. The figures are here made available in their entirety as Appendix 4, so that they can be more easily consulted by the reader. Four reviewers explicitly pointed out that the omission of the figures impeded their use of the volume.¹

1. New Findings and Hypothesis Testing

In the 20 years since the publication of this BAR volume, one might expect that some updating of the text would be needed. The most important new findings for determining the origin of the Hyksos. have come from Ashkelon, whose probable pivotal role in this process was highlighted in the closing remarks of the book (this volume, p. 83). This large fortified Canaanite city-state belonged to the “Gaza group of Middle Bronze Age (MBA) sites” or “Southern Palestine,” *sensu strictu*, which included at least seven more city-states within a concentrated area of about 2000 square kilometers (800 square miles). The NAA results showed, at a minimum, that this region had very intense trade relations with Tell el-Dab`a from later Middle Bronze (MB) IIA through MB IIC,² the extended period in which the Semitic Hyksos rose to power in the northeastern Nile Delta of Egypt and ruled from their capital at Avaris (Tell el-Dab`a). In 2000,

¹H. Neff, *SAS Newsletter* 25 (2002), pp. 25-26; S. J. Bourke, *Bulletin of the American Schools of Oriental Research* 326 (2002), pp. 90-94 (<https://doi.org/10.2307/1357693>, accessed 2/28/2020); L. Hulin, *Discussions in Egyptology*, 53 (2002), pp. 115-122; D. A. Aston, *Journal of Egyptian Archaeology* 90 (2004), pp. 233-237.

²MB (Middle Bronze) IIA/B/C nomenclature is used for the MBA, because it is less ambiguous than the MB I-II-III system in which “MB I” can refer to either EB (Early

Bronze) IV or MB IIA. For the NAA samples reported on in this monograph, five MB subphases were stratigraphically and typologically defined by Dr. Bietak at Tell el-Dab`a, viz., MB IIA, transitional MB IIA-IIB, MB IIB, transitional MB IIB-IIC and MB IIC. For Southern Palestine, similar MB subphases have been defined, except for transitional MB IIB-IIC.

however, one could seriously question this result, because the MBA of Southern Palestine at that time was relatively poorly known, with limited architectural, pottery, and other cultural parallels to Tell el-Dab`a.

The excavation of Ashkelon was a game changer. As a coastal site, it had one of the few natural harbors in Southern Palestine for mooring boats and managing shipments of every kind. Moreover, it lay within “striking distance” of Tell el-Dab`a, only about 300 kilometers by land or sea. If we were looking for the “origin” of the Hyksos, Ashkelon and its neighboring Gaza region city-states were the closest large-scale threat to Egypt. Applying Occam’s Razor—viz., the simplest, most straight-forward working hypothesis is often proven correct—suggested that any increase in the population of Southern Palestine might have “spilled over” into Egypt whether by land or sea.

Bietak has long argued³ that the Hyksos came from the northern Levant in the MBA, specifically Byblos. Since the NAA study showed minimal contacts with this region (and none for Byblos), this writer proposed to him that we test his theory by his choosing an additional group of samples from Tell el-Dab`a of supposed northern Levantine origin (p. 36). The 29 samples (PMG103-131, Appendix 1: pp. 155-157, Figs. 112-115) primarily included later MB IIA pottery, continuing through to the end of the MBA. Earlier MB IIA strata had been excavated only to a limited extent at the time. The samples included 20 Canaanite Jars, 2 Polished jars/jugs, 3 Kamares Ware cups, 1 Bichrome Painted jug, and 3 miscellaneous types (a jar, a juglet, and a bowl).

³Compare, e.g., M. Bietak, Problems of Middle Bronze Age Chronology: New Evidence from Egypt, *American Journal of Archaeology* 88 (1984), p. 474 <https://www.jstor.org/stable/504735?seq=1>, accessed 2/28/2020; and From Where Came the Hyksos and Where Did They Go, pp. 139-181 in M. Marée, ed., *The Second Intermediate Period (Thirteenth–Seventeenth Dynasties)*:

Inferring working hypotheses from large, well-defined databases, deducing their possible consequences if true, and further testing are the sine qua nons of any historical science, like archaeology, especially since it is based on extremely limited, fragmentary, degraded, and sometimes contaminated evidence.⁴ According to this methodology and on Bietak’s recommendations, we analyzed the follow-up group of samples. The Canaanite Jars typified the picture of where the imported pottery originated: 13 of the 20 jars (65%) tested belonged to the Southern Palestine group, fully in keeping with the percentage of imports from this region in later subphases, except for transitional MB IIB-C and MB IIC when the percentage rises to 90-100% (page 73; compare Fig. 26). The northern Levant, including Byblos, did not produce a single NAA match for the group.

This writer then proposed another test of Bietak’s hypothesis. Since Ashkelon was currently being excavated by Dr. Lawrence E. Stager of Harvard’s Semitic Museum and had already produced what was the best stratified MBA sequence for Southern Palestine, why not carry out NAA analyses on pottery from this site, to see whether the chemistry of local pottery there matched the imported pottery at Tell el-Dab`a assigned to Southern Palestine, according to the NAA results?

Bietak agreed, and Stager provided our project with 50 pottery sherds from his site, again covering later MB IIA through to the end of the MBA. The pottery types, very similar to those of the same subphases at Tell el-Dab`a (excluding MB IIB-IIC), included Canaanite Jars, jugs, juglets, jars, bowls, and cooking pots, together

Current Research, Future Prospects, Orientalia Lovaniensia Analecta 192, Leuven: Peeters, 2010.

⁴P. E. McGovern and G. R. Hall, Charting a Future Course for Organic Residue Analysis in Archaeology, *Journal of Archaeological Method and Theory* 23 (<https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/03/Uluburun-JAMT-paper-June-2015.pdf>, accessed 2/28/2020).

with possible Levantine Painted Ware (LPW), Chocolate-on-White Ware, painted Cypriot White Slip Ware, and Painted Bichrome pottery (PMG518-567; published here for the first time as Table 47, below). Thirty-two of the samples (64%) fell squarely, to a very high level of probability, into our well-established chemical grouping for the Gaza sites, i.e., they had been locally produced using the loess clay of Southern Palestine. If another 9 sherds, which also likely belonged to this group, albeit at a lower probability level, were included, the percentage from Southern Palestine rose to 82%. Three sherds of Southern Palestinian type were made of Egyptian Nile alluvial clay. Finally, 6 samples—2 jugs, a jug or cooking pot, a possible Lisht Ware juglet, a cooking pot, and a rim sherd of uncertain type—were of questionable provenance.

The Ashkelon stratified sequence of MBA pottery had passed the test. To all intents and purposes, Ashkelon pottery, made in Southern Palestine, was identical to most of the imported pottery at Tell el-Dab`a. Based on our original NAA findings of the very close ties of Southern Palestine to Tell el-Dab`a, further corroborated by the two follow-up tests, it could be concluded that at the very least Southern Palestine had been a major trading partner with Tell el-Dab`a, beginning by at least later MB IIA and intensifying in MB IIB and MB IIC.

Only in earlier phases of MB IIA, which were poorly represented in both NAA datasets for Ashkelon and Tell el-Dab`a, was there any evidence of connections with the northern Levant at sites along the coast and inland. This fact was stressed in this book (pp. 35, 52, and 70), but bears repeating here because some readers misunderstood that the MBA in its entirety was in view for the NAA study. Bietak did not provide me with a single sample unequivocally assigned to stratum H; three samples, however, were said to come from G-H. Another seventeen samples were assigned to stratum d2, which is said to be approximately contemporaneous with H.

Since both strata H and d2 postdate mid-MB IIA levels in Palestine (e.g., at Tel Ifshar and Tell Aphek along the central Palestinian coastal plain), they most likely date to later MB IIA, as do strata G1-4 and c-d2. These strata might well extend into the transitional MB IIA-IIB subphase, because of the large margins of error for pottery typological dating.⁵

On the assumption that Bietak is correct in his relative chronology of Tell el-Dab`a stratigraphy,⁶ the later MB IIA strata at Dab`a collectively did in fact account for more imported samples from the northern Levant than subsequent MB IIB and IIC strata. The

⁵ Compare W. G. Dever's pottery typological discussion and conclusions that Tell el-Dab`a's relative chronology should be based on the stratigraphical and pottery evidence of Syro-Palestinian sites and not vice versa: see W. A. Ward and W. G. Dever, *Scarab Typology and Archaeological Context: An Essay on Middle Bronze Age Chronology*, vol. 3: Studies on Scarab Seals, San Antonio: Van Siclen Books, 1994, pp. 25-87, especially p. 86. Also see footnote 9 and 43.

⁶N.B.: His chronological chart (e.g., M. Bietak, Egypt and Canaan during the Middle Bronze Age, *Bulletin of the American Schools of Oriental Research* 281 (1991): pp. 21-72, see fig. 3) (<https://www.journals.uchicago.edu/doi/abs/10.2307/1357163>, accessed 2/28/2020) was largely constructed in the 1980's. It has been reproduced over and over again in the

Tell el-Dab`a excavation series and elsewhere (including this monograph). Yet, it is largely based on very questionable Egyptological and other historical “datum lines.” Detailed pottery typologies were developed after the fact and are vitiated by poor methodology, including over-emphasis on decorative criteria and inadequate multi-variate statistical analysis of well-stratified pottery. For details and references, see W. G. Dever (footnote 5, pp. 74-86) and F. Höflmayer, New Evidence for Middle Bronze Age Chronology and Synchronisms in the Levant: Radiocarbon Dates from Tell el-Burak, Tell el-Dab'a, and Tel Ifshar Compared, *Bulletin of the American Schools of Oriental Research* 375(2016), pp. 53-76 (<https://www.journals.uchicago.edu/doi/abs/10.5615/bullamerschoorie.375.0053>, accessed 2/28/2020).

differences, however, were slight: only three confirmed samples out of the total of 608 samples in the Tell el-Dab’a NAA database (0.5%) for later MB IIA versus no samples (0%) for MB IIB and IIC.

Looking back, I now see that I should have stressed the lack of representation for the early-mid MB IIA at Tell el-Dab’a. The available NAA evidence only applies to the late MB IIA when connections with the northern Levant were evidently winding down and populations had already begun building up at sites in Southern Palestine (e.g., Ashkelon—see below) and as reflected in the vastly greater number of imported pottery samples coming from this region rather than farther north. This southern Palestinian population soon would physically overwhelm a probably long-established Asiatic population at Tell el-Dab’a, which might well have included a northern Levantine component, perhaps even from Byblos.

Of course, more NAA analyses of earlier MB IIA pottery, now available from more recent excavations at Tell el-Dab’a, Ashkelon, and elsewhere, might show that the northern Levantine connections were stronger at that time. The picture for later MB IIA down to the end of the MBA, however, is incontrovertible, according to the NAA results.

In short, the working hypothesis of the Hyksos

being of Southern Palestine origin appeared to be the most likely possibility. This hypothesis was further bolstered by other cultural affiliations between Tell el-Dab’a and Southern Palestine, including handmade cooking pots reflecting a traditional Syro-Palestinian cuisine, mudbrick vaulted tombs with equid interment and nearly indistinguishable burial assemblages in the two regions, etc. (see this volume, “Possible Ethnic Origins,” pp. 80-82).

2. A Two-Stage Process?

Our evidence was also consistent with a two-stage process of population movement over the course of the MBA (for what follows, see Chapter 6 in this book and, especially, the general overview provided in *Ancient Wine*,⁷ which stresses wine’s importance as a trading commodity in Canaanite Jars and the Canaanite contribution to the Nile Delta winemaking industry). Imported and locally made MBA scarabs and sealings in the northern Levant versus those found in Southern Palestine provided additional supporting evidence (also see below).⁸

In the first stage during late EB IV (First Intermediate Period of Egypt) and into early MB IIA, people from the northern Levant probably began to move into the southern Levant, which was populated mainly by villagers and pastoralists. The northerners would have brought with them their traditions of architecture, equid burials, pottery styles and technology (e.g., the fast-wheel for throwing the distinctive MB

⁷P. E. McGovern, *Ancient Wine: The Search for the Origins of Viniculture*, 2nd ed., Princeton: Princeton University; 2019, pp. 107-120.

⁸J. M. Weinstein, Egyptian Relations with Palestine in the Middle Kingdom, *Bulletin of the American Schools of Oriental Research* 217 (1975), pp. 1-16 (<https://www.journals.uchicago.edu/doi/abs/10.2307/1356218>, accessed 2/28/2020), and The Egyptian Empire in Palestine: A Reassessment, *Bulletin of the American Schools of Oriental Research* 241 (1981), pp. 1-28 (<https://www.journals.uchicago.edu/doi/abs/10.2307/1356708>, accessed 2/28/2020), hereafter cited as “Egyptian Empire”; D. Ben-Tor, Can Scarabs Argue for the Origin of

the Hyksos?, *Journal of Ancient Egyptian Interconnections* 1 (2009), pp. 1-7; *contra* M. Bietak, From Where Came the Hyksos and Where Did They Go, pp. 139-181 in M. Marée, ed., *The Second Intermediate Period (Thirteenth-Seventeenth Dynasties): Current Research, Future Prospects*, Orientalia Lovaniensia Analecta 192, Leuven, Peeters, 2010. For the most up-to-date, exhaustive, and definitive study showing a total absence of Egyptian scarabs during the 2nd Intermediate or “Hyksos” period (i.e., MB IIB-IIC) in the northern Levant, see V. Boschloos, Egyptian and Egyptianising Scarab-Shaped Seals in Syria and Lebanon, *Bibliotheca Orientalis* 69 (2012), pp. 175-181.

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pottery types including Canaanite Jars, highly polished jugs and juglets, and painted vessels in the LPW tradition, etc.). The northerners built fortified sites throughout Palestine and likely integrated the local non-urban people into their socio-political system. They especially consolidated their power in the south, in the Gaza region, which was closest to Egypt.

With an ever-growing population in Southern Palestine and ever-increasing trade between Southern Palestine and Tell el-Dab'a during later MB IIA and into MB IIB, the stage was set for the second stage of the process. Egypt had gradually descended into political instability, even chaos, at the end of Middle Kingdom and continuing into the Second Intermediate Period, following the collapse of the powerful 12th Dynasty. The northeastern Nile Delta, which beckoned with its rich, well-watered agricultural fields, was a

natural “relief valve” for a burgeoning Southern Palestinian population, and it was within relatively easy reach by land or sea. Other Semitic peoples, who had long lived there and were engaged in trade and various occupations, could help smooth immigration to the new land, particularly if they had family ties with the new arrivals.

Tell el-Dab'a was already a trading entrepôt during the Middle Kingdom, with especially close ties with Byblos as well as other city-states along the northern Levantine coast (e.g., Sidon), and those connections probably expanded to encompass newly established sites farther south (e.g., Tel Ifshar). The “Hyksos” 15th Dynasty, whose capital was at Avaris (Tell el-Dab'a), was the crowning achievement of this process in MB IIB and MB IIC (ca. 1750-1550 B.C.⁹). During this subphase, the Tell el-Dab'a population

⁹“Absolute” dates are very tentative and meant only to help orient the reader. They are not absolute as such, given the on-going chronological debate for the period. Note that numerous radiocarbon dates for the MBA at Tell el-Dab'a and numerous Levantine sites (Tell el-'Ajjul in Southern Palestine, Tel Ifshar and Tel Kabri in Israel, Jericho in the West Bank, Tell el-Hayyat in Jordan, and Tell el-Burak in Lebanon) are some 75-100 years earlier than Bietak's textually, historically, and pottery typologically based lower chronology, which he has long advocated. If the radiocarbon dates, as calibrated and statistically evaluated, hold up, a major revision of Egyptian-Levantine relations will be needed.

The original radiocarbon data are published in W. Kutschera, et al., The Chronology of Tell el-Daba: A Crucial Meeting Point of 14C Dating, Archaeology, and Egyptology in the 2nd Millennium BC, *Radiocarbon* 54 (2012), pp. 407-422. For subsequent discussion and debate about how to reconcile the conflicting data, see M. Bietak, Antagonisms in Historical and Radiocarbon Chronology, pp. 76-109 in *Radiocarbon and the Chronologies of Ancient Egypt*, eds. A. J. Shortland and C. Bronk Ramsey. Oxford: Oxbow, 2013; F. Höflmayer, The Expulsion of the Hyksos and the End of the Middle Bronze Age: A Reassessment in Light of Recent Chronological Research, *Journal of Ancient Egyptian Interconnections* 21 (2019), pp. 20-30; F. Höflmayer, A Radiocarbon Chronology for the Middle Bronze Age Southern Levant, *Journal of Ancient Egyptian Interconnections* 13 (2017), pp. 20-33; M. Bietak, review of Sturt W. Manning, *A Test of Time and A Test of Time Revisited: The Volcano of Thera and the Chronology and History of the Aegean and East Mediterranean in the Mid-Second Millennium BC*, *Bryn Mawr Classical Review* 2016, p. 50; etc. In support of Bietak's lower chronology, see D. Ben-Tor, Evidence for Middle Bronze Age Chronology and Synchronisms in the Levant: A Response to Höflmayer et al. 2016, *Bulletin of the American Schools*

of Oriental Research 379 (2018), pp. 43-54 (<https://www.journals.uchicago.edu/doi/abs/10.5615/bullamerschorie.379.0043>, accessed 2/28/2020).

Rather than discount the high short-lived radiocarbon dates from Tell el-Dab'a as due to erosional wind-borne deposition, and/or bioturbation processes, in which older material contaminated later contexts (see, e.g., Bietak, “Antagonism,” above, p. 100), this writer would retain the precise and statistically based radiocarbon determinations unless it can be shown that they need to be recalibrated. Three possible solutions for scientifically reconciling the textual/historical/pottery typological and radiocarbon chronological discrepancy may be proposed: (1) recalibration of the radiocarbon dates (cf. C. L. Pearson, et al. 2018 Annual Radiocarbon Record Indicates 16th Century BCE Date for the Thera Eruption, *Science Advances* [<https://advances.sciencemag.org/content/4/8/eaar8241>], accessed 2/28/2020), which is anticipated to be published soon as calibration curve IntCal20; (2) re-dating substrata G1-3 at Tell el-Dab'a to later in MB IIA than phase 14 at Ashkelon, and consequently lowering the end-date of the transitional MB IIA-IIB subphase for stratum F and phase 13C at the two sites, respectively, pending further statistically based typological and stratigraphical analyses; or (3) some combination of nos. 1 and 2. Compare P. Beck and U. Zevulun, Back to Square One, *Bulletin of the American Schools of Oriental Research* 304 (1996), p. 68 (<https://www.journals.uchicago.edu/doi/abs/10.2307/1357441>, accessed 2/28/2020), concerning the possible pottery typological re-dating of strata G1-3 at Tell el-Dab'a, in accord with the pottery typological dating of Post-Palace II, phase at Tel Aphek, that has important implications for the stratigraphical dating of Ashkelon. Also see footnotes 5 and 6, and the recently published comparative chronological chart for MBA Palestinian sites(D. Ilan and E. Marcus, Middle Bronze Age IIA, pp. 9-75 in *The Ancient Pottery of Israel and Its Neighbors from the Middle Bronze Age through*

exploded, and the site expanded to some 250 hectares.

More excavation of Tell el-Dab`a and Southern Palestinian sites is obviously needed to firm up the two-stage hypothesis. For example, it might appear that LPW is largely a “northern Levantine phenomenon,” because of the current distribution of this pottery class at many sites in the north. But as the Ashkelon excavations have begun to show,¹⁰ LPW there is very similar to that from Tell el-Dab`a and follows a comparable stratigraphical sequence in its development, implying close ties between the sites. One might go further and argue for a “Syro-Palestinian” pottery industry at Tell el-Dab`a, which was initially established by immigrant potters from Southern Palestine as early as the late 13th Dynasty and which operated separately from the local Egyptian industry and eventually diverged somewhat from workshops in Southern Palestine. As discussed on page 80 of this monograph:

Early in the MBA, the imitations of Syro-Palestinian pottery types [made of Nile alluvial clay] were indistinguishable, stylistically and technologically, from true imports. By MB IIB, when the relative percentage of imitations also noticeably increases, a range of local “Syro-Palestinian” types has emerged, which were further elaborated upon during the remainder of the MBA, including piriform, biconical, and combed varieties of Tell el-Yahudiyeh jugs and juglets...and piriform and globular painted Tell el-Yahudiyeh juglets.

The available archaeological evidence is very much a product of serendipitous discovery of ancient sites, sometimes buried deep beneath overlying strata, and current evidence can easily

be skewed in one direction or another. As noted in the conclusion to this book (p. 83): “The clear implication is that MB sites in Southern Palestine have not been sufficiently excavated and/or published, so that [what are now described as] “northern” types [there] are under-represented in distributional studies.” Eventually, specific LPW types may need to be more generally reclassified as “Syro-Palestinian types” or even “Southern Palestinian types.” A similar case might be made for the temple and palace architecture at Tell el-Dab`a, which currently find their best parallels in the northern Levant.

3. Methodological Fallacies in Goren’s Petrographic Approach Revealed

The discussion of a petrographic study by Drs. Anat Cohen-Weinberger and Yuval Goren¹¹ of the Tell el-Dab`a imported pottery is appropriate here, since their provenance assignments are very much at odds with the NAA findings. They analyzed several of the same samples that we did by NAA, together with many more comparable imported Levantine pottery types from Tell el-Dab`a. Overwhelmingly, they assigned the imported pottery at Tell el-Dab`a, dated to the entire MBA and not just the earlier part of MB IIA, to the northern Levant (viz., Lebanon, Syria, and northern Palestine), as well as central Palestine. Southern Palestine played a minor role for the whole of the MBA, according to their analyses.

Yet, as cogently argued by geologist Christopher Wnuk in the accompanying Addendum, the methodology and data collection on which the Cohen-Weinberger and Goren paper were based, are fundamentally flawed. Goren, in

the Late Bronze Age, vol. 3, ed. S. Gitin, Jerusalem: Israel Exploration Society, 2019, Table 1.2.1).

¹⁰M. Bietak, K. Kopetzky, L.E. Stager, and R. Voss, Synchronisation of Stratigraphies: Ashkelon and Tell el-Dab`a, *Ägypten und Levante* 18 (2008), pp. 49-60 (<https://www.jstor.org/stable/23788605?seq=1>, accessed 2/28/2020). Also see footnote 32, below.

¹¹A. Cohen-Weinberger and Y. Goren, Levantine-Egyptian Interactions during the 12th to the 15th Dynasties Based on the Petrography of the Canaanite Pottery from Tell el-Dab`a, *Ägypten und Levante* 14 (2004), pp. 69-100, (<https://doi.org/10.1553/AEundL14s69>, accessed 2/28/2020). Hereafter cited as “Daba Petrography.”

collaboration with Cohen-Weinberger, his student at the time, was principally responsible for the petrographic approach. Wnuk’s criticisms are many and varied, and can be summarized, together with other methodological and archaeological issues, as follows:

1) Important prerequisites in applying a natural scientific technique, such as petrography and NAA, to an archaeological corpus include collecting the data of one discipline independently of any other, and not prejudicing your collection and processing of the data by other hypotheses, especially those based primarily on archaeological and textual data. Otherwise, you run the risk of not letting “the data speak for themselves.” As noted below (#7) and in the discussion to follow, Goren appears to have fallen into this trap.

As already touched on, once you have collected your data using a specific scientific technique for an archaeological investigation, you infer working hypotheses to be tested further by enlarging the sample size, modifying procedures for greater accuracy, etc. (also see footnote 4 and further below). You also tentatively begin to integrate working hypotheses using other scientific methods. You attempt to fit the various working hypotheses into a general interpretation that does justice to the archaeological, typological, and textual data. You then continue with your testing, such as the follow-up NAA tests of supposed northern Levantine imports into Tell el-Dab’a according to Bietak and the Ashkelon follow-up study of pottery made in Southern Palestine. A working hypothesis is gradually strengthened as follow-up tests prove positive. This is the same approach we applied in our ceramic technology program, going from pilot studies to progressively more enlarged, more directed databases (footnote 15 and below).

2) Another crucial requirement of any scientific study is to base your results on as large, comprehensive, and precise a database as possible. Ostensibly, the number of samples examined by Goren in defining 11 petrographic regional groups for the Levant is impressive, viz., 300+ Tell el-Dab’a pottery samples (“Daba Petrography,” p. 69), about 300 Amarna Letter clay tablets,¹² thin-section libraries of varying sizes in Israel and abroad (e.g., “Daba Petrography,” pp. 71-72, *passim*), field collection of some Levantine clays and minerals, and an indeterminate number of thin-sections from ongoing excavations (“Daba Petrography,” Fig. 1; *Inscribed in Clay*, p. 21). Yet, because many of these samples are unpublished or not described in detail, the actual reference dataset is much smaller, especially considering the area covered by the Levant (ca. 325,000 square kilometers or about 125,500 square miles, nearly the size of California). Moreover, inland Levantine areas, which might be important for petrographic provenancing, were omitted from the Levantine groups, except for the hill country of Palestine. It is also unclear how many samples formed the basis for each group. The upshot is that the results cannot be assessed by an independent investigator.

3) Lacking a composite and detailed sample listing for each Levantine group, primary archaeological data for the samples in each group are generally not available, including site name, provenience, date, present storage location, and pottery type and description (e.g., the fabrication method, the fabric colors of surface, sub-surface and core fabric, according to the Munsell Soil Color Charts, to determine the original firing temperatures of the pottery, any surface treatment such as slip, paint and/or burnishing, any design, etc.). Such non-petrographic information is potentially important in ultimately formulating working hypotheses that relate the probable clay

¹²Goren, Y., Finkelstein, I., and Na’aman, N., *Inscribed in Clay: Provenance Study of the Amarna Tablets and other Ancient Near Eastern Texts*, Monograph Series 23, Tel

Aviv: Emery and Claire Yass Publications in Archaeology, Institute of Archaeology, Tel Aviv University, 2004, p. 2. Hereafter cited as *Inscribed in Clay*.

provenances of samples to technological and cultural issues.

4) Again, because a composite and detailed sample listing for each group is lacking, the primary petrographic data for measured characters and features are generally not provided, including frequency percentages of specific minerals according to well-established and standard point counting, together with their sizes, angularity, any color differences, etc. Ideally, 300-500 discrete random points should be identified, although 100-300 can be acceptable; frequency distribution charts are also often adequate for major, well-identified inclusions. Pore structure and degree of clay vitrification, as well as the presence/absence of special features (e.g., clay nodules which might point to the mixing of clays), are also generally not noted by Goren and associates.

Despite the general lack of detailed information, some pertinent petrographic information is provided for the Tell el-Dab'a samples (“Daba Petrography,” table 1) and the Amarna tablets (*Inscribed in Clay, passim*). For example, photomicrographs of 19 Tell el-Dab'a thin-sections (“Daba Petrography,” pl. 1) are said to be representative of specific Levantine groups, but without more information about their distinctive mineralogical and other inclusions, it is difficult to know whether they adequately distinguish the Levantine groups from one another. Goren’s petrographic database is also said to include reference raw materials and a collection of pottery thin-sections from southern Levantine sites, in addition to thin-sections for many sites in Syria and Lebanon (this volume, “Daba Petrography,” p. 78, note 4), but details are lacking. The more

thin-sections included in a petrographic study and the more detailed and comprehensive the variables recorded, the better.

5) Summarizing points 3 and 4, the essential archaeological, petrographic, and other information were not compiled into a readily accessible database for testing and corroborating the 11 Levantine groups by other investigators independently. Raw data that this writer and others have requested have not been shared.

6) An uncertain number of local clay and mineral samples for the 11 Levantine groups were collected and refired as clay briquettes for preparing thin-sections for comparison with the ancient pottery.

7) In lieu of collecting samples of clays and minerals in the field, geological maps were used as the principal source of possible provenances (“Daba Petrography,” *passim*; *Inscribed in Clay*, pp. 20-21, *passim*). The maps cited, some of which are outdated, often give several possibilities for the mineralogy of a pottery thin-section, and the petrographer might then choose one region over another based on other non-geological, often subjective, criteria, such as what one might expect for a specific period based upon the available archaeological evidence. Once that petrographic profile has been assigned to that region, it might then be applied uncritically to other thin-section identifications, in a circular reasoning fashion.

Goren has used this questionable approach in other studies (described further below and in the Addendum).¹³ The eastern Mediterranean littoral is particularly problematic, because it was subject

¹³E.g., Y. Goren, The Southern Levant in the Early Bronze Age IV: The Petrographic Perspective, *Bulletin of the American Schools of Oriental Research* 303 (1996), pp. 33-72 (<https://doi.org/10.2307/1357469>, accessed 2/28/2020), and N. Porat and Y. Goren, Petrography of the Naqada IIIa Canaanite Pottery from Tomb U-j in Abydos, pp. 252-270 in *Egypt and the Levant: Interrelations from the 4th through the Early 3rd Millennium B.C.E.*, eds. E. C. M. van den

Brink and T. E. Levy, London and New York: Bloomsbury T&T Clark, 2001. The latter study illustrates the uncritical interweaving of non-petrographic criteria in making a case for a specific petrographic provenance. Most problematic are the use of only geological maps for Transjordan and Egypt, together with the presumed presence or absence of archaeological sites, finds and ceramic traditions for certain periods, cf. pp. 263ff and table 16.3. See further, below.

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to frequent incursions of the Tethys Sea, as well as drainage from the adjacent hills and mountains. Consequently, it is especially difficult to distinguish clays there from one another petrographically.

8) No heavy mineral separation and analysis, which can often provide further clues for clay provenances, were carried out.

9) Thin-section examination was sometimes bypassed in favor of unorthodox petrographic techniques developed by Goren, including “scattered petrographic analysis” (SPA), “peeling,” and “blocking” (*Inscribed in Clay*, pp. 11-12). The goal was to do minimal damage to samples, but the reliability of these non-destructive techniques is uncertain (see Addendum).

10) No rigorous statistical tests, using as many measured petrographic characters and features as possible, were done to define the 11 Levantine groups.

11) The evidence for a “reliability index” in assigning a sample to one of the 11 regional groups, based on the size and the quality of the sample, was not provided, so their actual significance is uncertain. It is also not explained why five indices were used in the Amarna tablets study (“high,” “satisfactory,” “moderate,” “fair,” or “unreliable;” see *Inscribed in Clay*, pp. 14-15)

and three in the Tell el-Dab’a study (A: the proposed origin is “highly reliable”; B: “fairly reliable”; and C: “poorly reliable”; see “Daba Petrography,” p. 71) nor how those categories relate to one another.

12) Goren’s use of chemical data, obtained by inductively coupled plasma atomic emission spectrometry and mass spectrometry (ICP-AES and ICP-MS), to bolster his petrographic analysis has its own problems. His ICP comparative database is too small to be of any value in statistically establishing provenances. His use of a less precise portable X-ray fluorescence instrument in the field to collect chemical data in support of his petrographic results is even more problematic.¹⁴

Many of these points are further buttressed and elaborated upon in the Addendum by Dr. Wnuk, who has worked for the United States Geological Survey and as a consultant to private exploration companies in the Middle East and around the world since his graduation from Penn in 1984. During his time at Penn and continuing until 1993, he served as my geological petrographer, carrying out studies of pottery from the Baq’ah Valley (Jordan), Beth Shan (Israel), and Wadi al-Jubah (Yemen) projects. The latter investigations integrated petrography into a pioneering ancient ceramic technology program at the Museum Applied Science Center for Archaeology (MASCA).¹⁵

¹⁴Y. Goren, H. Mommsen, and J. Klinger, Non-destructive provenance study of cuneiform tablets using portable X-ray fluorescence (pXRF), *Journal of Archaeological Science* 38 (2011), pp. 684-696 (<https://doi.org/10.1002/gea.21493>, accessed May 1, 2019).

¹⁵a) P. E. McGovern, G. Harbottle, and C. Wnuk, Late Bronze Pottery Fabrics from the Baq’ah Valley, Jordan: Composition and Origins, *MASCA Journal* 2 (1982), pp. 8-12 (<https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/04/MASCAJbaqahNAA.pdf>, accessed 2/28/2020);

b) P. E. McGovern, W. W. Vernon, and J. C. White, Ceramic Technology at Prehistoric Ban Chiang,

Thailand: Physicochemical Analyses, *MASCA Journal* 3 (1985), pp. 104-113 (<https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/03/mascajbanchiang.pdf>, accessed 2/28/2020);

c) P. E. McGovern, G. Harbottle, and C. Wnuk, Ware Characterization: Petrography, Chemical Sourcing, and Firing, pp. 178-193 in *The Late Bronze and Early Iron Ages of Central Transjordan: The Baq’ah Valley Project, 1977-1981* by P. E. McGovern, University of Pennsylvania Museum Monograph 65, Philadelphia: University of Pennsylvania Museum, 1986;

Wnuk’s critique is based on the data collection and methodology provided by the Cohen-Weinberger and Goren paper, together with a more extended and thorough methodological discussion in the book by Goren and colleagues on the Late Bronze Age (LBA) Amarna Letters, *Inscribed in Clay* (which the Cohen-Weinberger and Goren paper refers to for clay provenancing) and other relevant Goren articles. The Addendum is illustrative of important mistakes, misinterpretations, and ambiguities, and is not intended to be exhaustive.

Summarizing Wnuk’s conclusions, Goren’s petrographic methodology falls short of current practice in archaeological petrography, which stresses data collection, sampling of clays and

other raw materials within a circumscribed region or site, firing briquettes of these local raw materials and comparing their thin-sections to ancient pottery, etc.¹⁶ Admittedly, point counting and statistics have not always been well-integrated into other petrographic programs.

It is also instructive to compare the petrographic approach favored by New World archaeologists, which produced results contrary to those obtained by NAA.¹⁷ In this instance, unidirectional trade relations were unequivocally shown by NAA analyses to have existed between the Early Formative Olmec “mother culture” at San Lorenzo in southeastern Mexico and its outlying “sister cultures.” This debate is a mirror-image, as it were, to the Old World controversy about the imported pottery at Tell el-Dab’a primarily

- d) P. E. McGovern and C. Wnuk, Ceramic Technology I: Petrography, Firing, and Surface Decoration, pp. 181-190 in *The Wadi al-Jubah Archaeological Project*, vol. 3 by W. D. Glanzman and A. O. Ghaleb, ed. L. J. Tiede and S. J. Fleming, Washington, D.C.: American Foundation for the Study of Man, 1987; (<https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/03/Jubahpottery1.pdf>, accessed 2/28/2020);
- e) P. E. McGovern, Ancient Ceramic Technology and Stylistic Change, pp. 63-81 in *Scientific Analysis in Archaeology and its Interpretation*, ed. J. Henderson, Oxford University Committee for Archaeology Monograph 19, UCLA Institute of Archaeology Archaeological Research Tools 5, Oxford: Oxford University, 1989; (<https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/03/PotterySWAsia1.pdf>, accessed 2/28/2020);
- f) P. E. McGovern, G. Harbottle, J. Huntton, and C. Wnuk, Ware Composition, Pyrotechnology, and Surface Treatment, pp. 80-94 in *The Late Bronze Egyptian Garrison at Beth Shan: A Study of Levels VII and VIII* by F. W. James and P. E. McGovern, University of Pennsylvania Museum Monograph 85, Philadelphia: University of Pennsylvania Museum, 1993;
- g) I. Freestone, Ceramic Petrography, pp. 111-115 in *Science in Archaeology: A Review* by P. E. McGovern, *American Journal of Archaeology* 99

(1995), pp. 79-142 (<https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/04/scienceinarchaeology.pdf>, accessed 2/28/2020);

- h) S. J. Vaughan, Ceramic Petrology and Petrography in the Aegean, pp. 115-117 in *Science in Archaeology: A Review* by P. E. McGovern, *American Journal of Archaeology* 99 (1995), pp. 79-142 (<https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/04/scienceinarchaeology.pdf>, accessed 2/28/2020).

¹⁶P. S. Quinn, *Ceramic Petrography. The Interpretation of Archaeological Pottery and Related Artefacts in Thin Section*, Oxford: Archaeopress, 2013 (<https://doi.org/10.1002/gea.21493>, accessed May 1, 2019), and, as one representative case study, M.-C. Boileau, Petrographic Signatures of the Tell ‘Acharneh Ceramics: A Diachronic Perspective, *Levant*, published on-line June 22, 2018, pp. 1-19 (<https://doi.org/10.1080/00758914.2018.1477296>, accessed 2/28/2020).

¹⁷ See, especially, H. Neff, et al., Methodological Issues in the Provenance Investigation of Early Formative Mesoamerican Ceramics, *Latin American Antiquity* 17 (2006), pp. 54-76 (<https://doi.org/10.2307/25063036>, accessed May 7, 2019), and, more recently, H. Neff, Comment: Chemical and Mineralogical Approaches to Ceramic Provenance Determination, *Archaeometry* 54 (2012), pp. 244-249 (<https://onlinelibrary.wiley.com/doi/full/10.1111/j.1475-4754.2011.00621.x>, accessed 2/28/2020).

originating from Southern Palestine according to our NAA results, rather than from sites farther to the north according to the petrographic results.

4. Were the NAA Results Incorrect?

By contrast to the limited data collection and weak methodology of Goren’s approach, the NAA database and methodology were “data-rich” and very transparent and compelling for their group and site provenance assignments based on powerful statistics, as follows:

- a) 608 well-provenienced and well-dated MBA pottery samples from Tell el-Dab’a, as well as clay bed samples from throughout Egypt, were analyzed;
- b) 810 pottery samples, primarily MBA in date and generally well-provenienced and well-dated, from 55 coastal and inland sites of Syria, Lebanon, Jordan, Israel, the West Bank, and the Gaza Strip, together with numerous clay bed samples from the same areas, were analyzed. Where local clay deposits were lacking, mudbricks, cooking pots, and wasters of probable local origin were analyzed and tested for local compositional group membership;
- c) 4583 well-provenienced and dated pottery and clay samples from elsewhere in the ancient Near East covering other periods were analyzed.

Unlike Goren’s petrographic studies, the primary archaeological and NAA data are fully published in this book and on-line for the samples run by the University of Missouri-Columbia’s Research Reactor Center and those in the Brookhaven National Laboratory’s Old World database (www.archaeometry.missouri.edu).

The NAA data provided by these 6001 samples were then subjected to rigorous statistical analysis to establish site-specific and regional groups to high degrees of probability. Powerful multi-variate algorithms, based on as many as 35

chemical elements at part-per-million levels, served as independent variables in our NAA study. The accuracy of the data and statistical criteria were so stringent that there was a nearly 0% probability that the 268 pottery vessels comprising the Gaza group of imported pottery at Tell el-Dab’a were misassigned. As pointed out on page 25 of this monograph:

...the MDP [Mahalanobis distance probability] that the Gaza group of pottery and clays belongs to the large, well-defined Dab’a group is close to 100%. Remarkably, all other well-defined local groups in the Old World data bank had a 0% probability of belonging to the Dab’a group. It is *virtually certain therefore that the 268 pottery vessels comprising this group at Tell el-Dab’a were produced in Southern Palestine and exported to the northeastern Nile Delta* [emphasis added]. Because of the homogeneity of the red loess clay in this region, it is extremely difficult to isolate specific sites or workshops that produced the amphoras that eventually made their way to Tell el-Dab’a. In MED [mean Euclidean distance] space, the locally defined groups at Tell el-’Ajjul and Ashkelon are especially close to many of the Dab’a specimens.

This NAA finding for the Southern Palestine group alone should have been reason enough to seriously question the petrographic results.

The first pilot study of the Baq’ah Valley (Jordan) Late Bronze (LB) pottery that this writer did with Dr. Wnuk (see footnote 15a), nearly 40 years ago, demonstrated the advantages of integrating detailed archaeological information with that obtained by the complementary scientific techniques of petrography and NAA. We collected eight clay samples and six sand/sandstone samples from the valley for comparison to the ancient pottery, which was dominated by quartz inclusions. We employed random point-counting of inclusions. The statistical groupings of the fully detailed petrographic characters and features observed were quite comparable to those obtained by NAA. Later, we expanded the study to include a total of 58 pottery samples from a well-provenienced and well-dated continuous sequence of LB and early

Iron Age phases (see footnote 15c). The results from the pilot study were confirmed. Other scientific techniques, especially xeroradiography, interrelated the materials properties of the pottery fabrics with formation techniques. For example, as the fabrics became coarser in LB II, possibly because of mass production, hand-made slab bases for bowls and kraters, rather than wheel-thrown bases made in the upside-down mode, became the rule. This development became even more prominent in Iron IA at the same time that a new cultural and technological constellation was taking shape (the results and working hypotheses are summarized in reference e of footnote 15).

By stressing the advantages of NAA to those of petrography for provenancing the clay origins of Levantine pottery, there is no intention of deprecating the value of the latter. Petrography, properly practiced and applied, is essential to evaluating the NAA results and providing essential technological information, which NAA cannot provide. Petrography was a critical component of our ceramic technology program, which combined a coordinated series of scientific approaches to elucidate the technological, environmental, and cultural underpinnings of pottery manufacture (see, especially, the flow diagram in reference e of footnote 15). For example, xeroradiography sheds light on formation processes—whether by hand, slab/coils, or wheel—and sequential firing of briquettes made from local clays and minerals, coupled with scanning electron microscopy to observe vitrification of clay particles and other changes in the pottery fabric, enabled the original firing temperature of the ancient pottery to be determined. Petrography was integral at every stage of the investigation in providing evidence of the workability of the clay for a given production method, recording mineralogical changes with increased firing temperatures, establishing preliminary fabric types for the archaeological corpus, and more. This holistic approach to ancient pottery technology, in conjunction with other archaeological, textual and environmental

data, enabled us to propose novel working hypotheses for further study. For example, the dramatic cultural and technological changes on the central Transjordanian plateau during the 500-year transition from the LBA to the early Iron Age contrast sharply with a continuity of traditions on Thailand’s Khorat Plateau from the 3rd to the 1st millennium B.C. (see footnote 15e).

Ideally, the goal of a pottery provenance study is to determine the source of the ancient clay from which the pottery was made. Yet, petrography usually cannot adequately characterize and localize a clay, despite all its other advantages for understanding ancient pottery technology. For that, a highly sensitive and precise chemical technique like NAA is essential, “tempered” as it were by petrographic analyses. For example, the NAA elemental results can be skewed by the washing out of native inclusions or the addition of foreign inclusions from a non-local, more distant mineralogical deposit by natural geological processes, such as erosion, that can produce highly selective dilution or concentration effects for the native clay. Inclusions might also have been intentionally mixed with the clay, as tempering agents, by the ancient potter, to produce a more workable clay or better-firing product. Petrography, by comparing thin-sections of fired clay briquettes of local clay and minerals with those of the ancient pottery, provides the all-important check on such variables.

Even at one remove from the clay bed itself, however, petrography can sometimes work better than NAA provenancing of ancient pottery. For example, when a region has a very distinctive petrology, such as an igneous regime, the inclusions in the clay might be sufficient to characterize and source the clay bed. Coastal regions of the Levant, however, do not meet that criterium, as already explained and further elaborated upon in the Addendum.

To determine the origin of a Levantine clay,

which might differ watershed by watershed along the Levantine coast, intensive chemical analytical methods, such as NAA, are needed. As stated on pp. 70 and 73 of this monograph: “A gradual increase in transition metals (particularly chromium, manganese, and cobalt), alkalis and alkaline earths, and, to a more limited extent, in the rare earths are observed in the clays and the local compositional groups going from south to north along the Mediterranean coast. This trend is even more pronounced than it might otherwise seem, since the pottery from northern sites were tempered more heavily with calcite, which has a diluent effect on chemical composition.”

It should be noted that, in lieu of petrographic details for most archaeological sites in the Levant, correction for calcium dilution of other elements in our NAA study by various mathematical procedures—viz., best relative fit by least squares—did not improve the statistical discrimination of local groups using the uncorrected NAA data. As more petrographic analyses are carried out, it should be possible to identify distinctive mineral suites for specific local group samples by percentages of inclusions, including quartz and related silicate minerals of igneous origin, in order to apply correction factors. It is doubtful, however, that these corrections would significantly improve the local group separations of this study.

Admittedly, the more visual, lower-tech approach of petrography, as compared with the sub-microscopic compositional and statistical methodology of NAA, is more readily understood by non-natural scientists, and if the petrographic results are in accord with prior hypotheses, then they are more likely to be accepted. The much lower cost of petrography in comparison to NAA, which requires a nuclear reactor, is another consideration. However, when weighing the

relative merits of the NAA evidence for MBA pottery provenances vis-à-vis the results obtained by petrography, even as a non-specialist, consider this: how much reliance would you place on a radiocarbon date that was based on very imprecise data and no statistics?

In contrast to three generally favorable reviews, two reviewers¹⁸ of the book failed to appreciate the relative merits of NAA for Levantine pottery provenancing over those of petrography. Both were members of the Tell el-Dab’a team, Goren himself as the Tell el-Dab’a petrographic specialist, and Dr. David Aston, the long-time pottery consultant for the project. Neither was well-qualified to assess the methodology and results for the NAA analyses, since Goren had been trained as an archaeologist and petrographer and Aston as an Egyptologist. By contrast, the review by Dr. Hector Neff, an accomplished NAA practitioner and archaeologist, should carry more weight. Additionally, the reviews by Stephen Bourke (a Palestinian archaeologist, who directs the excavations of MBA levels at Pella), and Dr. Linda Hulin (an Egyptologist and archaeologist), even though they were not NAA specialists, were more even-handed in pointing out both the strengths and weaknesses of this volume, nearly all of which were well-justified (for references to reviews, see footnote 1).

Both Goren and Aston’s critiques concur in stressing that the NAA data coverage for the northern Levant was relatively poor for the NAA study. Yet, this writer admitted in the book that our NAA coverage of the northern Levant needed to be expanded, and I qualified my conclusions accordingly. What both reviewers overlooked was that the petrographic and ICP delimitation of northern Levantine groups was even more imprecise than were the NAA groups for the same region, due to unfounded geological assumptions and a lack of archaeological, petrographic raw

¹⁸Y. Goren, *Bibliotheca Orientalis*, 60 (2003), pp. 106-109, and D. A. Aston, *Journal of Egyptian Archaeology* 90 (2004), pp. 233-237.

material data, and statistical analyses (for details, see above and the Addendum).

Goren claimed that “this entire databank [of the Brookhaven and Missouri NAA labs] is of little significant value,” and advocated rechecking the NAA results against the “better-selected” database of the Lawrence Berkeley lab (footnote 18, p. 109). He concluded: “In its present state, McGovern’s conclusions should be treated with much skepticism and reservation.” Dr. Michael Glascock, director of the Missouri lab, and his associate Dr. Hector Neff do not agree, nor is it likely that Mrs. Joan Huntoon and Dr. Garman Harbottle at the Brookhaven lab, who ran many of the Levantine and Old World samples, would concur, if they were still alive.

5. Goren’s “Petrographic Origin” for the Scorpion I Jars from Abydos: Caveat Emptor!

A very instructive and relevant illustration of how Goren’s methodology can lead to implausible results and an unworkable hypothesis is his and Dr. Naomi Porat’s study of the Scorpion I wine jars in tomb U-j at Abydos, which belonged to one of the first kings of ancient Egypt (Dynasty 0) near the beginning of the EBA.¹⁹ Once again, the petrographic results were markedly at odds with the provenances determined by NAA. For both the EBA study and for the investigation of the Tell el-Dab’a imported pottery of the MBA, presented in this monograph, similar suites of

minerals were identified petrographically (N.B.: arkose). Moreover, Goren’s assignments have now been put into question by another archaeological petrographer, Dr. Mary Ownby, who argues for a northern Levantine rather than an Egyptian origin for the Scorpion I jars which she studied (below). Thus, a similar issue of how best to provenance Egyptian and Levantine clays and pottery is at stake. The divergence between the petrographic and NAA results in both instances also has major cultural implications (e.g., movement of peoples, trade and economics, technology transfer, etc.), further highlighting the need to apply the appropriate scientific methodologies.

The NAA results can be briefly summarized. Eighteen jar samples²⁰ unquestionably pointed to 15 of the them having been made of southern Levantine clays, centered on the Jordan Valley and the adjoining hill country plateau to the east and west in Jordan and on the West Bank. Two additional samples possibly matched clay farther south along the Rift Valley, while a third was possibly made of the loess clay of the Gaza region (i.e., Southern Palestine). Not a single Egyptian clay was even remotely related to the Scorpion I jars, although both marl and alluvial clays from the entire country were very well-represented in the database.

The southern Levantine origin of the jars in Scorpion I’s tomb was in good agreement with other findings, which provided collaborative

¹⁹N. Porat and Y. Goren, *Petrography of the Naqada IIIa Canaanite Pottery from Tomb U-j in Abydos*, pp. 466-481 in *Umm el-Qaab II: Importkeramik aus dem Friedhof U in Abydos (Umm el-Qaab) und die Beziehungen ägyptens zu Vorderasien im 4. Jahrtausend v. Chr.* by U. Hartung, German Institute of Archaeology at Cairo Archaeological Publications 93, Mainz: P. von Zabern, 2001; *idem*, *Petrography of the Naqada IIIa Canaanite Pottery from Tomb U-j in Abydos*, pp. 252-270 in *Egypt and the Levant: Interrelations from the 4th through the Early 3rd Millennium B.C.E.*, eds. E. C. M. van den Brink and T. E. Levy, London and New York: Bloomsbury T&T Clark, 2001.

²⁰P. E. McGovern, *The Origins of the Tomb U-j Syro-Palestinian Type Jars as Determined by Neutron Activation*

Analysis, pp. 407-416 in *Umm el-Qaab II: Importkeramik aus dem Friedhof U in Abydos (Umm el-Qaab) und die Beziehungen ägyptens zu Vorderasien im 4. Jahrtausend v. Chr.* by U. Hartung, German Institute of Archaeology at Cairo Archaeological Publications 93, Mainz: P. von Zabern, 2001; P. E. McGovern, U. Hartung, V. R. Badler, D. L. Glusker, and L. J. Exner *The Beginnings of Winemaking and Viniculture in the Ancient Near East and Egypt*, *Expedition* 39 (1997), pp. 3-21 (<https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/04/The%20Beginnings.pdf>, accessed 2/28/2020).

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evidence that the NAA results were correct. Organic residue analysis showed that the jars had originally contained a resinated grape wine,²¹ which had been liberally infused with southern Levantine herbs (balm, senna, coriander, germander, mint, sage, and/or thyme) that did not grow in Egypt (except possibly senna and sage).²²

Most tellingly, neither the wild nor the domesticated Eurasian grape (*Vitis vinifera*) grew in Egypt at this early period.²³ Any wine therefore had to have been imported from abroad, and, in keeping with Occam’s Razor and common sense, the southern Levant was the nearest and most likely possibility. According to archaeobotanical findings at sites in the Jordan Valley, a wine industry had been established there as early as ca. 4000 B.C., and large-scale production is attested in the EBA at sites along the Transjordanian eastern side of the Dead Sea.²⁴ A special peculiarity of the wine in the Scorpion I jars was that 11 of them uniquely contained sliced and perforated figs, and figs were especially prominent in the botanical assemblages at the Dead Sea sites.

Only several hundred years later did the Egyptians initiate their own wine industry in the

Nile Delta, probably under the tutelage of Levantine peoples, later denoted as the Canaanites. One might again argue for a two-stage process in the transfer of the wine industry from the Levant to Egypt, albeit over a millennium earlier than the Hyksos phenomenon. First, the domesticated grape and vinicultural expertise were transferred from farther north in the mountainous Levant, where the earliest evidence of winemaking is ca. 6000 B.C.,²⁵ to the Jordan Valley and environs several thousand years later, at least by ca. 3500 B.C. In the second phase, the domesticated grape and necessary technology for winemaking were introduced into Egypt after approximately another 500-1000 years, ca. 3000 B.C.

The style of the Scorpion I wine jars themselves supplied further clues about where the wine had been made, on the reasonable assumption that both the pottery and the wine originated from the same general area. Their decorations of smeared red and white slips, narrow painted bands, or dramatic, swirling “tiger-stripes” set them apart from anything made in Egypt. Only one time period and area fit the bill: an early phase of the EBA (specifically, EB IB, equivalent to Naqada IIIa2 in Egyptian chronology), at sites in the

²¹P. E. McGovern, D. R. Glusker, and L. E. Exner, The Organic Contents of the Tomb U-j Syro-Palestinian Type Jars: Resinated Wine Flavored With Fig, pp. 399-403 in *Umm el-Qaab II: Importkeramik aus dem Friedhof U in Abydos (Umm el-Qaab) und die Beziehungen ägyptens zu Vorderasien im 4. Jahrtausend v. Chr.* by U. Hartung, German Institute of Archaeology at Cairo Archaeological Publications 93, Mainz: P. von Zabern, 2001 (<https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/04/UmmelQaab.pdf>, accessed 2/28/2020).

²²P. E. McGovern, A. Mirzoian, and G. R. Hall, Ancient Egyptian Herbal Wines, *Proceedings of the National Academy of Sciences USA* 106 (2009), pp. 7361-7366 (<https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/04/PNASEgyptherb.pdf>, accessed 2/28/2020);

P. E. McGovern, et al., Anticancer Activity of Botanical Compounds in Ancient Fermented Beverages (Review), *International Journal of Oncology* 37 (2010), pp. 5-14 (<https://www.penn.museum/sites/biomoleculararchaeology>

[/wp-content/uploads/2010/03/AnticancerIJO.pdf](https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/03/AnticancerIJO.pdf), accessed 2/28/2020).

²³P. E. McGovern, *Ancient Wine: The Search for the Origins of Viniculture*, Princeton: Princeton University, 2003/2006/2019, pp. 91-106; P. E. McGovern, *Uncorking the Past: The Quest for Wine, Beer, and Other Alcoholic Beverages*, Berkeley: University of California, 2009/2010, pp.165-170.

²⁴C. E. White, D. M. McCreery, and F. H. Toro. Crop Storage, Processing, and Cooking Practices at Numayra: The Plant Remains, in R. T. Schaub, W. Rast, and M. S. Chesson, eds., *Numayra: Excavations at the Early Bronze Age Townsite in Jordan, 1977-1983*, Winona Lake, IN: Eisenbrauns, 2020, pp. 370-394.

²⁵P. E. McGovern, et al., Early Neolithic Wine of Georgia in the South Caucasus, *Proceedings of the National Academy of Sciences USA* 114 (2017): E10309–E10318 (<https://www.pnas.org/content/pnas/114/48/E10309.full.pdf?with-ds=yes>, accessed 2/28/2020).

vicinity of Gaza on the southern Levantine coast, in the inland Jezreel and Jordan Valleys, and in the hill country of Transjordan, as far south as the Dead Sea sites of Bab edh-Dhra' and Numayra.

The southern Levantine stylistic affinities of the jars were further corroborated by numerous clay sealings scattered in and around the jars. They had apparently been originally attached as labels by strings that held down an organic cover, such as leather, over the mouth of each jar, which then disintegrated and caused them to fall to the floor. The sealings displayed finely cut cylinder seal impressions of distinctively non-Egyptian types, which combined free-flowing designs of animals (including antelope, fish, birds, and snakes) with geometric patterns. A thorough search of the archaeological literature revealed no exact matches for them, but the closest parallels pointed again to the northern Jordan Valley and the eastern shore of the Dead Sea.

With such a wealth of evidence from a wide range of disciplines—NAA, organic residue analysis, pottery typology, art history, etc.—for the importation of the Scorpion I wine jars from the southern Levant, it came as a shock to this writer when Porat and Goren claimed that of “about 130” jars that they examined petrographically, all were made from a local arkose clay bed in a single workshop, likely at Abydos itself. The Scorpion I jars’ thin-sections were also checked against 8000 clay and pottery samples from the southern Levant. When no convincing matches could be made, the southern Levant was ruled out in favor of a geological map showing that the requisite clay was located in the Abydos area. It is said to be a marl containing arkose. As Goren emailed me in January 1997: “Minerals of igneous origin can be derived, as single fine sand particles, by aeolian forces inland. However, in the case of the pottery from Abydos we are dealing with arkose, that is to say very coarse matter with granitic

particles sizing 3 mm and sometimes even more. The particles are angular, indicating a short distance from their mother rock.”

Yet, as Wnuk expands upon and makes clear in his Addendum, Goren appears not to understand what arkose is in geological terms

The issue of arkose in Goren’s analyses is not restricted to Abydos. It has seemingly played a large part in many of Goren’s petrographic analyses. For example, Goren claims that Moza clay from Jerusalem and the central hill country of the West Bank was used to make EB IV pottery found in the Negev, some of the imported MBA pottery from Tell el-Dab’a, and a group of LB Amarna tablets.

As was my usual methodological practice when the NAA results appeared to disagree with another method’s results, this writer proposed to Goren that some of his “Abydos” samples be run by NAA. When analyzed, they again matched the southern Levant profiles.

Some 15 years after the start of debate over the provenance of the Scorpion I jars, another petrographer, Mary Ownby, stepped forward. Her “new petrographic perspective” argues for a non-Egyptian origin for the jars.²⁶ Only four U-j jars, which had also been examined by Porat and Goren, were studied, but all were interpreted as coming from the northern Levant. While Ownby’s results disagreed with the NAA findings for a southern Levantine origin, they at least concurred in establishing that Levantine, not Egyptian, clays were most likely used in making the Scorpion I jars.

Whether Ownby’s hypothesis of a northern Levantine origin holds up is still in question. Regrettably, her study is methodologically compromised by its very small database (a total

²⁶U. Hartung, C. Köhler, V. Müller, and M. F. Ownby, *Imported Pottery from Abydos: A New Petrographic Perspective*, *Ägypten und Levante* 25 (2016), pp. 295-334

(<https://doi.org/10.1553/AEundL25s295>,
2/28/2020).

accessed

of 20 sherds for several EB subphases). No clay or mineral collections were done in the field for comparison, but geological maps were instead referred to in establishing the putative region of origin, viz., the northern Levantine coastline, specifically Byblos. Most of the text was written by an associate of Bietak at the Institute of Egyptology at the University of Vienna and published in his journal, in keeping with his focus on the northern Levant. While this writer might wish it were so, having long argued that the Canaanites and Phoenicians of this region were the principle conduit for viniculture throughout the Mediterranean (most recently, in the new edition of *Ancient Wine*; see footnote 7), the NAA results show no matches, not even a slight chemical hint, for a northern Levantine provenance. Admittedly, however, samples were taken from different jars in Ownby’s study than those tested by NAA.²⁷ Meanwhile, the evidence for winemaking and pottery and sealing parallels to the Scorpion I jars continue to accumulate for the southern Levant (e.g., see footnote 23).

6. Does Bietak Now Agree with the NAA Results?

As it turned out, many researchers, especially associates of Bietak and including Mary Ownby at one time,²⁸ accepted Goren’s and Aston’s arguments and conclusions for the northern Levantine origin of the vast majority of the Tell el-Dab’a imported pottery, as presented in their book reviews and articles. A very recent critique of the NAA results in favor of the petrographic

viewpoint comes from Bietak in his review²⁹ of the published Ph.D. dissertation by A.-L. Mourad. Bietak points out that Mourad approaches the Hyksos question of origins from an archaeological and textual standpoint. As such, one can ask whether she is sufficiently qualified to pass judgment on whether the petrographic results should take precedence over those based on NAA. Yet, relying principally on the critiques by Goren and Aston, she accepts the petrographic conclusion that the primary ties of Tell el-Dab’a were with the northern Levant throughout the MBA. Bietak concurs when he writes “the author stresses that there is no evidence for a southern Levantine origin.”

But how is Bietak’s assessment to be reconciled with the following statement earlier on in his review: “Only in the late 13th Dynasty did imports from the southern Levant arrive in growing numbers, until during the Hyksos Period the percentage imported from the north fell dramatically.” This is a strong statement, yet to be explained, that appears to agree with the principal conclusions of the NAA study presented here. It accords with the founding of Ashkelon and other major city-states in the Gaza region earlier in MB IIA, followed by the growth of Tell el-Dab’a later in the period with the emergence of close trading ties with Southern Palestine. Bietak’s statement, however, goes against the petrographic data and their interpretation that the northern Levantine influence on Tell el-Dab’a far exceeds that of Southern Palestine throughout the MBA, from early in MB IIA and continuing

²⁷Dr. Ownby now informs me that she has carried out petrographic analyses of an additional 14 Scorpion I jars, some of which have affinities with western Galilee (Moza clay) and Iron II pottery wares from the Wadi Arabah. A joint publication by her and Ulrich Hartung, on the new results is to appear in 2020.

²⁸Although Dr. Mary Ownby has rejected Goren’s results for the Scorpion I jars, she was initially of this persuasion: cf. M. F. Ownby, *Canaanite Jars from Memphis as Evidence for Trade and Political Relationships in the Middle Bronze Age*, unpublished Ph.D. dissertation, University of Cambridge, 2010, pp. 178-180, *passim*. The

same criticisms of our NAA article were repeated in M. F. Ownby and J. Bourriau, *The Movement of Middle-Bronze Age Transport Jars: A Provenance Study Based on Petrographic and Chemical Analysis of Canaanite Jars from Memphis, Egypt*, pp.173-188 in *Interpreting Silent Artefacts: Petrographic Approaches to Archaeological Ceramics*, ed. P. S. Quinn, Oxford: Archaeopress, 2009.

²⁹M. Bietak, review of A.-L. Mourad, *The Rise of the Hyksos, Egypt and the Levant from the Middle Kingdom to the Early Second Intermediate Period*, *Bibliotheca Orientalis* 75 (2018), pp. 229-248.

through the Hyksos 15th Dynasty up until the end of the period.

Bietak’s apparent about-turn fits with his accommodation to or diminishment of scientific data when they are in accord or disagree with his strongly held theories. As another example, he was willing to accept physical anthropological evidence from Tell Kamid el-Loz in the Beqaa Valley of Lebanon that supposedly showed a close genetic relationship between Iron Age males of that northern region with the MBA Tell el-Dab’a male population, who then married local Nile Delta women.³⁰ Yet, a recent paper³¹ argues for the opposite. Based on strontium isotope ratios of human tooth enamel from Tell el-Dab’a skeletons, the women appear to be of non-local Levantine origin (perhaps from Southern Palestine?), who then married into the local ruling Hyksos family. Comparative studies remain to be done for Levantine sites and areas. While claiming to be “the first to use archaeological chemistry to directly address the origins of the enigmatic Hyksos Dynasty,” it overlooks this study.

Dr. Bietak follows the same approach when he endorses Goren’s petrographic arguments that the imported pottery at Tell el-Dab’a came from the northern Levant, because those data and their interpretations fit with his hypothesis that the Hyksos settlers of Tell el-Dab’a originated from there. By the same token and without adducing any cogent scientific explanation, he is willing to deprecate the NAA data. Now, it seems that he is ready to reject the petrographic data for the Hyksos period in preference to “imports from the southern Levant,” without providing his evidential basis and when previously he used those data to discredit the NAA data (see footnote 3).

³⁰M. Bietak, *Avaris, The Capital of the Hyksos: Recent Excavations at Tell el-Dab’a*. London: British Museum, 1996, p. 36.

³¹C. Stantis, et al., Who Were the Hyksos?: Challenging Traditional Narratives Using Strontium Isotope (⁸⁷Sr/⁸⁶Sr)

7. Finding a Way Forward

It bears repeating that scientific method starts with a well-ascertained and robust dataset from which “working hypotheses” are induced (for a fuller discussion of what follows, see footnote 4). If you are on the right track, you should then be able to deduce other consequences, which, if confirmed, strengthen your case. Like a modern forensic science investigation, the smallest, most unintentional piece of evidence—a bit of DNA or a smattering of grape juice on the floor—may be most compelling. One thing you try to avoid is dismissing meaningful data, like the NAA corpus, or cull your data by only citing questionable petrographic data, to support your theories.

These recommendations for working hypothesis construction and testing are very important for a historical science like archaeology, whose interpretations are based on an often highly compromised and constricted body of evidence (as a result of degradation, contamination, and/or disturbance), truly buried in the past, where replicative experiments, the hallmark of the hard sciences, cannot be carried out; the latter can only be approximated to by experimental archaeology. The temptation to hold on to a poorly substantiated theory, despite mounting contrary evidence, is also greater in archaeology than in the physical sciences. If you make a mathematical mistake or misapply an equation in physics or chemistry, disastrous consequences might result in the real world, such as a bridge collapsing or a rocket blowing up. In archaeology where the effects of a misguided theory are less apparent, the primary check on speculation is the application of sound scientific methodology.

Bietak is to be commended on his stratigraphical

Analysis of Human Remains from Ancient Egypt, *PLOS ONE* 15(7) (2020), e0235414 <https://doi.org/10.1371/journal.pone.0235414>, accessed 7/19/2020).

excavation and full publication of Tell el-Dab`a, which serves as a key touchstone in Egyptian-Levantine relations during the MBA. His use of data and interpretations from the natural sciences, however, is less convincing. His attempt to impede the publication of the NAA data and a contrary viewpoint to his own, reported on in this volume, and his widely disseminated skepticism of its conclusions in the literature do not promote the pursuit of objective truth in a collegial, scientific fashion (compare footnote 17).

This writer did the best he could with the archaeological samples that were passed on to him by Bietak, who personally chose most of the Tell el-Dab`a samples and who conferred closely on the sampling of MBA pottery from sites throughout Syria-Palestine carried out by Mrs. Joan Huntton, a member of his staff and from whom this writer took over the project after her death. The regrettable limitations of the Byblos evidence are specifically pointed out in the book (pp. 9, 29, and 70). This writer went to considerable lengths to apply powerful statistical tests, however, to the available data. The small Byblos group was clearly shown to differ from the Southern Palestine group and be closer to better-defined groups in the northern Levant and Jordan (compare the dendrogram, Fig. 2, and the principal component plot, Fig. 14, in this volume).

While I remain convinced of the central tenet of this book that Southern Palestine had the closest relationship with Tell el-Dab`a of any region in Syria-Palestine beginning in later MB IIA and continuing through the remaining phases of the MBA, based on the samples made available to me, I do not rule out the possibility of a more active role by sites in the northern Levant, especially Byblos, with Tell el-Dab`a in late EB IV and early MB IIA (see above). I can even envision a further modification of the two-stage

hypothesis in which Canaanites from Byblos first made their way by ship to Southern Palestine and helped establish city-states there, and that some of their descendants later moved on to the eastern Nile Delta. Classical authors describe such a migration some 1000 years later when the Iron Age Phoenicians—probably descendants of the Bronze Age Canaanites-- fled from Tyre by ship to found the colony of Carthage. But the Bronze Age scenario remains to be proven.

What we do know is that if one went in search of another site in the Levant that explained the Hyksos phenomenon at Tell el-Dab`a, you would be hard pressed to find a better candidate than Ashkelon (above). Prior to Lawrence Stager’s death in 2017, our follow-up testing of the 50 pottery sherds from Ashkelon had already been put on a backburner by the project, as Goren’s petrographic results came to play the principal role in establishing the foreign relations of the site. The recent publication of the Middle Bronze Age volume³² does not mention the NAA results for either Tell el-Dab`a or Ashkelon nor does it cite this NAA volume. Yet, throughout the latter publication—whether one examines the stratigraphy, Levantine pottery types and technology, Egyptian imported pottery and seals, foreign connections, burial customs, etc.—the correspondence between the two sites is remarkably similar. This can hardly be an accident, and is best explained, in my opinion, by the two-stage working hypothesis.

The inferences drawn from the NAA analyses, as summarized and discussed in Chapter 6 of this BAR volume, continue to pass one crucial follow-up test after another. As this writer concluded on page 83 of this book:

It is rare that a technical pottery study entails rewriting history, or, at least, archaeological hypotheses. But according to the Neutron Activation Analysis results presented here, the very

³²*Ashkelon 6: The Middle Bronze Age Ramparts and Gates of the North Slope and Later Fortifications*, Final Reports of The Leon Levy Expedition to Ashkelon, eds. L. E.

Stager, J. D. Schloen, and R. J. Voss, University Park, PA: Pennsylvania State University Press and Eisenbrauns, 2018. Hereafter cited as *Ashkelon 6*.

earliest contacts of the "Hyksos" at Tell el-Dab'a/Avaris were overwhelmingly with its nearest Levantine "neighbors" in Southern Palestine and not farther north, and this pattern continued throughout the MBA. [N.B.: Although contacts between Southern Palestine and Tell el-Dab'a had already begun in later MB IIA, the "Hyksos" period proper belongs to MB IIB-IIC.]

8. Looking Back

Some readers may wonder why it has taken so long to present a rebuttal to the reviews and comments of Drs. Bietak, Goren, Aston, and others. Primarily, I was not competent enough in petrography and geology to present a cogent and fair review, and, secondarily, organic residue analyses had become my principal endeavor.

I was certainly too cautious in my response at the time, especially in light of what followed. I hoped that the disparities between the NAA and petrographic results would eventually be resolved, and that it would be concluded that the NAA results for a Southern Palestine provenance for most of the imported pottery at Tell el-Dab'a was correct (omitting the early MB IIA which was admittedly not well represented in the NAA database, but showed some evidence for northern Levantine connections to Tell el-Dab'a). I also hoped that other petrographers would step forward and point out the inadequacies of Goren's methodology, or that some archaeologists or textual scholars might take issue with the petrographic results.

My hopes proved wrong. Opinion swung strongly to Goren's side, and remains there,

³³K. Kopetzky's acceptance of the petrographic assignments of pottery imports at Tell el-Dab'a by Goren and Cohen-Weinberger and then equating those results to low-microscopic visual identifications of pottery at Ashkelon and sites in the northern Levant, without confirmatory petrographic or chemical analysis, is a case in point. See *Ashkelon* 6, pp. 209-236 and Tell el-Dab'a and Byblos: New Chronological Evidence, *Ägypten und Levante* 28 (2018), pp. 309-358 (<https://www.jstor.org/stable/26664995?seq=1>, accessed

mainly in archaeological circles.³³ A discussion by Drs. Daphna Ben Tor and Lanny Bell of the clay sealings, which were impressed with Egyptian scarabs, from the Moat Deposit at Ashkelon,³⁴ further illustrates the problem. Unpublished petrographic results by Goren are cited as being authoritative, whereas the unpublished NAA results of which I had informed Drs. Stager and Ben-Tor in advance of Goren's petrographic analysis go unmentioned. According to the NAA results, three out of five sealings that were studied had been made in Southern Palestine (one most likely at Ashkelon itself). Two sealings were of uncertain origin. No Egyptian "matches" were documented for any of the samples.

In Dr. Ben-Tor's defense, however, she was primarily concerned about whether or not the sealings had been made in Egypt or the southern Levant. She was also obliged to follow Stager's argumentation in his book. Goren's petrographic results appeared to provide the necessary support for the sealings having been made in the southern Levant, although his data are yet to be published and he has sometimes been wrong about whether a pottery vessel was made of an Egyptian or Palestinian clay (see above, concerning the Scorpion I jars). Moreover, she has long held that the NAA results should have priority over the petrographic results, especially as concerns the northern Levant (see footnote 8).

The Ashkelon sealings are unique to Southern Palestine, apart from a single sealing stamped with an Egyptian private-name scarab from Tell

2/28/2020). Such "evidence" leads her to re-date the Royal Tombs I-III at Byblos to the Hyksos period, contrary to the very strong scarab, NAA, metallurgical, and other evidence to the contrary, presented here.

³⁴*Ashkelon* 6, pp. 337-381; see especially pp. 337-339. A total of 41 sealings were recovered from an ashy layer (2.56.L17) deposited in the moat. Three additional sealings were recovered from later phases 12-10.

el-`Ajjul, often argued to be Sharuhēn (although other locations have been suggested including Gaza City itself, now covered by a modern city). Sharuhēn, which was captured by Ahmose I after a three-year siege at the beginning of the LBA, was a major stronghold in Southern Palestine to which the Hyksos had retreated to from Avaris, according to the autobiography of Ahmose, son of Ibana.

While Goren’s petrographic results are generally in accord with the NAA results in this instance, one needs to see his evidence before accepting his results of “local” production for the Ashkelon corpus of 41 sealings. For example, it has not been possible to interrelate the two sealings of “uncertain origin,” according to the NAA data, to Goren’s results. The fact that these two sealings had unusually high amounts of calcium (upwards of 40%) could indicate that large amounts of calcite or another calcium-containing mineral was mixed with the clay as temper, and that once a correction is made for this, the NAA data will fall in line with the those of the other three “local” sealings. Another issue is just how extensive “local” is: does it refer only to Ashkelon or a larger area within the Gaza group of MBA sites? If the latter, it is possible that some of the containers come from elsewhere within the region, such as Sharuhēn.

One of the sealings was impressed on the stopper of a juglet, a practice unrecorded in Egypt and that appears to have been unique to Southern

Palestine. Intriguingly, the similarly unique Palestinian practice of stamping a handle with a scarab was attested on a Second Intermediate Period Canaanite Jar of MB IIB-IIC date (JH091: Fig. 61), excavated at Tell el-Dab`a. The NAA results confirm that the jar was an import from Southern Palestine. Goren and Cohen-Weinberger’s petrographic result was that the vessel came from “Lebanon east of the coast line Beirut–Byblos.” They “cautiously suggest” (“Daba Petrography,” p. 84) that the scarab and jar is that of a Byblian prince, which fits well with Bietak’s theory.

The hieroglyphic inscription of the scarab reads *ḥ3ty-`shimw*, “ruler [of] shimu,” and is variously interpreted as referring to a city-state or individual in the northern Levant (perhaps Damascus or the latter’s prince³⁵) or Southern Palestine (e.g., Sharuhēn—this monograph, page 33). Ben-Tor makes a strong case that the stamped jar must originate from Palestine, because stamped handles only occur there (apart from imported jars at Tell el-Dab`a and Lisht) and because there is not a single private-name scarab of a Byblite or other northern Levantine prince after the late Middle Kingdom (personal communication, Feb. 21, 2001). She also informed me in the same email that *ḥ3ty-`* on Byblite scarabs is always accompanied by the name of Byblos and that royal-name scarabs are as yet unattested in the northern Levant following the Middle Kingdom.³⁶ She concluded by stating: “I strongly believe the jar comes from Palestine.” That inference can now be narrowed

³⁵M. Bietak, *Historische und archäologische Einführung*, pp. 17-57 in *Pharaonen und fremde Dynastien im Dunkel*, 194th special exhibition, Vienna: Museums of Vienna, 1994; *idem*, M. Bietak, *Avaris, The Capital of the Hyksos: Recent Excavations at Tell el-Dab`a*. London: British Museum, 1996, pp. 60-63.

³⁶D. Ben-Tor, Scarabs of Middle Bronze Age Rulers of Byblos, pp. 177-188 in *Bilder als Quellen/Images as Sources: Studies on Ancient Near Eastern Artefacts and the Bible Inspired by the Work of Othmar Keel*, eds. S. Bickel, R. Schurte, and C. Uehlinger, *Orbis Biblicus et Orientalis Sonderband*, Fribourg Switzerland: Academic Press and

Göttingen: Vandenhoeck & Ruprecht. N.B.: In this article, as well as in other publications, Ben-Tor cites this monograph and a related article: P. E. McGovern and G. Harbottle, “Hyksos” Trade Connections between Tell el-Dab`a [Avaris] and the Levant: A Neutron Activation Study of the Canaanite Jar, pp. 141-157 in *The Hyksos: New Historical and Archaeological Perspectives*, ed. E. Oren, University Museum Monograph 96, Philadelphia: University of Pennsylvania Museum, 1997 (<https://www.penn.museum/sites/biomoleculararchaeology/wp-content/uploads/2010/03/hyksotrade8.pdf>, accessed 2/28/2020).

down to Southern Palestine to a very high level of probability according to the NAA results.

The amazing group of sealings bears out the hypothesis that the earliest significant contacts between Southern Palestine and the eastern Nile Delta were in later MB IIA and the transitional MB IIA-IIB subphase, in accord with the NAA results and associated evidence, especially scarabs. The discovery fits with the two-stage hypothesis of, first, the building of city-states in Southern Palestine, earlier in MB IIA, and then the movement of people, given an ever-expanding population, from Southern Palestine to the eastern Nile Delta.

The key questions are: (1) how did the sealings function within this general historical framework and specifically in the administration of Ashkelon; and (2) when were they used and then disposed of within this extended time span? Considerable disagreement exists about the origin, dating, and interpretation of the ashy deposit with the sealings (2.56.L17). Ross J. Voss, who personally supervised the sealings' excavation and documentation, initially interpreted the ashy deposit as a “fill” between phases 14 and 13.³⁷ He later argued that the deposit was intentionally laid down for consolidating and protecting against erosion.³⁸ He interpreted the large amount of pottery, 70,000+ whole and fragmentary bones including the front half of a donkey skeleton, and extremely disparate artifacts (bone inlay, copper-based artifacts, crucible and tuyère fragments, pieces of alabaster vessels, beads, an ostrich eggshell button, loom weights, etc.) as likely debris from the cooking fires of the workers who had dug out the moat and constructed the phase 14 fortifications.³⁹

This writer is of the opinion that Ross Voss' initial interpretation of the ashy deposit as a later fill is more likely. If the goal of the builders in using ash was to prevent erosion, then they would most likely have separated out as much of the miscellaneous materials as possible in advance, to increase the surface area of the ash for water retention. If so, this fill and an overlying deposit of kurkar (aeolian quartz sandstone) are better interpreted to be the foundational build-up for the new street that ran between the glacis and moat and served as the indirect approach to Gate 3 of subphase 13C. The moat of this subphase then had to be expanded outwards by excavating the kurkar bedrock, to compensate for the loss in its width because of the street foundation.

Further evidence for this interpretation is provided by seven sealings that refer to and evidently were used to seal a silo and doors of buildings⁴⁰ elsewhere on the tell. Their existence implies that the ashy fill originated from a refuse dump, which included materials of such structures, and/or from the clearance of these structures after they had been destroyed by accidental fire or during a battle. More excavation of the tell is needed to resolve this issue.

More stringent stratigraphical control and pottery typological analysis is also required to establish the relative dating of 2.56.L17. For example, an important piece of evidence is the phase 13C street leading to Gate 3 (2.56.LF13, and 2.67.LF16 and 18 and 19 = 2.76.L163 and 2.76.L168, respectively), which was also made up of considerable ash, miscellaneous materials and three sealings.⁴¹ The street appeared to seal off

³⁷*Ashkelon* 6, p. 104. Besides the cited references, the following discussion benefited greatly from an extensive email exchange with Ross Voss and Daniel Master.

³⁸*Ashkelon* 6, pp. 31, 33, 56, 337 (footnote 2), and 383.

³⁹*Ashkelon* 6, pp. 31 and 33.

⁴⁰*Ashkelon* 6, pp. 387 and 389-390.

⁴¹*Ashkelon* 6, p. 45.

2.56.L17, thus fitting with the interpretation that the context should be assigned to phase 14. However, extensive later rebuilding of the fortifications, including deeply cut foundation trenches and retaining walls, and Philistine pitting operations left only “narrow strips” of the streets,⁴² thus throwing this interpretation into question. Moreover, it appears that the phase 13A street went out of use in phase 13B and its refurbishing or rebuilding is unclear.⁴³ Other streets and contexts associated with the gateways of phases 13A and 12, which might have provided confirmatory evidence for the hypothesis, were similarly compromised by phase 11 construction.⁴⁴

The upshot of these stratigraphical considerations, in conjunction with the uncertainty about the pottery typological synchronisms between Ashkelon and Tell el-Dab`a,⁴⁵ is that ashy deposit 2.56.L17 might well belong to some unspecified time in phase 13 or even phase 12, quite possibly extending into the later transitional MB IIB-IIC subphase. According to this interpretation, the more formidable fortifications of phase 13C whose gate was approached indirectly by the ashy street, might even have been rebuilt in response to ongoing warfare during later MB IIA or the transitional period between Ashkelon (and perhaps a larger coalition of Southern Palestine city-states) and an Egyptian power based in the Nile Delta, such as at Tell el-Dab`a/Avaris that

eventually culminated in the Hyksos 15th Dynasty there.

Bietak has variously argued for major changes in population size and the architectural layout of residences and religious structures between strata H (d2) and G4 (d1), between the latter and G1-3 (c) due to a hiatus in occupation, and between the latter and F (b3) as the possible result of an epidemic.⁴⁶ In explaining these incongruities, he has hypothesized at least two major Canaanite incursions into Tell el-Dab`a.⁴⁷

Conversely, this writer would hypothesize, based on the available, admittedly limited, evidence, that a successful military campaign of a late 13th or 14th Dynasty ruler into Southern Palestine led to the takeover of Ashkelon and the adoption of Egyptian administrative practice, which included the sealing of boxes, special stone and pottery vessels, doors and silos, etc. with official Egyptian scarabs. Note that one of the officials, attested on two sealings in the corpus, was probably Senbi,⁴⁸ the well-known treasurer and one of the most powerful officials under the 13th Dynasty kings Neferhotep I and Sobekhotep IV (mid-late 18th century B.C., according to the lower historical chronology).

If there were indeed such an Egyptian take-over of Ashkelon, it might eventually have been followed by a counterattack of Southern Palestinian forces on both Ashkelon and Tell el-Dab`a, which might explain why the Egyptian administrative system evidently ended⁴⁹ and new,

⁴²*Ibid.*

⁴³*Ashkelon* 6, p. 56.

⁴⁴*Ashkelon* 6, p. 65.

⁴⁵See footnotes 5, 6, and 9.

⁴⁶M. Bietak, Egypt and Canaan during the Middle Bronze Age, *Bulletin of the American Schools of Oriental Research* 281 (1991), pp. 21-72 (<https://doi.org/10.2307/1357163>, accessed March 17, 2020).

⁴⁷M. Bietak, *Avaris and Piramesse: Archaeological Exploration in the Eastern Nile Delta*, reprinted with rev.

postscript and bibliography, London: British Academy, 1986, pp. 244 and 256.

⁴⁸W. Grajetzki: *Court Officials of the Egyptian Middle Kingdom*, London: Duckworth, 2009.

⁴⁹Two later sealings came from questionable contexts in phases 11 and 10, and are probably intrusive. A third later sealing was recovered from the revetment fill of phase 12, which suggests a continuation of Egyptian occupation into that phase. See *Ashkelon* 6, pp. 337 and 378-381.

stronger fortifications were built at Ashkelon. Correspondingly and perhaps contemporaneously, this explanation might help explain one of the stratigraphical incongruities at Tell el-Dab’a. This general hypothesis is in accord with the interpretation of 2.56.L17 as destruction debris fill following a Southern Palestinians victory over the occupying Egyptians, followed up by the invasion of the Delta, the capture of Tell el-Dab’a, and the settlement of their own people.

Drs. Ben-Tor and Bell concur that the best explanation for the Ashkelon sealings and other scarab evidence—as well as the NAA findings—is that the Egyptian administrative practice of using seals was in place at Tell el-Dab’a in the late Middle Kingdom.⁵⁰ Some elements of this practice were then transferred to Ashkelon by a local ruler who independently adopted the system, or it was imposed by an outside power based in the Delta. An autonomous development is comparable to rulers at Byblos enclosing their hieroglyphic names in cartouches and using Egyptian royal epithets at about the same time.⁵¹ A amuletic function might have complemented any political function.

Since historical inferences need to be undergirded by accurate dating, it is hoped that additional radiocarbon determinations for phases 14 and 13

will soon be forthcoming, as they already have for phases 12-10.⁵² To further clarify the purposes, origins, and the extent of the Egyptian administrative system in Southern Palestine. follow-up NAA tests, especially of pottery vessels on which the sealings were used, including 9 jugs, and two kraters with bowl lids, and one krater,⁵³ as well as organic residue analysis to determine what the vessels contained. The question also remains whether such hypothesized administrative practices continued into Hyksos times in Southern Palestine.

9. The All-Important Scarab Evidence for the Hyksos Period in the Southern Levant

While the Ashkelon sealings shed new light on Egyptian-Southern Palestine relations in the pre-Hyksos period (later MB IIA and the transitional MB IIA-IIB subphase), Dr. James M. Weinstein had already made the important discovery that those relations continued to intensify during the Hyksos period proper (MB IIB and MB IIC), again citing scarab and sealing evidence that also bear on yet-to-be-defined administrative procedures. In his 1981 article,⁵⁴ he documented the names of five or six Hyksos rulers that appear on 38 scarabs and sealings, which were excavated at MB IIB and MB IIC southern Levantine sites. Many of the scarabs were even likely made at Tell el-Dab’a itself.⁵⁵ Most significant for Hyksos

⁵⁰*Ashkelon* 6, pp. 338-339.

⁵¹D. Ben-Tor, Some Observations on Egyptian-Levantine Relations in the Middle Kingdom [tentative title], Metropolitan Museum of Art exhibition “Ancient Egypt Transformed: The Middle Kingdom,” 2014-2015, forthcoming.

⁵²H. J. Bruins and J. van der Plicht, The Minoan Santorini Eruption and its 14C Position in Archaeological Strata: Preliminary Comparison Between Ashkelon and Tell El-Dab’a, *Radiocarbon* 59 (2017), pp. 1295-1307 (<https://doi.org/10.1017/RDC.2017.88>, accessed 317/2020); *idem*, Radiocarbon Dating Comparée of Hyksos-Related Phases at Ashkelon and Tell el-Dab’a, pp. 353-368 in *The Enigma of the Hyksos*, vol. 1, eds. M. Bietak and S. Prell, Contributions to the Archaeology of

Egypt, Nubia and the Levant, vol. 9, ed. M. Bietak, Wiesbaden: Harrassowitz, 2019.

⁵³*Ashkelon* 6, pp. pp. 385, 387-389, 404-411, 416-420, and 425-426.

⁵⁴J. M. Weinstein, “Egyptian Empire,” see especially, figures 2 and 3. Note that the number of such finds continues to increase as a result of recent excavations.

⁵⁵D. Ben-Tor, *Scarabs, Chronology, and Interconnections: Egypt and Palestine in the Second Intermediate Period*, Orbis Biblicus et Orientalis., Series Archaeologica 27, Göttingen : Vandenhoeck & Ruprecht, 2007, p. 104; Mlinar, The Scarab Workshops of Tell el-Dab’a, pp. 107-140 in *Scarabs of the Second Millennium BC from Egypt, Nubia, Crete and the Levant: Chronological and Historical Implications*, eds. M. Bietak and E. Czerny, Denkschriften

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origins, these artifacts were concentrated precisely in the region of Southern Palestine that the NAA results had singled out as where most of the pottery imports at Tell el-Dab`a came from, viz., Tell el-`Ajjul, Ashkelon, Tell Jemmeh, Tell el-Far`ah South, Tell Beit Mirsim, and Lachish (this monograph, page 2 and Appendix 2). Modern clay samples from Gaza City, whose Bronze Age levels are unfortunately poorly known and under constant threat of modern development,⁵⁶ belong to the same group. The evidence for the royal-name scarabs and sealings gradually decreased as one went from south to north, until it disappeared in the area north of the Jezreel Valley, including, most notably, the northern Levant.

Weinstein concludes:

...the geographical distribution of this scarab group in its entirety suggests that the cities of southern and inland Palestine had the closest relations with Egypt in MB IIB-IIC. Such a situation agrees well with the evidence obtained from the Hyksos royal-name scarabs.... Only one Hyksos royal-name scarab and but a handful of contemporary private name-and-title scarabs have been found north of the Carmel Ridge, while the majority of these two groups of scarabs come from sites in the same geographical arc as the sites that were destroyed so violently and deserted at the end of the Middle Bronze Age or the very beginning of the Late Bronze Age. Such a situation seems hard to explain solely on the basis of coincidence or the accidents of archaeological investigation. It is therefore proposed that the principal centers of Hyksos power in Palestine were situated in the southern and inland regions of Palestine, certainly south of the Plain of Esdraelon. The Hyksos rulers who conquered Egypt, and whose homeland has at various times been placed in so many different areas of Western Asia, were simply southern and inland Palestinian

princes, and as such they were the objects of the military efforts of Ahmose, directed against their cities.

Most recently, another of Weinstein's “discoveries” (i.e., a working hypothesis inferred from the available evidence) has been borne out, viz., that uninscribed amethyst scarabs appear to be largely confined to Southern Palestine in MB IIB and MB IIC and as yet are not attested in the northern Levant.⁵⁷ The evidence for very close relations of the Hyksos with Southern Palestine continues to accumulate.

Weinstein's finding that Southern Palestine was the focus of Hyksos activity and likely where the immigrants into Tell el-Dab`a in MB IIB originated from was confirmed by Garman Harbottle and me simultaneously and independently on the same day in October 1988, based on the NAA evidence. Our messages passed in cyberspace over ARPANET (the military and university forerunner of the Internet; see Foreword to this book). We arrived at this conclusion by applying powerful statistical tests to the data obtained from the Tell el-Dab`a pottery samples in relation to the Old World database at Brookhaven lab of over 5000 samples from throughout the Near East and Egypt. We were elated when we came to the same conclusion, and immediately conveyed our results to Bietak.

The NAA results were incontrovertible (above): the Hyksos of Tell el-Dab`a were most intimately associated with Southern Palestine and, to a high degree of probability, came from there and **not**

der Gesamtkademie 35, Vienna: Austrian Academy of Sciences, 2004. Dr. Weinstein estimates that some two dozen of the known royal-name scarabs and sealings excavated in the southern Levant were made at Tell el-Dab`a (personal communication by email, May 25, 2019). He is preparing a joint publication on Tell el-Dab`a scarab workshop scarabs and other Middle Kingdom and late Middle Kingdom scarabs from the Levant with Dr. Vanessa Boschloos (personal communication by email, May 4, 2019).

⁵⁶E.g., F. Akram, In Gaza, Hamas levels an Ancient Canaanite Archaeological Treasure, *Times of Israel*, published on-line October 6, 2017

(<https://www.timesofisrael.com/in-gaza-hamas-levels-an-ancient-archaeological-treasure>, accessed 2/28/2020).

⁵⁷Compare J. Weinstein, The Chronology of Palestine in the Early Second Millennium B.C.E., *Bulletin of the American Schools of Oriental Research* 288 (1992), pp. 27–46 (see page 40, note 18) (<https://www.journals.uchicago.edu/doi/abs/10.2307/1357229>, accessed 2/28/80) and A. David, Uninscribed Amethyst Scarabs from the Southern Levant, *Bulletin of the American Schools of Oriental Research* 381 (2019), pp. 57–81 (<https://www.journals.uchicago.edu/doi/full/10.1086/703076>, accessed 2/28/80).

the northern Levant. Our only caveat with Weinstein’s analysis was that, while he argued for a “Hyksos-influenced” area south of the Jezreel Valley, we would restrict this area to the Gaza group of MBA sites (“Southern Palestine”), with trading activities radiating out from there.

10. Final Comments and Serendipity

More time is clearly needed to resolve the NAA-petrography debate. New findings have begun to run counter to Goren’s petrographic results, specifically Goren’s and Porat’s provenancing of the Scorpion I wine jars to a local Egyptian clay source (see footnotes 13, 19, 27, and 28). The Addendum to this Afterword catalogues numerous problems with his and his followers’ methodological approach to petrography, geochemistry, geology, and statistics. Goren’s and Bietak’s hypothesis of the importation of Middle Bronze IIB and MB IIC vessels from the northern Levant to Dab’a should eventually collapse. An independent, objective observer should now be able to conclude that virtually all the available evidence—scarabs, burial customs and artifacts,⁵⁸ etc., but particularly the NAA evidence—points to very close connections between Tell el-Dab’a and **only** Southern Palestine during the Hyksos period.

A seemingly fortuitous series of events led to my delving once again into the quagmire of the archaeological debate about the origin of the

Hyksos. The initial impetus came from lectures I gave for Harvard University and its Fogg Museum in October 2018 that provided me the opportunity to examine archaeological artifacts in the Semitic Museum storerooms that I had previously analyzed. In digging back through my correspondence with Stager, I also came across some previously unpublished NAA results for Ashkelon, which included the moat sealings and the testing of the Southern Palestine working hypothesis, discussed above.

A second impetus that drew me back to the Hyksos question was when Weinstein asked for my assistance in evaluating and dating an unpublished grave (1803) at Beth Shan of probable transitional MB IIA-IIB date, which included an imported late Middle Kingdom Egyptian design scarab of the Sobekhotep-group. Since only a handful of scarabs of this type have been found in early 2nd-millennium-B.C. contexts in the southern Levant and since Beth Shan had been a major focus of my Ph.D. dissertation⁵⁹ and a subsequent Museum monograph of the LB levels,⁶⁰ I was only too happy to do what I could to find out more. This scarab group dates to the early-to-middle 13th Dynasty, the time of the last phase of Middle Kingdom Egyptian contacts in the region (above), in accord with the two-phase hypothesis as based on the scarab and NAA evidence.

In exploring the Beth Shan records in the

⁵⁸In addition to pottery types, particular note should be taken of metalwork types—toggle pins, axes, daggers, etc.—showing “that during MB IIB/C, i.e., the Second Intermediate Period proper, there existed a zone of stylistic communication which embraced not the whole Levant, but only the Delta and south” and that “the distribution of weapon types within the southern Levant is broadly similar to that... [of] the main source regions for imported Levantine ceramics as reconstructed by McGovern (2000).” For citations, see G. Philip, *Tell el-Dab’a XV: Metalwork and Metalworking Evidence of the Late Middle Kingdom and Second Intermediate Period*, *Untersuchungen der Zweigstelle Kairo des Österreichischen Archäologischen Institutes*, vol. 26;

Denkschriften der Gesamtkademie, vol. 36, Vienna: Austrian Academy of Sciences, 2006, pp. 232-233.

⁵⁹P. E. McGovern, *Late Bronze Age Palestinian Pendants: Innovation in a Cosmopolitan Age*, *Journal for the Society of the Old Testament/American Schools of Oriental Research Monograph Series*, no. 1, ed. E. M. Meyers, Sheffield, Eng.: JSOT/ASOR, 1985.

⁶⁰F. W. James and P. E. McGovern, *The Late Bronze Egyptian Garrison at Beth Shan: A Study of Levels VII and VIII*, *University of Pennsylvania Museum Monograph* 85, Philadelphia: University of Pennsylvania Museum, 1993.

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Museum’s archives, I found an unpublished manuscript by my doctoral dissertation supervisor, Dr. Frances W. James. It included a discussion of the stratigraphical situation and finds of a large MBA graveyard which Gerald M. FitzGerald had excavated on the tell. Even the renewed excavations at the site by Dr. Amihai Mazar, which had reached the same levels (especially XI) as the “new” graveyard, did not know of its existence.⁶¹

In reviewing James’ manuscript, a grave in room 1803 stood out, because it was a well-defined, intact burial of a single individual, interred with his/her burial goods. Nine whole vessels (2 bowls, 5 juglets, a red-painted jug, and an amphora jug), together with a copper-based toggle-pin, rounded out the corpus. The pottery can be broadly characterized as of probable northern Palestinian and quite likely local manufacture. It should be stressed, however, that pottery typology is not an exact science, no radiocarbon determinations of the grave were made or indeed are now possible, and NAA analyses are needed to establish which vessels might be of local manufacture or were imported.⁶²

Another grave (Locus 38201) from the recent excavations,⁶³ possibly associated with the transitional MB IIA-IIB Beth Shan cemetery or somewhat later, yielded an uninscribed amethyst scarab, possibly the earliest yet found in the southern Levant, and two beads of the same material were recovered from a grave in room 1845, again of probable transitional MB IIA-IIB date and part of a probable larger cemetery of that

subphase. Amethyst scarabs began to appear in Southern Palestine slightly in advance of Hyksos influence in the region (above).

A large jar with a Levantine Painted Ware decoration similar to that of the Montet Jar⁶⁴ from Byblos, was found nearby and associated with the same room (1803) as the grave. The Montet Jar has been dated to early MB IIA and is notable for its large scarab group of late 11th-early 12th Dynasty date.⁶⁵ The Beth Shan jar may or may not be related to the burial in room 1803, since this locus has a mixed assemblage of earlier EB and later MB pottery.

These Beth Shan findings naturally led this writer to undertake a fresh appraisal of this monograph, since I had cited parallels to some of the same pottery vessel types as those from the grave in room 1803 and needed to recheck the latter, in addition to collecting *comparanda* from the many Levantine sites and tombs which have since been published. It took some time to get back up-to-speed on the latest publications, radiocarbon dating, and other matters related to this important period.

As I delved back into the NAA-petrographic controversy with Goren, I realized that I needed a professional geologist to assess that data. By another stroke of serendipity, I tracked down Dr. Wnuk, my petrographer from nearly 30 years ago, sent him an email, and within days we were back in touch. In the intervening years, he had had a fascinating career discovering coal, gold, and other mineral deposits throughout the Middle East. He was in between projects and offered to

⁶¹A. Mazar and R. A. Mullins, eds., *Excavations at Tel Beth Shean 1989-1996*, Volume 2: The Middle Bronze and Late Bronze Strata in Area R, Jerusalem: Israel Exploration Society, Institute of Archaeology, Hebrew University, 2007. Hereafter cited as *Beth Shean 2*.

⁶²Grave 1803 is now being prepared for publication by J. M. Weinstein, R. A. Mullins, and this writer.

⁶³*Beth Shean 2*, pp. 50-51, fig. 8.4.

⁶⁴O. Tufnell and W. A. Ward, *Relations between Byblos, Egypt, and Mesopotamia at the End of the Third*

Millennium B.C.: A Study of the Montet Jar, Syria 43 (1966), pp. 165-241, fig. 1, pl. 11 (https://www.persee.fr/doc/syria_0039-7946_1966_num_43_3_5872, accessed 2/28/80).

⁶⁵D. Ben-Tor, *The Absolute Date of the Montet Jar Scarabs*, pp. 1-17 in *Ancient Egyptian and Mediterranean Studies in Memory of William A. Ward*, ed. L. H. Lesko., Providence, RI: Dept. of Egyptology, Brown University, 1998.

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fully review Goren’s methodology. I now had the technical backup that I needed to move forward not just on publishing the Tell el-Dab’a pottery drawings at long last, but in carrying out a full-fledged critique of an approach and results that I have seriously questioned for many years.

Since obtaining the best data you can, developing working hypotheses to be tested, and making the results available to the larger academic world for further investigation are the prerequisites of any science, I also reinitiated contact with Dr. Glascock of the Missouri lab, to have as much of the Brookhaven and Missouri data for this study be made available on-line on the Missouri homepage. He agreed to this, and the data are now available at www.archaeometry.missouri.edu.

Archaeological petrographers have begun to move in this direction: see <https://www.levantineceramics.org/>.

The Afterword to this book, together with the pottery figures and petrographic Addendum, are intended to provide the scientific rationale for seriously questioning the petrographic claims for the origin of the Hyksos as coming from the northern Levant and, conversely, of sustaining the NAA working hypothesis that, in large part, they originated from Southern Palestine. The objective is not to be confrontational or pejorative, but rather to let the primary evidence and working hypotheses speak for themselves in the spirit of objective and congenial scientific debate. My hope is that it will lead to fruitful discussion by encouraging a reassessment of the origin of the Hyksos during the Middle Bronze Age--a time of exceptional cultural interaction, movements of peoples, trade, technological development and exchange, and urban growth in the ancient Near East, Egypt, and the Mediterranean world.

A broader goal of the Afterword is to elucidate how best to integrate scientific data and

hypotheses with archaeological, textual, and other scientific findings. Such methodological considerations are not confined to the “Hyksos” question, but are applicable world-wide through time (e.g., *re* a comparable New World debate, see footnote 17).

**TABLE 47: NAA RESULTS FOR FOLLOW-UP TEST
AND MOAT SEALINGS FROM ASHKELON⁶⁶**

PMG518 Jug rim; MB II 2.67.L17.B7+.(1) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89 NAA Provenance: ?	PMG524 Painted jug rim; MB II 2.76.L163.F163.B11+.(17) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89 NAA Provenance: Southern Palestine
PMG519 Jug body sherd; MB II 2.67.L18.F18.B19+.(6) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89 NAA Provenance: Southern Palestine	PMG525 Red-slipped body sherd; MB II 2.76.L163.F163.B11+.(27) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89
PMG520 Red-slipped jug rim; MB II 2.67.L19.B21+.(1) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89 NAA Provenance: ?	PMG526 Painted body sherd; MB II 2.76.L163.F163.B11+.(29) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89 NAA Provenance: Probably Southern Palestine
PMG521 Amphora rim; MB II 2.67.L19.B21+.(4) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89 NAA Provenance: Southern Palestine	PMG527 Red-slipped and burnished bowl; MB II 2.76.L163.F163.B11+.(33) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89 NAA Provenance: Southern Palestine
PMG522 White-slipped and painted sherd (possibly Chocolate-on-White Ware); MB II 2.67.L19.B21+.(21) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89 NAA Provenance: Southern Palestine	PMG528 Red-slipped and burnished bowl; MB II 2.76.L163.F163.B38+.(8) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89 NAA Provenance: Southern Palestine
PMG523 Cooking pot rim; MB II 2.67.L19.B21+.(25) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89 NAA Provenance: ?	PMG529 White-slipped jug rim and neck (possibly Chocolate- on-White Ware); MB II 2.76.L166.B21+.(2) Harvard Semitic Museum; Israel Antiquities Authority license no. A41/89 NAA Provenance: Southern Palestine

⁶⁶MB = Middle Bronze. Sample nos. are cited in the following order: grid no, square no., layer no., fill no., basket no. (if more than one, indicated by +.(basket no.)). The Israel Antiquities Authority license no. is followed by the year that it was issued. The pottery typological data provided by the Ashkelon expedition and Y. Goren were cursory (e.g., paint colors and other specific features were not described), and figures and/or plates were not provided to double-check the descriptions. Also, the specific MB II phases to which the samples should be assigned were not provided.

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PMG530

Jug rim and neck; MB II

2.76.L166.B21+.(4)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG531

Bichrome Painted sherd; MB II

2.76.L166.B21+.(5); MB II

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG532

Cooking pot rim; MB II

2.76.L166.B21+.(6)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG533

Cooking pot rim; MB II

2.76.L166.B21+.(7)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG534

Cooking pot rim; MB II

2.76.L166.B21+.(8)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG535

White-slipped and painted sherd (possibly

Chocolate-on-White Ware); MB II

2.76.L166.B21+.(11)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG536

Amphora rim; MB II

2.76.L166.B21.(12)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG537

Amphora/pithos upper body; MB II

2.76.L166.B25+.(32)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Probably Southern Palestine

PMG538

Red-slipped and painted sherd; MB II

2.76.L166.B25+.(37)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG539

Rim; MB II

2.76.L166.B25+.(46)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: ?

PMG540

Amphora rim with shoulder collar; MB II

2.76.L166.B25+.(48)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Probably Southern Palestine

PMG541

Cooking pot rim and sidewall; MB II

2.76.L166.B26+.(28)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG542

Amphora rim and neck; MB II

2.67.L17.B7+.(1)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG543

Jug or cooking pot (?); MB II

2.67.L17.F18 B19+.(6)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: ?

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PMG544

Amphora rim and neck; MB II

2.67.L19.B21+.(1)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG545

Amphora rim and neck; MB II

2.76.L166.B21+.(4)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Probably Southern Palestine

PMG546

Painted amphora (?) body sherd; MB II

2.76.L166.B21+.(21)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Probably Southern Palestine

PMG547

Cooking pot; MB II

2.76.L166.B21+.(25)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG548

2.76.L163.F163.B11; MB II

Cypriot White Slip Ware bowl, painted

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: ?

PMG549

Jar; MB II

2.76.L163.F163.B11

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Probably Southern Palestine

PMG550

Jar; MB II

2.76.L163.F163.B11

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Probably Southern Palestine

PMG551

Jar; MB II

2.76.L163.F163.B11

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG552

Bichrome Painted and burnished jar body sherd; MB II

2.76.L163.F163.B38

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG553

Jar rim; MB II

2.76.L166.B21+.(2)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Probably Southern Palestine

PMG554

White-slipped jar rim and neck (possibly Chocolate-on-White Ware); MB II

2.76.L166.B21+.(4)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG555

Bichrome Painted jar body sherd; MB II

2.76.L166.B.21+.(5); MB II

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG556

Jar rim; MB II

2.76.L166.B21+.(6)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Probably Southern Palestine

PMG557

Amphora rim and neck; MB II

2.76.L166.B.21+.(7)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

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PMG558

Jar rim; MB II

2.76.L166.B.21+.(8)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG559

White-slipped and painted jar body sherd (possibly Chocolate-on-White Ware); MB II

2.76.L166.B.21+.(11)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG560

Bichrome-painted bowl

2.76.L166. B21+.(12) ; MB II

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG561

Amphora rim and neck

2.76.L166.B21+.(37) ; MB II

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG562

Amphora rim and neck; MB II

2.76.L166.B21+.(32)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Probably Southern Palestine

PMG563

White-slipped and painted juglet sherd (possibly Chocolate-on-White Ware); MB II

2.76 L.166 B.25+.(46)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG564

Lisht Ware juglet (?); MB II

2.76.L166.B25+.(48)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Southern Palestine

PMG565

Tell el-Yahudiyeh Ovoid type base; MB II

2.76.L166.B26+.(28)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A41/89

NAA Provenance: Egyptian Nile alluvium

PMG566

Tell el-Yahudiyeh Piriform 4 type base; MB II

2.85 L.99 B.22

Harvard Semitic Museum; Israel Antiquities

Authority license no. A72/92

NAA Provenance: Egyptian Nile alluvium

PMG567

Tell el-Yahudiyeh Piriform 2 base; MB II

2.85 L.99 B.22+.(nn⁶⁷)

Harvard Semitic Museum; Israel Antiquities

Authority license no. A72/92

NAA Provenance: Egyptian Nile alluvium

PMG576

Unstamped clay bulla; MB IIA

2.56.L17.B303.MC⁶⁸#51658

*Ashkelon 6*⁶⁹: fig. 13.28 or 13.32-33

Harvard Semitic Museum; Israel Antiquities

Authority license no. A73/98

NAA Provenance: Southern Palestine

PMG577

Stamped clay bulla; MB IIA

2.56.L17.B436.MC#51647

Ashkelon 6: catalogue no. 25 and fig. 13:43

Harvard Semitic Museum; Israel Antiquities

Authority license no. A73/98

NAA Provenance: ?

⁶⁷nn = no number.

⁶⁸MC = material culture.

⁶⁹*Ashkelon 6* = *Ashkelon 6: The Middle Bronze Age Ramparts and Gates of the North Slope and Later Fortifications*, Final Reports of The Leon Levy Expedition to Ashkelon, eds. L. E. Stager, J. D. Schloen, and R. J. Voss,

University Park, PA: Pennsylvania State University Press and Eisenbrauns, 2018. See chapter 12 (D. Ben-Tor and L. Bell, Clay Sealings from the Moat Deposit) for the catalogue entries, and chapter 13 (B. Brandl, Morphology and Function of the Sealings from the Moat Deposit) for the figures.

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PMG578

Stamped clay bulla; MB IIA

2.56.L17.B316.MC#51627

Ashkelon 6: catalogue no. 7 and fig.13:42

Harvard Semitic Museum; Israel Antiquities

Authority license no. A73/98

NAA Provenance: Southern Palestine (probably local
Ashkelon)

PMG579

Unstamped clay bulla; MB IIA

2.56.L17.B316.probably MC#51660

Ashkelon 6: probably fig. 13:44

Harvard Semitic Museum; Israel Antiquities

Authority license no. A73/98

NAA Provenance: Southern Palestine

PMG580

Unstamped clay bulla; MB IIA

2.56.L17.B343.MC#51667

Ashkelon 6: cf. catalogue no. 21 and fig. 13.42

Harvard Semitic Museum; Israel Antiquities

Authority license no. A73/98

NAA Provenance: ?

ACKNOWLEDGMENTS

The authors benefited greatly from recent discussions of the issues addressed in this Afterword and Addendum with the following scholars and scientists. The viewpoints and conclusions expressed and arrived at here, however, are strictly those of the authors.

Dr. Daphna Ben-Tor
The Israel Museum, Jerusalem

Dr. Hendrik J. Bruins
Ben-Gurion University of the Negev
Beersheba, Israel

Dr. Marie-Claude Boileau
Center for the Analysis of Archaeological
Materials (CAAM)
University of Pennsylvania Museum

Dr. William Gilstrap
Center for Materials Research in Archaeology
and Ethnology
Massachusetts Institute of Technology

Dr. Michael Glascock
Research Reactor Center, Archaeometry
Laboratory
University of Missouri—Columbia

Dr. Gretchen R. Hall
Biomolecular Archaeology Project
University of Pennsylvania Museum

Dr. Jennifer M. Huggett
Petroclays, U.K.

Dr. Daniel Master
Wheaton College and Harvard Semitic Museum

Dr. Hector Neff
California State University, Long Beach

Dr. Pamela Vandiver
University of Arizona

Mr. Ross J. Voss
Richmond, Virginia

Dr. James M. Weinstein
Cornell University

ADDENDUM

Assessment of the Petrographic, Geochemical, Geological, and Statistical Methodologies Used by Yuval Goren and His Colleagues

Dr. Christopher Wnuk

Chief Geologist, Transformation Advisors Group

The following critique of the geologic, petrographic, and geochemical methodology of Yuval Goren and his colleagues is based on the following articles:

1. Cohen-Weinberger, A., and Goren, Y., 2004, Levantine-Egyptian interactions during the 12th to the 15th dynasties based on the petrography of the Canaanite pottery from Tell el-Dab'a: Austrian Academy of Sciences Press, *Ägypten und Levante (Egypt and the Levant)*, v. 14, p. 69-100.
<https://doi.org/10.1553/AEundL14s69>
(Accessed 2/28/2020)
2. Goren, Y., 1996, The southern Levant in the Early Bronze Age IV: The petrographic perspective: *Bulletin of the American Schools of Oriental Research*, v. 303, p. 33-72.
<https://doi.org/10.2307/1357469>
(Accessed 2/28/2020)
3. Goren, Y., Bunimovitz, S., Finkelstein, I., and Na'aman, N., 2003, The Location of Alashiya: New Evidence from petrographic investigation of Alashiyan tablets from el-Amarna and Ugarit: *American Journal of Archaeology*, v. 107, p. 233-255.
4. Goren, Y., Finkelstein, I., and Na'aman, N., 2004, *Inscribed in clay: provenance study of the Amarna tablets and other ancient Near Eastern texts*: Tel Aviv University, Sonia and Marco Nadler Institute of Archaeology, Monograph Series Number 23, 407 p.
5. N. Porat and Y. Goren, Petrography of the Naqada IIIa Canaanite pottery from Tomb U-j in Abydos, pp. 466-481 in *Umm el-Qaab II: Importkeramik aus dem Friedhof U in Abydos (Umm el-Qaab) und die Beziehungen ägyptens zu Vorderasien im 4. Jahrtausend v. Chr.* by U. Hartung, German Institute of Archaeology at Cairo Archaeological Publications 93, Mainz: P. von Zabern, 2001; *idem*, Petrography of the Naqada IIIa Canaanite Pottery from Tomb U-j in Abydos, pp. 252-270 in *Egypt and the Levant: Interrelations from the 4th through the Early 3rd Millennium B.C.E.*, eds. E. C. M. van den Brink and T. E. Levy, London and New York: Bloomsbury T&T Clark, 2001.
6. Goren, Y., Mommsen, H., and Klinger, J., 2011, Non-destructive provenance study of cuneiform tablets using portable X-ray fluorescence (pXRF): *Journal of Archaeological Science*, v. 38, p. 684-696. <https://doi.org/10.1002/gea.21493>
(Accessed 2/28/2020)

The geological, petrological, and geochemical tools that are used by Goren and his coworkers have been used by geologists for more than 200 years.⁷⁰ Geologists started using these tools to study rock provenance as soon as or shortly after they became available. As a result, the capabilities and limitations of these instruments and procedures are well understood, and instances of their misapplication to problem analysis well documented. There now exists an enormous body of literature that defines standard

⁷⁰ The petrographic microscope was invented in 1829, the first mass spectrometer was built in 1927, and the first optical emissions spectrometer was constructed in 1937.

procedures for using these tools to collect meaningful data. These procedures are based on testing, retesting, and independently cross-comparing analytical outcomes.

Based on a review of their analytical methodologies as published in their reports and book, Goren and his coworkers would appear to be unaware of these standard procedures. Consequently, many of the analytical results upon which they make their archaeological interpretations are highly suspect. This circumstance, in turn, impacts the validity of the conclusions drawn from the analytical results for collecting and analyzing petrographic and chemical data for assessing the provenances of pottery samples from Middle Bronze (MB) Age Tell el-Dab'a, Early Bronze (EB) Age IV in the southern Levant, and the EB IB tomb U-j (of Scorpion I) at Abydos in Egypt, as well as the LBA Amarna tablets between rulers of Egypt, the Near East, Anatolia, and Cyprus.

The one over-riding problem with all these analyses is that the authors clearly do not understand how critical proper sample size is to the validity of an analysis. They concede that their samples are too small, but then go on to ignore this issue as if it has no real consequences. They seem quite comfortable in ignoring the extraordinary bias they have introduced into their entire analysis and ignore the possibility that many of their conclusions are unsupportable because they are studying unrepresentative samples.

In general, the methodology of the analyses is disorganized, so much so that this reader had difficulty in determining which tests and analyses the authors were using to collect and assess the significance of their data, or to determine which assumptions Goren and his colleagues were making during their analyses. Further complicating any assessment was the fact that

these authors consistently and incorrectly use technical terms that strongly create the impression that they don't understand the science behind their technical analyses and therefore, that they are misinterpreting their results. Their constant misuse of technical terminology leaves the reader confused and spending additional time trying to determine if the authors are simply careless using words or if they truly do not understand the concepts behind the words. Misused terminology is so commonplace, the latter interpretation seems to be the more likely.

In the sections which follow, the problems with the methodologies as used in the above cited studies will be reviewed. Procedural inadequacies will be discussed, and explanations will be provided showing why Goren and his coworkers are using flawed approaches for their provenance studies. The assessment is largely based on the interrelated studies that were published in 2004, viz., the Cohen-Weinberger and Goren paper on the petrography of pottery sherds from Tell el-Dab'a, and the book on the provenance of the Amarna tablets. Related and highly relevant comments, bearing on the conclusions of the 2004 studies, are also made to earlier and later studies.

1. Sampling for Petrographic Analysis

Decades of research resulting in thousands of methodological studies have been devoted to defining effective petrographic analytical methodologies. Goren and his colleagues have ignored this established body of work and have introduced untested petrographic methodologies that are demonstratively flawed.

Goren et al. (2004) state that the minimum size for a thin section sample is 10 mm x 5 mm⁷¹, i.e. 50 mm². Even so, the authors concede that most of their “peel” samples are smaller than this minimum. No reference is provided for the origin of this minimum. The Office of the Wyoming

⁷¹ Goren et al. (2004), page 11, line 31. (Line citations include section titles and chapter headings.)

State Archaeologist recommends that pottery samples be 22 mm x 42 mm (i.e. 924 mm²) to ensure the best possible sample for petrographic analysis of pottery material (OWSA 2019). In the geologic petrographic literature, it is generally accepted that the sample must be large enough to allow between 300 and 500 unique point counts (Hutchison 1974; Howard 1993; Poole and Sims 2016; among many others). For certain applications, several thousand points per slide are required (Los Alamos National Laboratory 1990). Active research continues regarding how best to minimize counting and sampling error when making point counts (Demirmen 1971; Neilson and Brockman 1977; Bustin 1991; Vermeesch 2018; etc.). Ultimately, the optimal size of the thin section will be controlled by the grain size of the material being studied. The coarser the grain size, the larger the thin section required to allow the 300-500 unique grain counts.

Goren et al. (2003) and Goren et al. (2004) apparently introduce a new petrographic sample collection strategy, Scattered Petrographic Analysis (SPA), but they provide no justification to support their contention that the method provides representative samples of the material to be analyzed. The studies referenced in Flanagan (1986) and USDOE (2019) among many others demonstrate the intensity of testing and assessment that any analytical procedure must experience before being deemed sufficiently robust to be accepted as a standard methodology. As far as can be determined from the Goren et al. (2004) methodology section, the only testing of SPA occurred “...in the pilot phase of the study [when] a new sampling and examination method was developed by Goren and named ‘Scattered Petrographic Analysis’ (henceforth SPA)⁷².” The very description of the SPA procedure raises alarms. Goren et al. (2004) state “A tiny flake of the clay matrix (ca. 1 x 1 mm) is chipped from a previously fractured surface using a scalpel. The inclusions exposed on the surface of the object are

identified under the stereomicroscope and a representative sample dragged as single grains (usually from the edges of the tablet...⁷³” The whole process of hand selecting inclusions from a preexisting surface (which poses its own problems of how to deal with secondary contamination of the surface) is the very definition of a non-random sample. Inclusions which may not be obvious under the microscope may not be collected even though they offer key provenance information. Easily observed inclusions may be over-sampled. The authors provide no explanation for how they avoid these specific pitfalls. Given that the authors provide no evidence that the results of their SPA outcomes were rigorously tested to document the method’s effectiveness by comparing SPA outcomes against known and accepted standards, the methodology remains unvalidated and the results are all suspect.

The SPA reliability⁷⁴ designations defined by Goren et al. (2004) are meaningless. There has been no testing to show that these category designations are reliable in the way that the petrographic point counting methodology has been tested (van der Plas and Tobi 1965; Dennison 1966; see also references in Flügel 1982). The authors’ categories are arbitrary and clearly, have been defined to create the illusion that there is rigorous statistical analysis to support the reliability assurance assignments.

Cohen-Weinberger and Goren (2004) make reference to the fact that they use their own petrographic database. The authors do not tell the reader how many reference raw materials are contained in this database or the geographic distribution of samples from across the Levant. With this information unreported, investigators cannot know if this database is representative of the range of raw materials that potters may have used. Cohen-Weinberger and Goren then indicate that their database contains “thin sections of

⁷² Goren et al. (2004), page 11, lines 19-21.

⁷³ Goren et al. (2004), page 11, lines 34-37.

⁷⁴ Goren et al. (2004), pages 14-15.

pottery from most of the significant archaeological sites in the southern Levant⁷⁵.” The authors do not mention how this database was determined to be composed of sherds reliably identified as locally manufactured. Given the uncertainties associated with this comparative database, and the unwillingness of the authors to better define the database content, provenance determinations using this information will always be questioned. The fact that their petrographic observations are qualitative rather than quantitative and the classification criteria have not been subjected to any sort of rigorous statistical analysis makes their A through C reliability criteria meaningless.

The reliability indices used are not static. They change from report to report. Goren et al. (2004) uses five reliability categories; Cohen-Weinberger and Goren (2004) use three. They are named and defined differently in each manuscript. The authors do not provide a rigorous definition for how a petrographic assessment will be assigned to a category. The criteria vary from manuscript to manuscript and are subjective – to be applied to the data collected in that study rather than generally applicable to other studies. The subjective nature of the criteria means that they can be manipulated to deliver required outcomes.

2. Sampling for Geochemical Analysis

Since chemical analysis was used extensively in Goren’s book on the Amarna tablets and provenances established there were used in provenancing MB pottery at Tell el-Dab’a and since Goren and his colleagues have been highly dismissive of another chemical technique (NAA), it is important to assess their geochemical methodology.

There is a major body of literature concerned with sampling and processing methods to develop procedural standards for ICP-MS, ICP-AES and ICP-OES analyses. Different materials typically require custom standards for sampling and processing to ensure reliable results. Many of these standards are codified as ISO or ASTM standards that can then be purchased from the International Standards Organization (ISO⁷⁶) or the American Society for Testing and Materials (ASTM⁷⁷). The interested reader should view the US Department of Energy website (USDOE 2019) for a list of 400+ procedural studies on ICP-MS methodology. Similar compilations almost certainly exist for the other analytical techniques as well.

It is not our purpose to review the standards literature. Our concern is whether or not Goren et al. (2004) had collected representative samples from the clay tablets they were studying. Their description of the sampling methods shows conclusively that they did not. Given the miniscule sample sizes collected, which by the authors’ own admission was “in most cases ... far smaller than the 250 mg of material that is commonly recommended for ICP analysis of ceramic materials⁷⁸,” this methodology is problematic from many perspectives.

First, the authors do not reference the source of the 250 mg minimum size. Goren (1996) chooses to use 500 mg also without referencing this choice of quantity. A review of recommended sample size made by laboratories and standards groups for analysis of sediments and archaeological materials indicate that minimum sample size should be between 1 g and 8 g (Michigan State University 2019; Sandström et al. undated; among many others). Thus, the clay tablet samples appear to be one to two *orders of*

⁷⁵ Cohen-Weinberger and Goren (2004), page 71, col. 1, lines 35-37.

⁷⁶ A catalogue of the 22,500+ ISO standards can be obtained at: <https://www.iso.org/standards-catalogue/browse-by-ics.html>.

⁷⁷ A catalogue of the 12,000+ ASTM standards can be obtained at:

<https://www.astm.org/BOOKSTORE/BOS/index.html>.

⁷⁸ Goren et al. (2004), page 13, lines 8-9 and page 63, lines 11-12.

magnitude smaller than the recommended minimum size. Minimum size requirements are not set at random. Minimum size requirements are specified as part of the ISO/ASTM standards setting process and as part of the specialized research into instrument performance as indicated in the list of studies cited in USDOE (2019) and other such document compilations. This author has personal experience in submitting an undersized sample to a commercial analytical lab for an ICP-MS analysis. The laboratory notified the author that the sample was too small for analysis (about 50% smaller than required), not several orders of magnitude smaller as were the samples submitted by Goren et al. 2004. After authorizing the lab to process the sample, the lab results were accompanied with a letter clearly stating that the results were unreliable because of sample inadequacy and that the lab would not take responsibility for the accuracy of the analysis.

It is true that smaller samples of biological materials may be analyzed, but the purposes of those analyses are very different from trying to establish provenance of pottery clay, so the use of smaller samples in this special case cannot be used as a potential justification for the small samples used by Goren et al. (2004). It is also possible that homogeneous manufactured goods like glass and metal alloys that exist as liquids before being fashioned into solid artefacts might yield accurate analyses from smaller samples. However, clay tablets do not fall into such a category. The descriptions by Goren et al. (2011) of the structural characteristics of several of the tablets indicates their potential to be nonhomogeneous⁷⁹. When clays accumulate in any natural depositional system, some fraction of non-clay sized grains is likely to accumulate as well. Almost certainly silt sized grains will be present and possibly sand fractions also. The clay is further modified by the purposeful addition of tempers. Flanagan (1967, 1986) among many

others describes the process of creating a homogeneous material from rocks and sediments. No clay tablet maker would have followed the process described by Flanagan (1967, 1986). Moreover, the addition of temper undoes the process of making a homogeneous material by purposefully adding inhomogenities (i.e. temper grains). Flanagan (1986) and SGS (2014) among many others address issues of sampling and homogenizing nonhomogeneous materials in order to get an accurate representative analysis of their trace element profiles. In all cases, this starts with a sample large enough to include as many as possible of the potential inhomogenities within the material to be tested.

The origin of the samples sent for trace element analysis is problematic. The authors state: “In most cases the samples were collected from the sediment that crumbled from the tablets in the process of peeling.⁸⁰” Nowhere in the methodology section do the authors discuss specific precautions taken to ensure that surface contamination derived from the burial medium and from materials deposited from circulating/percolating ground waters were not included with the material sent for analysis. In a previous section they state: “This method is almost non-destructive, requiring a sample of only a few milligrams that can be taken as tiny grains from one or several hidden or fractured spots in the artefact’s surface.⁸¹” If these statements actually reflect the level of precautions taken to minimize contamination, then there is a high probability that the trace element profiles include a significant contribution of material from the burial medium, ground water deposits, and even museum dust! Given the small sample size, the trace element contribution from contaminants is likely to be disproportionate and the trace element profiles therefore meaningless.

3. Geochemical Data Analysis and Interpretation

⁷⁹ Goren et al (2011) page 687, col. 1, line 10 and col. 2, lines 1-5.

⁸⁰ Goren et al. (2004), page 13, lines 5-6.

⁸¹ Goren et al. (2004), page 11, lines 21-23.

Under methodology, Goren et al. (2004) describe their basic assumptions regarding the interpretation of the meaning of their geochemical data. Most of their assumptions are based on an inaccurate understanding of major, minor, and trace element geochemistry, and therefore, are mostly incorrect. Confidence in their understanding of the significance of their geochemical findings is further eroded by their tendency to use technical terminology incorrectly throughout (see discussion, below), further indicating that they do not understand the science behind the words they are bandying about.

In describing ICP-AES and ICP-MS results, the authors make the following statement: “However, due to the small size of most samples the results of several elements were inaccurate and omitted from the list.⁸²” In making this statement, Goren et al. (2004) declare to the reader that the entirety of their geochemical results are unreliable. The statements that the authors make in the paragraph containing this sentence confirm their lack of understanding of basic geochemical reality. The authors have placed themselves into an inescapable trap. By admitting that their sample size is too small for *some* elements, they are *de facto* admitting that the sample size is too small to provide any reliable results whatsoever. One cannot declare for a given sample that some parts of the analysis are correct while other parts are not. The analysis as a whole is either correct or it isn't.

The very small sample size has another potential impact on the accuracy of the geochemical analyses. The trace element profile of the sample can be made unrepresentative of the true trace element profile by the random inclusion of a single rare mineral grain. Because the sample size is so small, rare grains contribute disproportionately to the trace element profile.

The geochemical methodology is so poorly described, the reader is left speculating about what Goren et al. (2004) did. Presumably the elements being excluded are elements that fell below the level of detection. It is unclear if different elements are being excluded from different analyses. Comparing table 3-1 with other tables in the report suggests a certain level of inconsistency in the elements being included for different analyses. The authors cannot address the issue that the absence of trace elements may be provenance diagnostic, because they can't verify if elements are below the level of detection due to inadequate sample size or because of primary depositional absence. The way this methodology statement reads, it could be concluded that the analyses might have been rejected because they did not fit the authors' preconceived interpretations.

Goren et al. (2011) clearly state that they remove elements from the database that are below the level of detection (LOD). Being below the LOD is a datum point. It means that a particular element (or more typically a suite of elements) is not present in the analysis. Tablets with and without these elements are therefore likely to have different provenance. Excluding this information from the database potentially changes the outcome of the statistical analysis based on this data.

Developing a nondestructive trace element analytical petrographic method would be a tremendous advance for provenance determinations. It would allow more vessels to be tested quickly and cheaply. The portable X-ray diffraction analyzer is just one of several technologies that have been developed and are in widespread use in mining and mineral exploration, materials testing, factory materials quality control, and other similar applications. It was encouraging to see Goren et al (2011) testing one of these technologies to determine its usefulness for provenance determination.

⁸² Goren et al. (2004), page 13, lines 16-17.

The Foreign Relations of the “Hyksos”

Unfortunately, Goren and coworkers’ testing methodology was seriously flawed, and raised more questions than it answered regarding the usefulness of the technology for his objective.

Goren used the Niton™ XL3t GOLDD+ XRF Analyzer⁸³. In 2013, I used a similar product made by this manufacturer during a copper exploration program in Afghanistan. These devices have several preprogrammed analytical algorithms designed to optimize analytical efficiency for the intended application. Goren et al. (2011) used the mining and minerals setting which is likely the most appropriate, but not the only setting available. Goren had the opportunity to test the capabilities of this instrument and presumably had access to comparative NAA data for the tablets that he tested. When a new technology is introduced, a full range of tests would ordinarily be performed to define best practice standard operating procedure. For this instrument, one might expect that the initial procedural testing would be done on a great many different places on each tablet, perhaps 10 to 20, maybe even more places in order to determine the optimal number of sample sites that should be analyzed per tablet to provide stable average analyses. ThermoFisher provides recommended minimum run times for each analysis. It would have been wise to test whether longer run times would provide more accurate analyses. The Niton™ I used in the field had four preprogrammed analytical algorithms. The instrument used by Goren likely had a similar number. It would have been wise to test all of the algorithms to see how the results differ and to see if different algorithms yielded better analyses for different suites of trace elements. These are the kinds of experiments that would be run to establish best practice. Goren and coworkers did not do this. They did three analyses per tablet at various combinations of recommended settings, declared a successful outcome, and then went on to use the results to discuss provenance groups.

They did not even compare their results to the existing NAA data.

According to conversations I have had with U. S. Geological Survey (USGS) chemists who routinely use X-ray diffraction in the lab, very low concentrations of some trace elements, especially in complex materials like rocks (or pottery clay) can confuse the algorithm, thus yielding less accurate results. For the work we did in Afghanistan, USGS provided a number of helpful suggestions that significantly improved the performance of our instrument under the conditions we were testing. The Niton™ can nominally analyze for as many as 30 elements. Goren and coworkers, by the time they eliminate the elements that are below the LOD and elements that are likely to be external contaminants unrelated to provenance, only 14 elements remain for their analysis, and of these, only 7 can be considered trace (V, Cr, Ni, Rb, Sr, Zr, Nb). For the small subset of tablets tested, these may have shown sufficient differences in concentration that allowed discrimination into well-defined groups, but with larger datasets there would likely be too much overlap for effective discrimination.

Goren et al. (2004) make the statement: “In most cases the elemental analyses supplied sufficiently accurate data.⁸⁴” On what basis do they make this statement? They provide no evidence to support this assertion. The authors discuss the “precision” of the analyses as if it is a fundamental verifier of the quality of the data set. Knowing the degree of error that is associated with a particular analytical result is useful information that should be included with the data table. The discussion of this information in the methodology section is irrelevant and seems to have been included to give the impression that the underlying data are of high quality (which they are not). Do the authors understand that even though the results may be very precise, that does not make them

⁸³<https://www.thermofisher.com/order/catalog/product/XL3TGOLDDPLUS>.

⁸⁴ Goren et al. (2004) page 13, lines 10-11 and page 63, lines 13-14.

accurate? Precision is a measure of how similar multiple analyses of a sample are to one another, NOT an indication that the analytical results are “correct.”

The authors provide an extended discussion of geochemical issues in their statistics section. This discussion is rife with inaccuracies and irrelevant information. The authors state: “One of the shortcomings of ICP for ceramic characterization studies is the deficiency of a database of standards, such as in the case of NAA studies of pottery. Chemical compositions of clay sources collected by other methods often proved to be insufficient, since they included only major and sometimes also minor elements but not traces.⁸⁵” If the authors have no provenance standards to compare their data with, how can they be so certain of their provenance assignments?

The second paragraph under the “Statistics” section (page 19) is filled with inaccurate and very confused geochemical observations that, as written, strongly suggest that Goren et al. (2004) do not understand basic geochemical principles. The authors state: “[It] is well known from the geochemical literature, Ca is often associated with elements such as Sr and Ba.⁸⁶” The statement is partially true, but also completely irrelevant. Mg is also closely correlated to Ca. Why was Mg not included in this list of associated elements? Perhaps if Goren et al. (2004) explained why they made this particular observation, the reader might understand why the authors think this observation is significant. These three elements may associate, but their proportions relative to one another can still be diagnostic of different provenance (Stanienda-Pilecki 2016).

Goren et al. (2004) state: “Iron, Sc and other transition metals usually exhibit highly

correlated relationships.⁸⁷” With this statement, the authors demonstrate that they have no conception of how the elements of the periodic chart behave in natural systems. What do they mean by correlated relationships? They provide no examples to support or explain this statement. Basic mining geology proves this statement to be completely wrong. Take a simple example—copper deposits. If the transition metals all had correlated relationships, then all of the world’s copper mines should produce the same suite of metals. This is not the case. Some copper mines also produce gold, some gold and silver, some gold and cobalt, some contain molybdenum, zinc, lead and/or arsenic, and some have just copper. It all depends on how and where they formed (Cox and Singer 1992, among others)

Goren et al. (2004) then state: “In pottery, negative correlations often occur between Ca and Si, or Al and Si, as a result of the dilution of clay elements with those of the non-plastic components.⁸⁸” The authors do not reference the basis for these statements, and the statement explaining the observed relationships is either inconsistent with mineral chemistry fact or incorrect depending on which element pair is being considered. Goren et al.’s monograph is focused on the provenance of clay tablets. Regarding the first part of the statement in which a negative correlation is said to exist between Ca and Si, the authors state that “marl⁸⁹” is typically used to manufacture the tablets, and that the correlation between Ca and Si in a marl is determined by the proportion of carbonate to clay fractions in the marl. By definition, however, marl is an “intimate mixture of clay and particles of calcite or dolomite” (AGI 1962), so why do the authors ignore Mg in this discussion? The substitution of Mg for Ca (i.e. the degree of dolomitization of the marl) will also affect the Ca-Si proportions. The addition of temper will further modify these relationships.

⁸⁵ Goren et al. (2004), page 19, 1st paragraph, “Statistics” section.

⁸⁶ Goren et al. (2004), page 19, lines 26-27.

⁸⁷ Goren et al. (2004), page 19, lines 27-28.

⁸⁸ Goren et al. (2004), page 19, lines 28-29.

⁸⁹ Goren et al. (2004), page 6, line 3.

The second part of the statement—that there is a negative relationship between Al and Si—is even more difficult to defend. Clay is an aluminosilicate. By definition the relationship between Al and Si is determined by the formula of the clay mineral(s) present. An extraordinary amount of temper would have to be added to make major changes to the Al-Si ratios as determined by the clay’s mineralogy, and most minerals also contain Al and Si in their crystals, so the tablet maker would have to be very specific about the choice of temper to significantly alter the Al:Si element ratios. If anything, the Al:Si ratios could be provenance diagnostic.

Goren et al. (2004) state: “It is also known that rare earth elements (REE) are commonly correlated.⁹⁰” The authors do not explain the significance of this statement to the present study. This information is irrelevant, because the nature of the correlations between various REEs is determined by the geochemical processes that formed the source rocks from which the REEs are derived, so the proportions and correlations are very diagnostic of provenance (for example see Temple and Walsh 1994; Bounouira et al. 2007; Randive et al. 2014; Koç et al. 2016; among many others).

The third paragraph under “Statistics” is filled with more errors and basic chemistry misunderstandings. SiO₂, Al₂O₃, Fe₂O₃, TiO₂, P₂O₅, CaO, MgO, and SO₃ are not elements⁹¹, they are compounds. Most of these happen to be minerals as well.

Goren et al (2004) state “...in the statistical analyses several elements were omitted due to the risk of bias.⁹²” They do not tell us which elements are being excluded from the analysis, nor do they definitively say whether these elements are excluded from every analysis or just certain analyses. The authors do not clearly describe

which statistical analyses are being performed. Goren (1996) reports the ICP-AES results for only 16 elements. Normally between 30 and 50 elements would be run in this kind of analysis (USGS 2013). No statistical analyses are performed on this reduced data set. Only two element pairs are hand plotted. The author does not explain why he is using such a small element suite or why a more rigorous statistical analysis is not being performed.

In an attempt to explain their various omissions Goren et al (2004) make a series of inaccurate or incorrect statements. They say: “Several elements, especially those with high ionic charge or ionic radius, are more sensitive to post-depositional processes that may occur in buried ceramics due to their solubility in groundwater.⁹³” The authors confuse ionic charge with electronegativity. An element can have a high ionic charge (as most transition metals do) and still be relatively insoluble, because its electronegativity is not great and they are bonded covalently rather than ionically. The iron in Fe₂O₃ has a high positive ionic charge (3+) but is water insoluble due to its covalent bond with oxygen. The sodium in NaCl has a lower ionic charge (1+), but is extremely water soluble, because the very high electronegativity of chlorine draws an electron away from sodium.

The discussion of ionic radius is both completely irrelevant and wrong. The authors seem to say that ions with a large atomic radius are easily soluble. Gold and cesium have similar atomic radii. Gold is virtually insoluble in water (or just about anything else except aqua regia); cesium is explosively soluble.

The authors do list several elements and compounds that they exclude from the analysis, but it is unclear from their description whether these are the ONLY elements and compounds being excluded or if there are others. Their

⁹⁰ Goren et al. (2004), page 19, lines 29-30.

⁹¹ Goren et al. (2004), page 19, lines 33-34.

⁹² Goren et al. (2004), page 19, lines 36-37.

⁹³ Goren et al. (2004), page 19, lines 37-39.

argument for excluding P and S is reasonable. Their argument for excluding Co and Ba is not. Their argument against including Co is basically an admission that their entire data set is unreliable. Goren et al (2004) do not explain on what basis they believe that ONLY Co is being affected by the small sample size⁹⁴. In reality, if Co is affected by the small sample size, so is every other element in the analysis. Their decision to exclude Ba is another indicator that they don't understand the geochemistry of the depositional systems they are working with. They are excluding Ba (as barite BaSO_4) for the same reason that they exclude gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), namely that gypsum is a contaminant that is commonly deposited from circulating groundwater. However, barite (BaSO_4) is not precipitated from circulating ground waters unless there is a major hydrothermal system someplace in the watershed. High concentrations of Ba in a clay is *highly* provenance diagnostic.

Goren et al. (2011) perpetuates the Ba fallacy. These authors cite a study by Katz et al. (2009) as proof that barite behaves identically to gypsum and precipitates from ground water. Goren et al. (2011) specifically reference the fact that the barite is found in Lake Lisan seismites. This description should have been an alert to these workers that something unusual is happening to the Lake Lisan sediments and that, perhaps, the origin of the barite may not be due to simple ground water evaporation. The geology of barite is discussed in detail by Johnson et al. (2017), where it is pointed out that barite is not especially mobile in ground water environments and thus requires special conditions to become concentrated. According to Johnson et al. (2017), virtually all barite deposits are associated in some way with magmatic systems. The Dead Sea (i.e. the residual Lake Lisan) is part of the Red Sea Rift, which continues to be volcanically active (Weinstein and Garfunkel 2013). Continued deep seated magmatic movements cause the earthquakes that produced the seismites.

Evidence of hydrothermal circulation has also been found on the floor of the Dead Sea (Ben-Avraham and Ballard 1984). Given the rhyolitic composition of some of the lavas in the rift zone, at least some of the magmas have the correct composition to supply Ba to the hydrothermal waters. So, the exclusion of Ba by Goren et al. (2011) is another example of excluding a provenance diagnostic trace element.

Goren et al. (2004) make confused arguments about various elements being correlated to one another without discussing what such relatedness may mean for their provenance analysis. Petrography can provide insights into manufacturing techniques, firing temperature, tempering practices and mineral constituents, but it cannot provide a detailed fingerprint of provenance diagnostic mineral chemistry. To understand this issue, consider this simple example—plagioclase. Plagioclase is a solid solution series with end members having the formula $\text{NaAlSi}_3\text{O}_8$ (albite) and $\text{CaAlSi}_3\text{O}_8$ (anorthite). Na and Ca freely substitute for one another in the plagioclase crystal structure and virtually any ratio of Na:Ca can exist. Sometimes a small amount of K might also present in the crystal structure. The ratio of Na:Ca in a plagioclase is determined by the composition of the magmatic melt from which it crystallized. Granites produce Na rich plagioclase that may contain a very small percentage of K, mafic rocks contain equal to dominant percentages of Ca:Na in the plagioclase crystal, and ultramafic rocks are dominated by Ca plagioclase almost to the exclusion of Na. If enough grains are present, the petrographer can determine the Na:Ca ratio.

For other minerals, only a chemical analysis will reveal the cation solid solution ratios. For example, consider the heavy mineral monazite. Monazite varieties are named for their dominant cation. Monazite-(Ce) has the chemical formula $(\text{Ce}, \text{La}, \text{Nd}, \text{Th})\text{PO}_4$. For monazite-(Sm) the formula is $(\text{Sm}, \text{Gd}, \text{Ce}, \text{Th})\text{PO}_4$. And these

⁹⁴ Goren et al. (2004), page 63, lines 13-14.

formulas only account for the *primary* solid solution cations. Any of these monazite species will contain other REE cations at much smaller percentages. The specific ratios of REEs in a monazite are HIGHLY provenance diagnostic, since no two monazite occurrences have exactly the same REE ratios.

That Cohen-Weinberger and Goren (2004) should accept precedence of petrography over NAA⁹⁵ indicates that they and presumably other archaeological petrographers who he has trained or influenced do not understand the geochemistry or the geology of the minerals they study. That Goren and his coworkers would argue that sherds with identical NAA trace element profiles but different petrographies must have different provenance is inconceivable. Their argument is backwards. Trace element profiles are as easy to duplicate as fingerprints! If two petrographically distinctive sherd assemblages have identical NAA profiles it is incumbent on the archaeologist to explain the cultural reason why these different assemblages co-occur in time and space. As a trained geologist and petrographer, I would always allow the chemical evidence to take precedence over the petrographic evidence.

4. Clay-Temper Factor (CTF) and the Use and Interpretation of Geologic Maps

Goren and his coworkers depend almost exclusively on geologic provenance data acquired from the study of geologic maps for all the articles and book under review here. The concept of the CTF (i.e. the Clay-Temper Factor⁹⁶) indicates that these workers have a fundamental misunderstanding of basic geologic principles and sedimentologic processes. From the description explaining how the authors calculate the CTF, it is clear that the authors assume that a formation is uniform throughout the area of its occurrence. Furthermore, the assumption is made

that the description of the formation's characteristics provided on summary large scale geologic maps accurately describe the characteristics of that formation everywhere that it occurs. Nothing could be further from the truth. Consider the characteristics of some of the formations mentioned by Goren et al. (2004). The Pakhna marls⁹⁷ of Cyprus are mentioned. From reading their discussion of this rock unit, one would conclude that it is a marl throughout its area of occurrence. In fact, the Pakhna Formation “...records heterogeneous, mainly carbonate, sedimentation... The succession begins with deep-water pelagic carbonates and shows increased input of shallow-water bioclastic and terrigenous sediment upward” (Eaton and Robertson 1993). Pelagic carbonates do not contain significant clay fractions and would not be suitable for clay tablet manufacture. A variety of other non-marl lithologies are also described in this formation. In discussing the Pakhna Formation, Goren et al. (2004) reveal their misunderstanding of rock characteristics when they refer to the Pakhna chalks.⁹⁸ Chalk is a limestone formed from the microscopic remains of marine organisms and could never be used as a raw material for clay tablet manufacture.

In the same sentence, Goren et al. (2004) mention the Moni clays. The Moni Mélange (see Robertson 1977) is a rock type that forms in a subduction zone. A mélange can literally contain any kind of rock that can be imagined. The rocks that it WILL contain are whatever rocks happen to be on the edges of the crustal masses that are colliding. A mélange will consist of sediments, metamorphic, volcanic, and plutonic rocks (often including ophiolites). Clays that are derived from such rocks will have whatever character the local rocks allow. Derived clay characteristics can change radically over a distance of a few hundred meters.

⁹⁵ Cohen-Weinberger and Goren (2004), page 85, col. 2, lines 20-22.

⁹⁶ Goren et al. (2004), pages 7-9, “Prediction of Materials Availability: Clay-Temper Factor (CTF)” section.

⁹⁷ Goren et al. (2004), see the discussion of the Pakhna marls starting with the section titled “The Provenance of the Alashiya Letters Within Cyprus,” pages 60-65.

⁹⁸ Goren et al. (2004), page 62, line 7.

Of specific importance to this critique is what Goren has to say about the site of Byblos in the northern Levant, which Bietak posits as the origin of the Tell el-Dab’a population. Goren et al. (2004) state: “The ancient mound of Byblos is located in an area where Neogene to recent marine sediments were deposited. These include a series of chalks, clays, marls and sand dunes.”⁹⁹ This description appears to be derived directly from the literature and not from an on-site investigation of the actual clay sources. It is true that the Mio-Pliocene deposits contain marls, but a review of the lithologic descriptions of this rock sequence indicates that in the 1500 m thickness of this sequence, marls are present in limited parts of the section (Buchbinder and Zilberman 1997). Even though this rock unit may be present around Byblos, the marl-containing part is not necessarily exposed.

Such misinterpretations of lithologic descriptions contained in geologic reports are pervasive in Goren and his coworkers’ manuscripts. For every formation named in Goren et al. (2004), a review of the published lithologic descriptions for that formation is likely to reveal that formation composition is far more complex than the synoptic descriptions offered on a geologic map. As the Eaton and Robertson (1993) description shows, formations can vary significantly in character and composition laterally. A formation that is marl in one place could be a sandy limestone several kilometers away. This lithologic change will not be noted on a geologic map.

Given the lateral complexity of sedimentary systems, it is not surprising that one might want to reduce this complexity to a simplistic map reference. This strategy removes the need to find actual clay or temper deposits with characteristics similar to the artefact. Using a map reference allows one to simply postulate that suitable clay/temper deposits must be nearby, because the

map shows formations that are likely to have appropriate lithologies in the general area. By not making an effort to collect and analyze representative clays and tempers from around an excavation, Goren and his coworkers miss an opportunity to improve existing databases and to develop a better understanding of sediment geochemistry variations that will significantly improve future provenance determinations. Goren and his coworkers prefer to ignore the fact that modern NAA databases are so useful today because they are the product of 50 years of data accumulation. Instead of arbitrarily declaring that these databases are flawed and then using untested and seriously flawed analytical methodologies that deliver unreliable provenance data, Goren would contribute more to ongoing research by working to properly expand existing databases.

Goren et al. (2004) and Cohen-Weinberger and Goren (2004) make constant reference to the fact that the geologic maps show that suitable formations are locally present to provide clay for pottery manufacture. Implicit in their statements is the assumption that the clay is derived from these formations, but never do they point to a quarry where this clay had been mined from the named formation. Clay for pottery manufacture can be obtained in two ways. The rock in formations that are predominantly clay can be mined, crushed and processed until a material suitable for a potter has been produced. This is difficult work. It is much simpler to harvest and process soft alluvial clay. If geologic maps are studied where alluvial clay is being mined today to provide material for village potters, the reader will find that most clay pits that do not exploit a specific rock formation will be mapped as “Quaternary alluvium.” The clays in these pits may be derived in part from the erosion of local formations, but they will also be mixed with materials washed in from other places within the watershed. This situation has significant geochemical implications. Clays that are mined

⁹⁹ Goren et al. (2004), page 134, lines 15-16.

and processed directly from *in situ* rock will have the geochemical profile that prevailed when that rock was first deposited. That profile can be completely different from the current watershed's geochemical profile. But, when that rock is eroded, its geochemistry becomes part of all downstream sediments. For this reason, consideration of the geologic map alone is a poor tool for understanding provenance. The complex origin of alluvial clay deposits requires that an extensive range of reference clays must be collected as comparative materials to support both petrographic and especially chemical testing.

Goren et al. (2003, 2004) and Porat and Goren (2002) make the specious argument that chemical databases are incomplete because atypical clays were chosen to manufacture specialized artefacts (like clay tablets) and chemical analyses of these clays are not contained within the reference databases. If these workers see this as a problem, the simplest solution is for these workers to collect samples of these clays to be analysed and added to the database. Porat and Goren (2002) also make the claim that inappropriate reference materials (like cooking pots and mud bricks¹⁰⁰) have been sampled to build existing databases and these clay samples are irrelevant. Misconceptions like these make it clear that (a) Goren and his coworkers do not understand the value of building a comprehensive reference database that captures the characteristics of every type of local clay that manufacturers might use, and (b) do not understand the nature of clay deposits. Acquiring as broad a sampling of all of the various types of clays being used by a society increases the likelihood that a properly executed multivariate statistical analysis will more clearly define provenance groups. Pretending that clay tablets are somehow unique and special and therefore their chemistry and petrography cannot be studied using standard methodology¹⁰¹ is an indefensible argument. This is particularly true when dealing

with Levantine marls which are used widely to make both tablets and earthenware vessels throughout the region (Goren 1995, 1996; Porat and Goren 2002; Goren et al. 2003; Cohen-Weinberger and Goren 2004; Goren et al. 2004; Master 2018). This widespread usage of such clays would seem to negate the argument that Goren et al. (2004) make that the compositions of clay tablets are not likely to match any known clay source.¹⁰² This argument seems to have been designed to create an artificial class of objects for which standard analytical techniques can be ignored and new, untested techniques be used instead.

From a petrographic standpoint, Goren's (1995) comment that “The distribution of the Taqiya Formation is widespread and therefore cannot be used for a definitive provenance distinction¹⁰³” might *possibly* be correct, but given the geology of the Taqiye Formation, properly executed petrographic point counts are likely to reveal minor but systematic regional variations in mineral constituents. Analysis of the trace element profiles would almost certainly show regional variations. To understand why this is true, one needs to consider the Cretaceous and Paleogene paleogeographic reconstructions of the Levant (see Scotese 2001, 2014) and details of the depositional history (see e.g. Kuss et al. 2003). During the Cretaceous, northern Africa and the Levant were submerged beneath a shallow epicontinental sea slightly north of the equator of that time. Carbonate deposition predominated forming reefs and other types of limestone when terrigenous sediment input was limited, whereas marls formed when and where more clay was being added to the depositional system (see Sass and Bein 1982 to get a sense of how quickly local lateral facies changes occur). There were at least three major sea level changes that occurred during this time that significantly altered land-sea boundaries (Flexer et al. 1986). These sorts of changes have provenance implications. A

¹⁰⁰ Porat and Goren (2002), page 467, column 1, last 3 lines.

¹⁰¹ Goren et al. (2004), page 9, last 5 lines.

¹⁰² Goren et al. (2004), page 9 bottom and page 10 top.

¹⁰³ Goren (1995), page 291, lines 15-16.

formation like the Taqiye and its various lateral equivalents as discussed in Goren et al (2004) may occur from Morocco to Turkey, Syria, Jordan, and possibly as far east as Iraq, but there will be regional differences in the specific characteristics of this formation. This may be less true for formations like the Moza Formation (Scarpa 1990), which was deposited during a time of relative geologic quiescence in the region, but the Taqiye accumulated during a time of geologic upheaval when the collision between Africa and Eurasia was well underway. All manner of volcanic and plutonic rocks were being erupted and emplaced, and existing rocks metamorphosed leading to the development of very complex regional trace element profiles (Adate et al. 2005; Dupuis et al. 2005). Without realizing the implications of their statement, Goren et al. (2004) admit the existence of this variability when they cite the Schreier (1988) analysis of the Esna clays (the Egyptian correlative of the Taqiye). Goren points out that Schreier noted that the clay chemistry changes from bed to bed within the formation¹⁰⁴. By avoiding the systematic sampling of Taqiye marls and their correlatives from around their excavations, Goren and his coworkers have missed the opportunity to better understand the regional variability of the Taqiye marls and the other important marls used in pottery manufacture.

Goren et al. (2004) also makes reference to the Esna being *equivalent* to the Taqiye.¹⁰⁵ The Esna is NOT equivalent, it is correlative. The two concepts differ significantly. The two formations may have been deposited at the same time but they accumulated in different places and under very different erosional and depositional influences.

Goren et al. (2004) spend two pages¹⁰⁶ discussing how modern potters locate their manufactories near to their source of raw materials. The studies

referenced by Goren indicate that modern potters rarely forage more than 10 km from their workshops for clay, and significantly shorter distances for temper. On the basis of these modern studies, Goren defines his CTF as being the geologic diversity within a 10 km radius of the manufactory¹⁰⁷. After spending pages defining his criteria for the CTF, it is curious to see Goren abandon these criteria in discussing the Amarna tablets. The reasoning behind the Goren et al. (2004) claim that the Esna shale is the ONLY possible clay source for his selected group of Amarna tablets is difficult to accept when they don't present comparative analytical chemistry data from any potential clay sources. Instead the authors claim that their conclusions are supported by chemical analyses of clay bodies presented in three geological studies (Basta et al. 1979; Schreier 1988; Ahmed et al. 1992). This evidence is inconsistent with their CTF claim that clay sources are unlikely to be more than 10 km away from the site of artifact manufacture. The samples analyzed in the cited geologic reports were collected much farther away than the maximum 10 km from the Amarna site. The Beris Oasis, for example, is more than 325 km southwest of Amarna and more than 240 km distant from the nearest bank of the Nile River. Even if Goren's argument is correct that the Esna clay was harvested from places distant from Amarna but accessible to river transport, it is unlikely that anyone would travel 240 km into the Western Desert to acquire clay for tablet manufacture.

Using the clay chemistry from these geologic reports introduces additional interpretational problems. By Goren's admission these reports only provide major element chemistry. Major element analyses provide chemical information about the clay minerals but contains no significant trace element fingerprint data. Schreier's report confirms the regional variability in trace element chemistry for the paleogeographic reasons

¹⁰⁴ Goren et al. (2004) page 30, lines 33-35.

¹⁰⁵ Goren et al. (2004) page 24, “Geological interpretation” section of Amarna tablet EA 1.

¹⁰⁶ Goren et al. (2004), page 5-6.

¹⁰⁷ Goren et al. (2004) page 6, lines 33-34.

discussed above, so it is precarious to suggest that clay sources separated by millions of years in time and by hundreds of kilometers in space would have the same geochemical signatures. And this discussion assumes that Goren’s tablet chemistry data are valid in the first place given the substandard sample sizes (see above).

Goren and his coworkers do not fully understand biostratigraphical applications. For example, in Chapter 3, I. Egypt, they discuss the evidence that the Esna shale is the primary clay source for many of the Egyptian tablets. As part of their evidence, they mention that tablet EA-357 was found to contain several (badly preserved) foram genera that could be referred to the Paleogene and, therefore, must have come from the Esna Formation. The *Paleogene* Period is very different from the *Paleocene* Epoch¹⁰⁸. The Paleogene spans the time from 66 MYBP to 23 MYBP, the Paleocene from 66 MYBP to 56MYBP. Though it is true that the Paleocene Esna shales and marls are widespread across Egypt (Aubry et al. 2007; Obaidalla et al. 2015), there are other Paleogene marl bearing formations in the country (e.g. Sallam et al. 2015; King et al. 2017). These are admittedly minor, but Goren and coworkers have not eliminated these as possibilities.

Map scale and map age are also concerns. Geologists’ understanding of rock units evolves over time and formation definitions become more refined. Old maps¹⁰⁹ rarely reflect modern thinking. The information quality on the map is determined by the capabilities of the mapper. Skilled mappers identify more details and map more accurately than less skilled or inexperienced mappers and map makers (Campbell 2005; Wilson 2016). Large scale maps, by their very nature, will show significantly less detail than small scale maps. One needs only to look at the

visual comparison between the two scales to realize that a map can potentially obscure the occurrence of numerous suitable clay or temper containing formation outcrops simply because they are too small to be shown at 1:250,000 but can easily be shown at 1:50,000 (see USGS 2002; USGS 2019). The authors only occasionally identify the age and/or scale of the maps they are using.

5. Geologic Terms Misused and Misunderstood

Goren and his coworkers use geologic terms throughout their manuscripts. Unfortunately, they use terms incorrectly with such frequency that they create the impression that they likely do not understand the science behind the words they use. For example:

- Goren (1996) states: “...argillaceous, ferruginous, shale-rich clay....¹¹⁰” This wording is the equivalent of saying clayey clay. Constantly referring to shale as being clayey indicates a lack of understanding of the nature of shale. Porat and Goren (2002) are also fond of referring to clayey clays. From a geologic perspective, this terminology makes no sense and it would appear that the authors do not know the proper terminology to describe what they are observing under the microscope.
- Porat and Goren (2002) refer to a dolomitic clay that is noncalcareous¹¹¹. This is terribly confusing terminology since it is, by definition, impossible. Dolomite is calcareous. Likely the author means that there are a small number of dolomite grains present in an otherwise carbonate free clay. They also refer to carbonate poor marls¹¹² which is a

¹⁰⁸ See the geologic time scale on Wikipedia: https://en.wikipedia.org/wiki/Geologic_time_scale.

¹⁰⁹ Goren et al. (2004), page 17, line 16.

¹¹⁰ Goren (1996), page 38, col. 2, lines 13-14 and Cohen-Weinberger and Goren (2004), page 73, col. 1, line 15.

¹¹¹ Porat and Goren (2002), page 474, col. 2, line 20.

¹¹² Porat and Goren (2002), page 471, col. 2, line 5.

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contradiction in terms since marl is defined as “calcareous clay” (AGI 1962)

- Goren (1996), Cohen-Weinberger and Goren (2004), and Goren et al. (2003, 2004) all refer to “grains of arkose.”¹¹³ Arkose is a *sandstone* containing at least 25% feldspar (AGI 1962). The grains of “arkose” that Goren et al. (2004) illustrate in Fig. 5 are merely feldspar grains that may or may not be derived from granite or “related igneous rocks.” There is no arkose in Fig. 5. Also, if there are enough twinned plagioclase grains present, it might be possible to determine what specific kind of igneous rock produced the plagioclase based on the Ca percentage in the crystals, which, in turn, could provide additional provenance information.
- Cohen-Weinberger and Goren (2004) make reference to “geode quartz”¹¹⁴. There is no such mineral. The quartz in a geode is chert usually presenting as agate. There is no way to petrographically determine that a chert fragment originated specifically from a geode since agate from a geode will look like any other chert.
- Cohen-Weinberger and Goren (2004) make reference to “igneous mafic minerals”¹¹⁵ and then name serpentine as one of these minerals. Serpentine is not an igneous mineral. It is a metamorphic mineral that forms when certain ultramafic rocks (often found in ophiolite sequences) are metamorphosed under water saturated conditions.
- Cohen-Weinberger and Goren (2004) make reference to “igneous mafic minerals” and then name pyroxene as one of these minerals. There are two main groups of pyroxene (orthopyroxene and clinopyroxene) and many different minerals in each group. The specific

species of pyroxene can be very diagnostic of provenance. The authors do not discuss this or identify the specific pyroxene(s) present.

- Cohen-Weinberger and Goren (2004) state: “Tuff, dykes and basalts occur in the slopes of Mount Hermon, where Lower Cretaceous volcanics expose nearby Jurassic limestone formations containing fossil reefs.”¹¹⁶ This sentence demonstrates exceptionally well that the authors are inaccurately transcribing words that they have read in geologic reports without having the slightest understanding of what these words actually mean. In the referenced sentence, tuff, dyke and basalt are used as if they are three distinct characteristics that in some way help to ascribe provenance. A tuff is a rock made from consolidated volcanic ash. In this case, it is probably a basaltic ash. A dyke is a volcanic rock that has a specific geometric shape and a specific 3D relationship to the other rocks enclosing it. Again, in this case, it is probably a basaltic dyke, but in other geologic environments dykes are made of other rock types. The sentence then goes on to state that somehow the Lower Cretaceous volcanics cause the Jurassic limestones to be exposed. This statement is an impossibility. Basalts are lavas. They flow out and cover things. Since the basalts are younger than the limestones, the basalts would have flowed over and covered the limestones. To suggest otherwise is a violation of Steno’s Law (formulated in 1669 and of critical importance to interpreting any archaeological excavation). If the limestones are exposed, it is because some

¹¹³ Goren (1996), page 47, col. 1, line 2.

¹¹⁴ Cohen-Weinberger and Goren (2004), page 73, col. 2, lines 19-20.

¹¹⁵ Cohen-Weinberger and Goren (2004), page 73, col. 2, line 21.

¹¹⁶ Cohen-Weinberger and Goren (2004), page 76, col. 2, lines 46-50.

other geologic process removed the basalt to expose the limestone.

- Cohen-Weinberger and Goren (2004) describe calcite inclusions as: “...dense, idiomorphic, silty calcite crystals which tend to be spherical¹¹⁷...” This string of words is self-contradictory on several levels. If the grains are rounded, there is no way to know if they were once idiomorphic. It is not clear what the authors mean by “silty.” Presumably there are silt inclusions in the calcite grains which means that their crystal growth was interrupted by the preexisting silt grains and therefore the calcite grains could be regarded as xenomorphic (another word which is used freely in this manuscript). ALSO, Goren et al. (2004) make frequent reference to “idiomorphic” dolomite grains. Calcite and dolomite are relatively soft minerals (Mohs hardness = 3) and have perfect rhombohedral cleavage. In all likelihood the frequent references to idiomorphic carbonate grains are really references to mechanically crushed cleavage flakes. Genetically, these are very different from idiomorphic crystals.
- “Bentonic¹¹⁸” is the name of a rock band (of the musical kind). I believe the authors meant to say “bentonite” or “bentonitic.” The two instances may well be typographical errors.
- In all of the manuscripts reviewed, the authors focus excessively on the geologic age of the source lithology creating the impression that they regard the age as somehow provenance diagnostic, which it is not.

The above examples are just several of the dozens of such examples of misused or misunderstood geologic terminology throughout the various

Goren manuscripts. The occasional misuse of a geologic term by a non-geologist can be ignored, but to be confronted by paragraph after paragraph, manuscript after manuscript strongly suggests that the authors are using the terminology in an attempt to sound knowledgeable when, in fact, they have no understanding of the geologic processes and characteristics they are describing. A list of minerals along with the mention of nearby rock types that could be the source of these minerals is more than sufficient to discuss likely provenance. Perhaps the most extreme example of this tendency is the one and a half pages allotted to describing the Troodos ophiolite and associated rocks¹¹⁹. Goren et al. (2004) provide an exhaustive list of rock types—andesitic basalt, quartz andesitic basalt, quartz microdolerite, olivine basalt, quartz microgabbro, mugearite, dolerite sheet dykes, unspecified detrital minerals (whatever those might actually be), umberiferous olistoliths, reefal limestone, and on and on and on. This entire listing of geologic terminology is meaningless. The authors need to tell us what minerals are present and whether the surrounding geology is likely to produce those minerals. Do the authors even know what minerals make a mugearite?

The discussion of clay geology by Goren et al. (2004)¹²⁰ supports the notion that these authors probably do not understand the geology of clay minerals or the depositional systems in which they are found. The discussion of clay as a grain size¹²¹ is archaeologically irrelevant. They discuss clay mineralogy, but they are not clear about the specifics, suggesting that clays are *usually*¹²² phyllosilicates. Clays are *always* phyllosilicates (Kerr 1977). They create artificial categories that no geologist would recognize. They state that the clay in *in situ* clay deposits forms in a different way from the clay in

¹¹⁷ Cohen-Weinberger and Goren (2004), page 76, col. 2, lines 21-22.

¹¹⁸ Goren et al. (2004) page 62, line 3 and page 109, line 34.

¹¹⁹ Goren et al. (2004) pages 61-62.

¹²⁰ Goren et al. (2004), page 4, 3rd paragraph, “Ceramic Production Systems and Clay Tablets” section.

¹²¹ Goren et al. (2004), page 4, lines 17-18.

¹²² Goren et al. (2004), page 4, lines 16-17.

sedimentary deposits. The authors state: “The first may develop from the chemical alteration of other minerals (such as feldspars) and produce beds of pure clay that may be used for stoneware or porcelain production. The latter are deposits originating from weathering processes of rocks...¹²³” All clays are weathering products, whether formed by hydrothermal processes or at surface temperatures and pressure (Velde 1995; Foley 1999). High purity kaolinite clays used for porcelain are nothing more than clays that have not yet been eroded and transported away from their place of formation. They are also clays that form from a very specific rock type, one that is extremely rich in feldspar minerals.

Cohen Weinberger and Goren (2004) state that Group J sherds contain abundant inclusions of quartz grains which “indicates an aeolian contribution from the coast.¹²⁴” They provide no documentation to support this claim. Aeolian quartz has a number of distinctive characteristics—very narrow range of grainsizes (usually very fine and fine) with the grains being generally well rounded, pitted and frosted. None of these characteristics are mentioned in their description. The authors provide no basis at all for assigning Group J to the Shephelah area other than it is near the coast. Assuming that the quartz is actually a dune sand, it more likely originates from aeolian desert dunes, which cover a significant part of the Shephelah study area.

6. Statistical Analysis

Goren et al. (2004) indicate that they use the STATISTICA software as their primary statistical tool, but they do not tell the reader how they analyze their data. The statistical methodology section is mostly devoted to incorrectly describing geochemical concepts (as discussed above). They have filled the statistics section with a lot of statistical terms (scattergrams, bivariate plots, multivariate

statistics, principle component analysis, cluster analysis, lognormal distribution, quasi-standardization, hyperspherical space, etc.), but there is no discussion of how the analyses were run or what data were used. Their methodology section leaves too many questions unanswered:

- Which data are being input for the cluster and principal components analysis? Is it just the (unreliable) geochemical data or are the qualitative petrographic data also included as observed characteristics?
- When a statistical analysis is run, which tablets or pottery are included in the run?—all samples in the study or just selected subsets?
- Are the geochemical results from the local materials included with the petrographic analyses?
- Why do we never see the outcome plots of the PCA or the cluster analyses?

Ultimately we are being asked to simply accept that Goren and his coworkers did a thorough analysis without them being required to show us the actual clusters/groupings. The disjointed and meandering discussion of statistical methodology and the bandying of statistical terminology without any substantive discussion of the analytical design gives the reader the impression that the Goren team does not really understand the nature of the analyses they are performing.

For every group of tablets analyzed, Goren et al. (2004) always refer to observed clusters, but they never show the graphical results of the cluster or PCA analyses. Consequently we never know which samples specifically were included in the analysis or which vessel characteristics were used to run the clustering/PCA statistics. In the entire report there is one PCA illustrated (Fig. 3.2) and one cluster analysis (Fig. 3.4). Since the reader does not know how tightly constrained the character input data are, the reader is not in a position to evaluate if the clusters identified by Goren and coworkers are realistic.

¹²³ Goren et al. (2004), page 4, lines 21-23.

¹²⁴ Cohen-Weinberger and Goren (2004), page 79, col. 2, lines 5-6.

Goren and his coworkers have amassed a significant collection of sherd and raw clay thin sections. According to Porat and Goren (2002) this collection contains more than 8,000 thin sections (as of 2002) and serves as their primary reference database for comparing new study material to the various defined provenance categories (Goren 1996; Porat and Goren 2002). Though Goren and his coworkers frequently reference this database, they do not provide details about its specific composition. Of particular interest would be the number of raw clay samples included and how many of these clays have associated geochemical data. Given that Goren and his coworkers tend to be overly reliant on geologic maps, there is significant concern that analyses of raw clays are underrepresented in this database. Nor do we know the nature of the types of chemical analyses that were performed. NAA is the accepted standard trace element analysis methodology for archaeological materials. Goren et al (2004) admit that (a) ICP-MS/AES methodologies are not as commonly used in provenance analyses, and (b) that ICP-MS/AES results cannot be directly compared to NAA results. By using this nonstandard methodology, they are reducing the size of the comparative regional chemistry database.

A regional sampling of 8,000 sherd and clay thin sections provides an ideal opportunity to test how well the subjective observational provenance categories compare to objectively determined statistical categories. Given that this thin section database has been petrographically studied, it is surprising that such a statistical analysis has not been performed. A successful analysis should provide objective support to the subjective sherd categories. On the other hand, since rigorous point counting does not seem to be used by Goren and his coworkers, there would seem to be a lack of objective point count data for most, if not all, of this thin section collection.

7. Concluding Comments

There are many significant methodological errors throughout the reviewed reports by Goren and his coworkers. Some of them might be considered relatively minor, but the majority are sufficiently serious that they bring into question the quality of the data being acquired, and therefore the validity of the conclusions drawn. To summarize:

- The methodology sections are confusing and often contain irrelevant information. It is often difficult to understand Goren and his coworkers' approach, which then had to be inferred from this reader's preexisting familiarity with the techniques being discussed.
- Goren and his coworkers incorrectly use geological, geochemical, chemical and statistical terminology throughout their manuscripts creating the impression that they do not understand the underlying science behind the technologies they are applying to their studies.
- Goren and his coworkers do not understand geologic processes. This causes them to draw unwarranted conclusions from geologic reports. There are innumerable instances that can be cited.
- Geologic maps can be very helpful in explaining why particular mineral suites or trace element profiles occur in wasters and modern clay and temper samples collected from potential pottery clay and temper sources near the excavation. Geologic maps, however, are NOT a substitute for collecting and analyzing potential clay and temper sources that the ancient potters may have utilized. Geologic maps do not contain the level of information required to correlate a rock formation to a clay or temper source. Goren and his coworkers do not consider or understand the degree of lateral variability that formations characteristically exhibit both in their mineral and trace element profiles.

- After decades of testing, Standard Operating Procedures (SOP) are well established to guide sample collection from the materials to be studied by the analytical technologies being used by Goren and his coworkers. Many of these SOPs are formally published as ISO or ASTM standards. Goren and his coworkers ignore many of these standards in favor of introducing untested methodologies.
- Goren and his coworkers do not follow the rigorous testing procedures required to prove that new methodologies are effective. Their description of how these techniques have been tested show how poorly based their approach is. The SPA methodology is the very definition of non-random sampling, so the information it provides will skew any analysis that results.
- Systematic point counts were never reported in any of the cited petrographic studies. As a result, the petrographic analyses are all qualitative, and, therefore, can more easily be manipulated by researchers to conform to preconceived provenance categories.
- It is unclear why Goren and his coworkers would have chosen ICP-MS/AES as their primary analytical tools when by their own admission, the analyses are not comparable to NAA. NAA is the standard analytical methodology used by archaeologists in the region and contains the largest comparative database for provenance determinations.
- The samples collected for the ICP-MS/AES are too small to provide accurate chemical analytical results.
- The samples collected by “peeling” a tablet are too small to provide a statistically significant petrographic analysis.
- The workers do not clearly explain why certain results are excluded from their

analyses. It is also unclear if the same elements are being excluded from every assessment or if different elements are excluded from different assessments.

- The absence of quantitative point counts makes it more difficult to objectively code petrographic characters for cluster or principle components analysis. For example, should the presence of a single unusual mineral grain in a thin section carry the same weight as a thin section in which 10% of the inclusions are of that mineral type? In a qualitative analysis, it is much easier to code the characters to create the appearance that the two thin sections are very similar for this character.
- The authors discuss numerous statistical tests that have supposedly been applied to their data, but they never illustrate the results of these tests. The readers are expected to accept their written description of what the analyses revealed. Nor do they describe carefully what input data were used, most specifically if the petrographic results were tested statistically.

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APPENDIX 4

LINE-DRAWING FIGURES OF ANALYZED TELL EL-DAB'A POTTERY (APPENDIX 1)

It should be noted that Manfred Bietak personally checked the stratigraphy and dating of the published and unpublished pottery from the site reported on and illustrated here. His artists prepared the drawings of the pottery, which were modified, brought into conformity with one another according to the conventions outlined below, and arranged as plates according to the author's instructions. They were subsequently approved by Bietak. In the interim since this study was completed, however, some reassessments may have occurred, and the reader is advised to consult more recent publications.

The pottery on the line-drawings (Figs. 30-115) is arranged by the major classes, viz., Canaanite Jars (Figs. 30-66), Polished Wares (Figs. 67-95), Painted Wares (Figs. 96-105), and Miscellaneous types (Figs. 106-111). A follow-up NAA test group (Figs. 112-115), which includes additional examples of each class, is presented separately. For the Canaanite Jars, Polished Wares and Painted Wares, vessels are arranged by sub-periods (Middle Bronze IIA, IIA-B, IIB, IIB-C, IIC, and later or questionable dating), and within each period by ascending NAA no. (denoted by the initials of the individual who collected the sample--Joan Huntton [JH], Manfred Bietak [MB], or Patrick McGovern [PMG]). Canaanite Jars rims, bases, handles and body sherds, usually in this order, are illustrated in the figures following those of the vessels for each sub-period. Whole vessels, fragmentary vessels, rims, handles, bases, and body sherds are intermixed for the other classes. The Miscellaneous vessels are not arranged chronologically, but by type (from more open forms--bowls and cups--to progressively more closed forms--cooking pots and jars). Scales vary according to the artifact size: 1:5 for complete or nearly complete Canaanite Jars and other larger vessels, 1:2 or 3:5 for smaller vessels, and usually 1:1 for rims, handles, bases, body sherds, and the occasional miniature vessel.

In other respects, the drawings follow standard Tell el-Dab'a conventions. Exterior views are generally to the left, and interior views and cross-sections to the right, with a median line dividing the vessel. To show complete designs or other details, drawings sometimes extend across the median line or cross-sections are offset to the side. Perspective views of such details can also be placed above or the side of an artifact. Handle cross-sections are rotated 90° from a straight-on view. A number of handles have only half-sections, because they were cut for sampling. Sherds with doubtful stances are drawn vertically. If the diameter of a rim or base can be determined, its length in cm is indicated.

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Stippling and sometimes cross-hatching is used to highlight exterior shadowing, surface features, and damaged areas. Interior manufacturing marks, whether due to coiling, throwing or turning, are schematically shown by complete and broken lines. Individual sherds, which were reconstructed to make the larger vessel, are often drawn; where sherds are missing, the exterior area is blackened if the back of vessel is complete in this area, or left unblackened, if the back is open. Broken sections of sherds, which were visible in perspective view, are sometimes indicated by diagonal hatching. The latter are distinguished from red paint, which is similarly denoted, by varying the spacing of the hatching. Black paint is shown as solid black. Single incised lines indicated by single or double lines, depending on the scale of the drawing. Irregularly spaced dashed lines are used for burnishing, which was carried out in the direction shown, whereas evenly spaced dashed lines indicate probable reconstructions.

The captions to the figures provide detailed information on each sample, in the following order: the NAA number, the site (Tell el-Dab`a) and a reference to any drawing already published in the final publication for Area AII (Bietak 1991b--here abbreviated *Tell el-Dab`a V*), the registration or K (Ger. Konvolut, "form") number, a short description of the pottery type, the macroscopic fabric classification, the field, area and sometimes sub-area (abbreviated pl., Ger. Planung) or grave (abbreviated gr., Ger. Grabung) number(s) followed by Bietak's contextual assignment in parentheses, the level(s) and MB (Middle Bronze) phase(s), and the NAA provenience.

Note on Copyright

As explained in the Preface (p. iii) and “Illustrations and Sample Data” (p. 98) of the original publication, the pottery line-drawing figures were omitted from the BAR Hyksos volume, to allow Manfred Bietak the opportunity to first publish them. Bietak and his associates have now published the majority of the drawings in several volumes of the Tell el-Dab`a series over the past two decades (e.g., VIII/2012, XII/2004, and XX/2010). Where a pottery figure has not yet been published but is illustrated as a photograph in the NAA book, they have cited the latter in their publications, thereby implicitly accepting my copyright of the pottery illustrations whether as photographs or drawings. By appending a full set of the pottery figures here, readers of the BAR book will have ready access to them, rather than having to dig through the Tell el-Dab`a volumes to find them.

The reader might ask why these figures were not published 20 years ago when the BAR volume first appeared? A fuller explanation of the background and rationale is needed to explain how and why this happened and to establish my rights to publish the pottery figures here.

In “short,” my manuscript, including the pottery figures, was formally approved for publication by the Austrian Academy of Sciences in 1997. With funding from the Academy and the Austrian Archaeological Institute in Cairo, I spent six weeks that year finalizing the publication in Vienna. Before I left, I submitted the finished manuscript to the Academy, including all the finished pottery figures. According to the Academy’s policy, I was scheduled to sign over my copyright to the Academy.

After I returned to the States, however, Bietak peremptorily withdrew the manuscript from publication by the Academy. His reasons were that negative reviews had been received, but he did not share those with me or give me the opportunity to respond to any criticisms. To date, I have not received any such negative reviews from Bietak. The only ones that I am aware of are those that were later published by Goren and

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Aston, members of the Dab’a team and close associates of Bietak, which are cited and critiqued in the new Afterword included in this ResearchGate Project.

The Academy acceded to Bietak’s demands, and returned the full manuscript to me, including all the finished pottery figures. By relinquishing their copyright to the manuscript, the Academy stated that I could publish it elsewhere under my copyright (according to a letter from Werner Welzig, president of the Academy, dated Feb. 10, 2000, which is available upon request). The Academy did not stipulate that they or Bietak held copyright or any other rights to the manuscript, drawings, and photographs. If the pottery figures belonged exclusively to Bietak, they would not have returned them to me.

I then contacted David Davison, editor of BAR International at the time. After he received two positive reviews, Davison accepted my manuscript, including the pottery figures, for publication. He agreed that I held sole copyright to the entire manuscript.

Concurrently with the review of my manuscript by BAR, I conferred with University of Pennsylvania counsel and the Penn Museum director at the time, Jeremy Sabloff, and my immediate supervisor, Stuart Fleming. On their advice, I agreed to proceed as cautiously as possible in publishing the book. One potential problem was delimited, viz., customarily in archaeology, priority of publication of pottery and other finds is given to the director of the excavation, Bietak in this instance.

Preferring to error on the side of caution, I decided to omit the pottery figures from the book, and I notified Davison accordingly. He agreed to omit the pottery figures on my recommendation, even though he did not question my right to publish them if so desired. Davison’s opinion on this issue is an important one, because the BAR book was copyrighted under my name.

The book was published 20 years ago, and since then, Bietak has never disputed my copyright for the book and by implication my right to eventually publish the pottery figures under the same copyright as part of the BAR publication. My intellectual rights and copyright were assured on two counts: (1) I had had a substantive input in preparing, editing, and finalizing the pottery figures, and (2) the figures were specifically designed for a book of which I was the author.

Moreover, the customary practice of letting the excavator first publish the pottery and finds from his/her excavation is not a hard and fast rule necessitated by copyright law. It assumes that the excavator as employer “owns” the finished product of his/her “employees.” But I was employed by the University of Pennsylvania and it, together with other institutions (such as the neutron activation laboratories) and grant agencies, had paid nearly \$600,000, far and above what Bietak and the Academy had contributed (about \$9000 of the total), to see the project completed and the book written by me over a twelve-year period (a letter from Brian Leslie, the Penn counsel, to the president of the Academy, Werner Welzig, dated Jan. 19, 2000, spells out these conditions, and is available upon request). Under such circumstances, I was entitled to majority, if not exclusive, copyright status.

That such priority of publication by the excavator is not a hard and fast rule and that I had every right to publish the pottery figures is also borne out by my receiving official written approval from the Kunsthistorisches Museum in Vienna to publish the photographs of many of the same pottery vessels that

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are also illustrated in the pottery figures. Because of this specific confirmation by the Museum of my rights to the pottery photographic plates, there was no need to be cautious about the copyright of those plates and they were published in their entirety in the BAR volume. If the photographic pottery plates could be copyrighted under my name in the book, then the pottery figures might quite justifiably have been, as well.

Now that Bietak and his associates have published most of the pottery figures in other publications, I have fulfilled my commitment to give him as the excavator the presumptive first rights to publish the pottery. His intellectual rights have been satisfied, but mine were still outstanding.

Since 2000, when the BAR volume was published, my book has suffered from the lack of visual evidence for the pottery being described, analyzed, and interpreted scientifically and historically. Archaeologists and archaeological scientists very much depend on such documentation. The positive reviews of the book by Hector Neff, Stephen J. Bourke, and Linda Hulin uniformly pointed out the lack of pottery figures as a major deficiency of the book.

By publishing at long last the pottery figures, we have made up for this deficiency in the original publication and here provide scholars with ready access to a valuable resource for a stratified sequence of imported Levantine pottery into Egypt over the course of the Middle Bronze Age. They will also now be better able to assess the relative merits of NAA and petrography in provenancing ancient pottery.

The pottery figures and the extended Afterword with its petrographic critique is a fitting capstone to the original BAR volume, which is the largest period-specific and area-specific NAA study ever carried out. It should lead to an improved understanding of the enigmatic Hyksos, as well as methodological refinements in scientific archaeology generally.

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Fig. 30: MB IIA Canaanite Jars

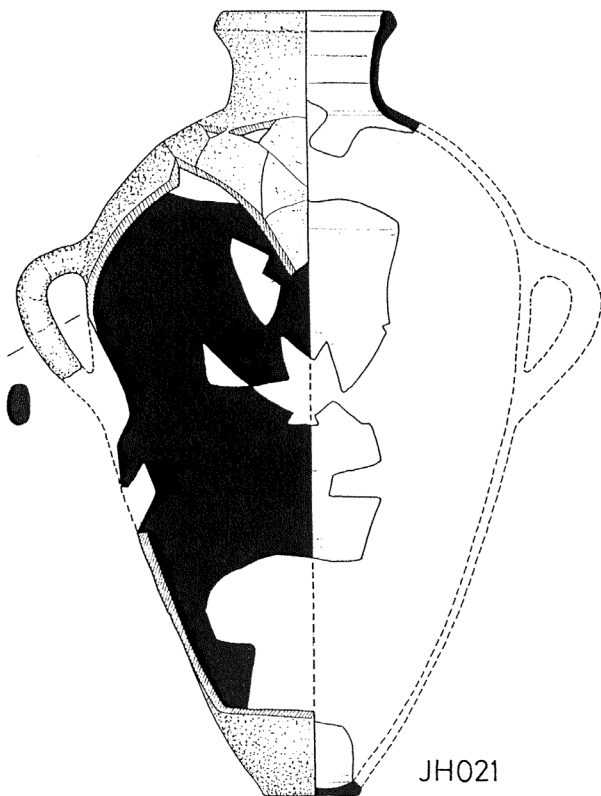
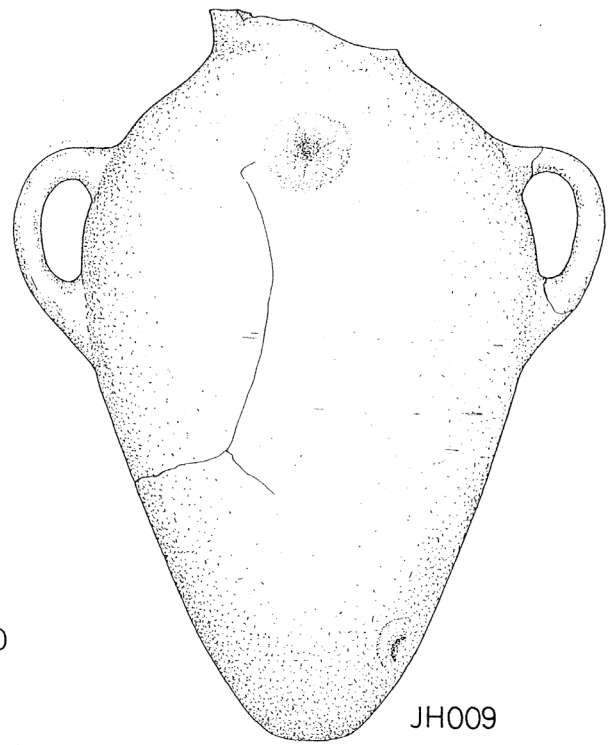
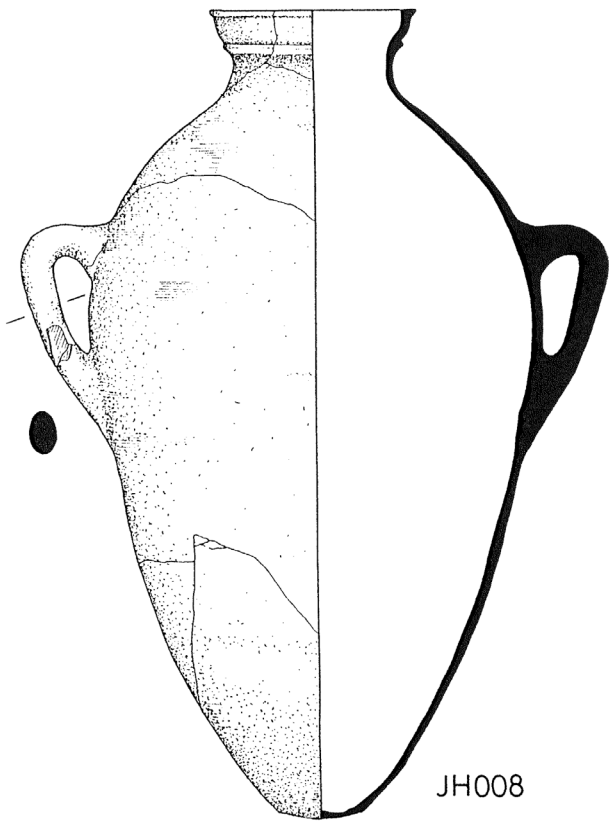
JH008
3983
Tell el-Dab`a
Canaanite Jar
IV-3b
FI j/22, gr. 29 (burial)
c; MBIIA
NAA Provenience: Southern Palestine

JH009
Tell el-Dab`a
3986
Canaanite Jar, complete up to neck
IV-3b
FI j/22, gr. 29 (burial)
c; MBIIA
NAA Provenience: Southern Palestine

JH021
Tell el-Dab`a
4544A
Canaanite Jar, base, rim, handle, and body sherds
IV-1c
FI k/22, pit 32 (residence)
End of c; MB IIA
NAA Provenience: Southern Palestine

JH022
Tell el-Dab`a
2532G
Canaanite Jar
IV-1c
AII n/15, magazine (residence)
G; MB IIA
NAA Provenience: Southern Palestine

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Fig. 31: MB IIA Canaanite Jars

JH027

Tell el-Dab`a

4550F

Canaanite Jar, complete up to upper body

IV-2c

FI k/22 (residence)

c; MB IIA

NAA Provenience: Southern Palestine

JH033-036

Tell el-Dab`a

4550B-E

Canaanite Jar, missing body sherds, with incised mark

IV-1-3b

FI j/23s (residence)

c; MB IIA

NAA Provenience: Southern Palestine

JH039

Tell el-Dab`a

2532E

Canaanite Jar, complete up to mid-/upper body

IV-2c

AII n/15, magazine (residence)

G; MB IIA

NAA Provenience: Southern Palestine

JH040 (not illustrated)

Tell el-Dab`a

4548C

Canaanite Jar, upper body, handle, and body sherds

I-e3

FI i/23, gr. 40 (burial)

c; MB IIA

NAA Provenience: Egyptian Nile alluvium

JH041 (not illustrated)

Tell el-Dab`a

4548D

Canaanite Jar, shoulder and body sherds

IV-2-3c

FI i/23, gr. 40 (burial)

c; MB IIA

NAA Provenience: most similar to Southern Palestine (ADCORR 3.4%; mean Euclidean distance 0.054)

JH042 (not illustrated)

Tell el-Dab`a

4550A

Canaanite Jar, lower body

IV-2c

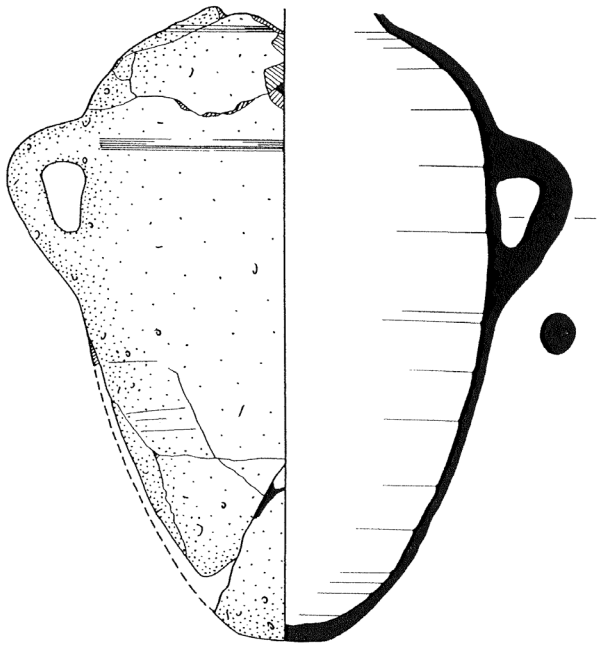
FI k/22, pl. 3 (residence)

c; MB IIA

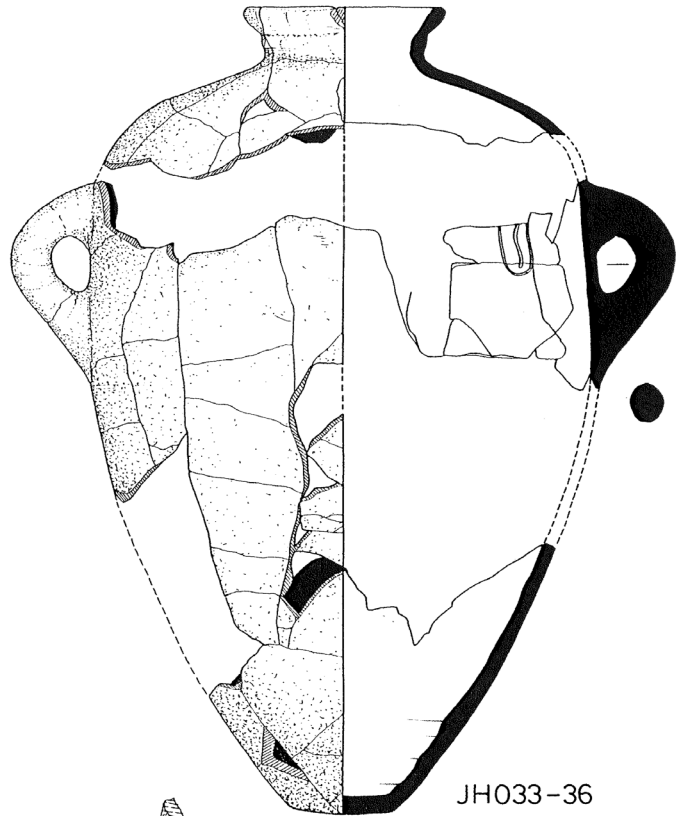
NAA Provenience: Southern Palestine

The Foreign Relations of the "Hyksos"

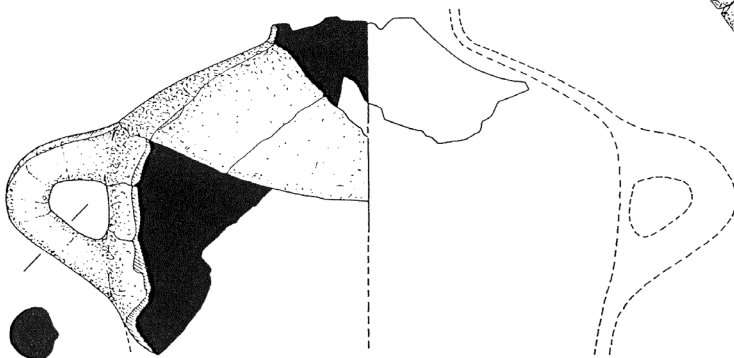
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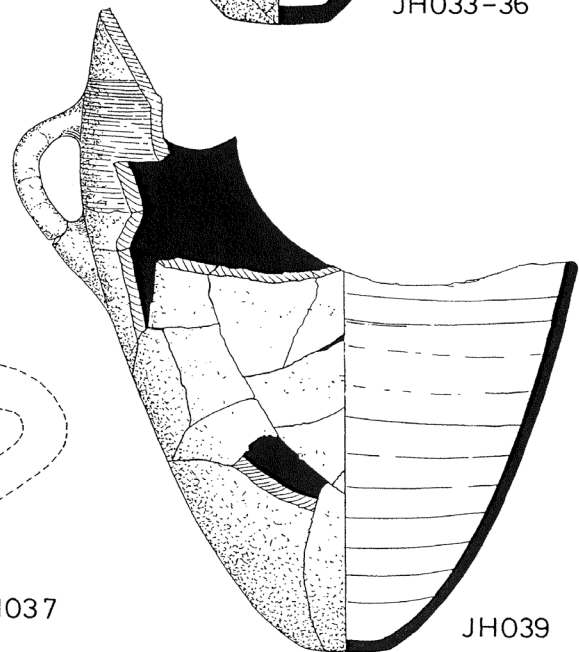
JH027



JH033-36



JH037



JH039

109

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Fig. 32: MB IIA Canaanite Jars

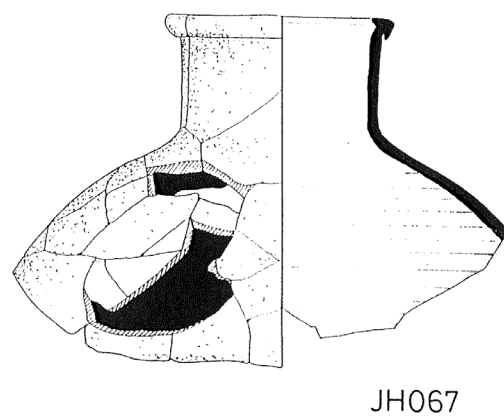
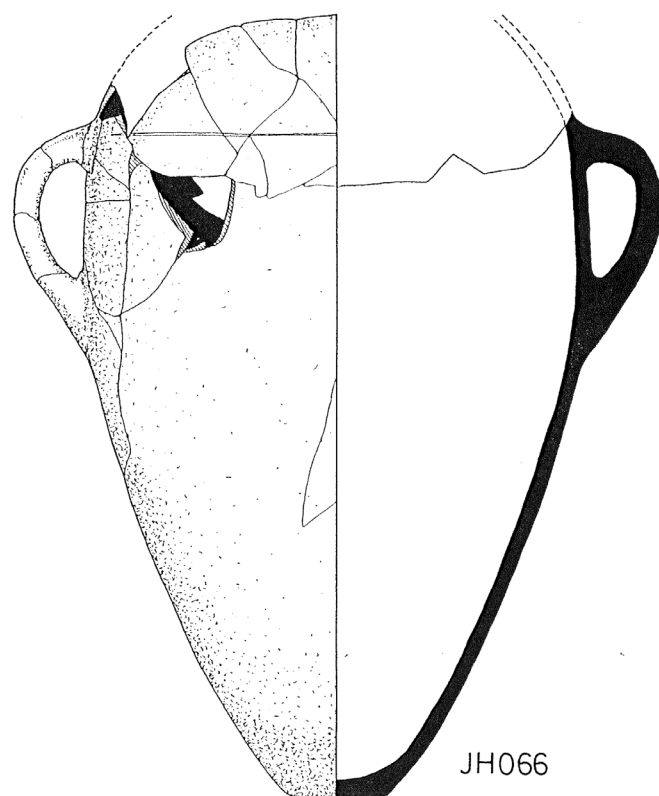
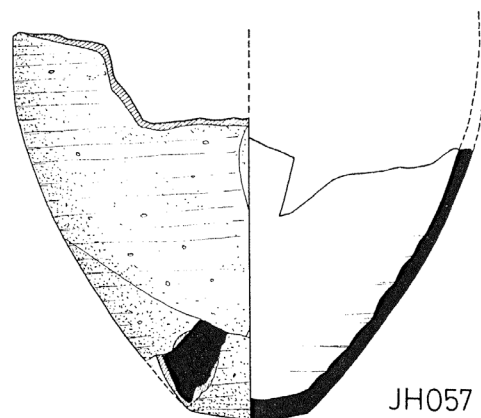
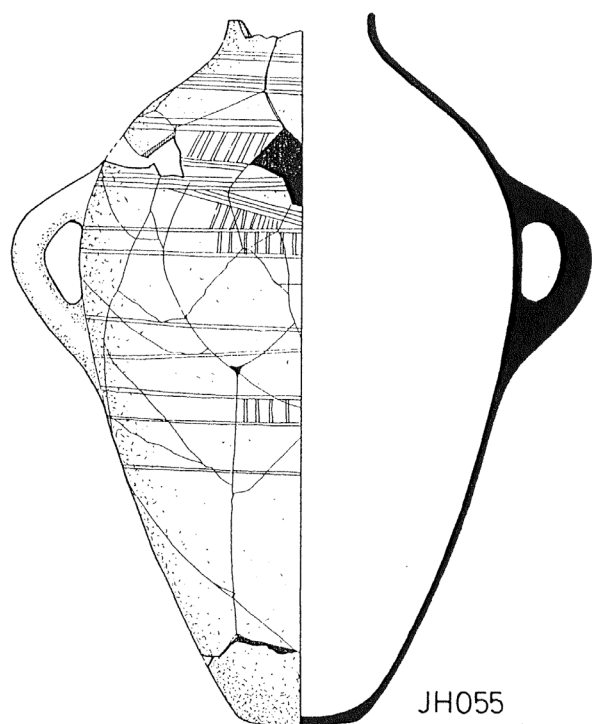
JH055
Tell el-Dab`a
2532C
Canaanite Jar, complete up to upper body
IV-1c
AII n/15, magazine (residence)
G; MB IIA
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

JH056 (not illustrated)
Tell el-Dab`a
4552J
Canaanite Jar, rim, shoulder, handle, and body sherds, with incised mark
IV-1c
AII n/18 (residence)
G; MB IIA
NAA Provenience: Southern Palestine

JH057
Tell el-Dab`a
4552A
Canaanite Jar, lower body
IV-2c
FI i/22, gr. 34, secondary fill (residence)
c; MB IIA
NAA Provenience: Southern Palestine

JH066
Tell el-Dab`a
4030B
Canaanite Jar, complete up to midbody, with incised mark
IV-2d
AII p/21 (residence)
G; MB IIA
NAA Provenience: Southern Palestine

JH067
Tell el-Dab`a
4030C
Canaanite Jar, upper body
IV-1c
AII p/21 (residence)
G; MB IIA
NAA Provenience: most similar to Southern Palestine (ADCORR 1.8%; mean Euclidean distance 0.071)



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Fig. 33: MB IIA Canaanite Jars

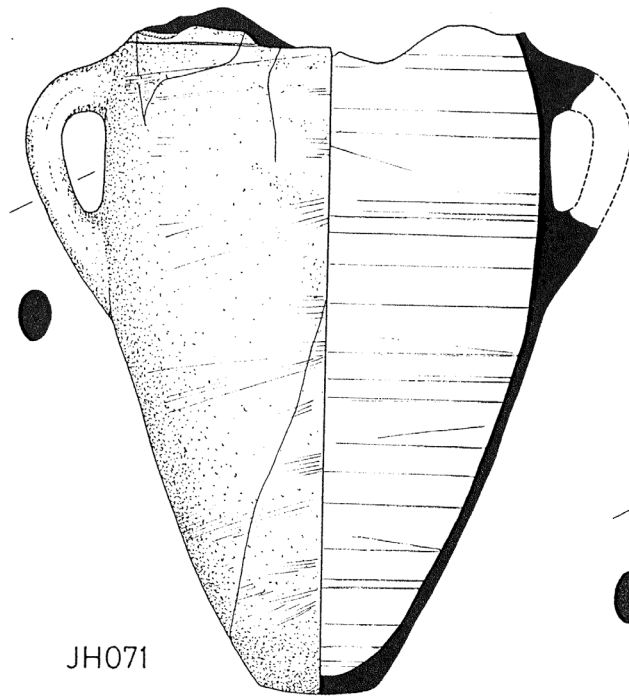
JH071
Tell el-Dab`a
2497N
Canaanite Jar, complete up to midbody
IV-2c
AII n/11 (residence)
G1-2; MB IIA
NAA Provenience: Southern Palestine

JH086
Tell el-Dab`a
3968A
Canaanite Jar, missing lower body
IV-2b
FI i/22, gr. 31 (burial)
c; MB IIA
NAA Provenience: most similar to Southern Palestine (ADCORR 0.2%; mean Euclidean distance 0.069)

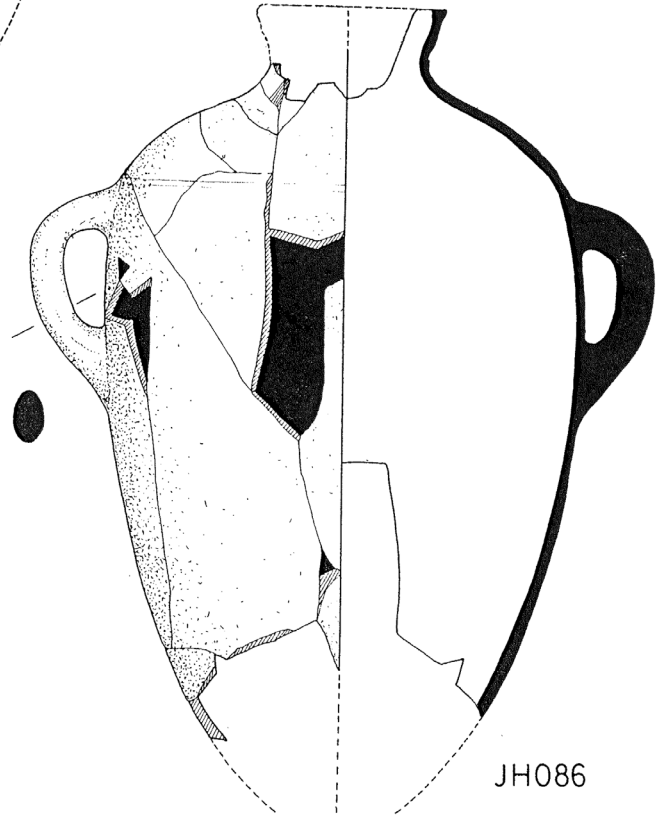
JH089 (Pl. 1a)
Tell el-Dab`a
4536
Canaanite Jar
IV-3c
FI j/22, gr. 29 (burial)
c; MB IIA
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.1%; mean Euclidean distance 0.086)

JH093
Tell el-Dab`a
4552H
Canaanite Jar, upper body
IV-2c
FI j/23s (residence)
c; MB IIA
NAA Provenience: most similar to Southern Palestine (ADCORR 0.8%; mean Euclidean distance 0.072)

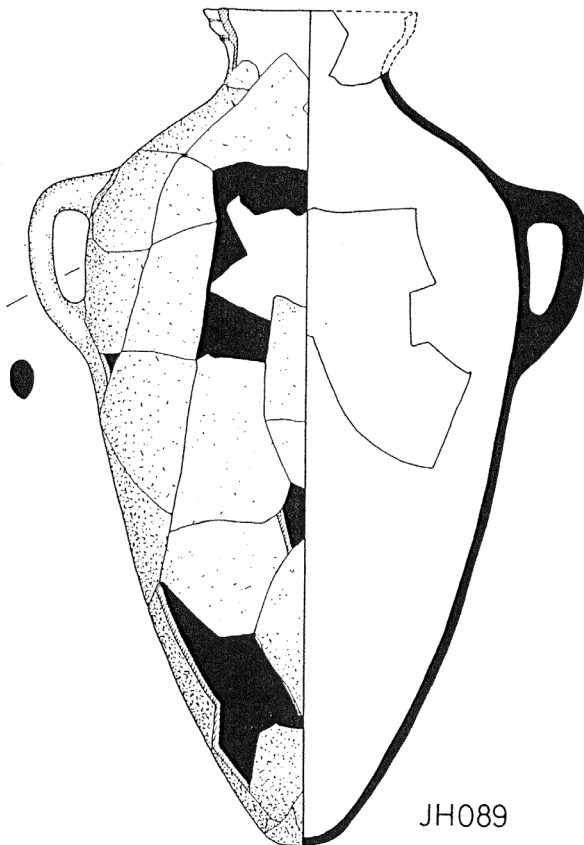
The Foreign Relations of the "Hyksos"



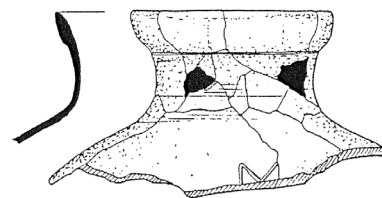
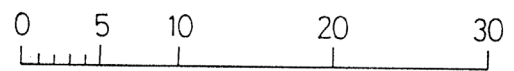
JH071



JH086



JH089



JH093

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Fig. 34: MB IIA Canaanite Jars

JH110

Tell el-Dab`a

4630B

Canaanite Jar, complete up to upper body, missing both handles, with incised mark

IV-2c

FI 1/20, pl. 0/1 (residence)

c; MB IIA

NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.1%) and JH061, of uncertain provenience (mean Euclidean distance 0.094)

JH130

Tell el-Dab`a

2532D

Canaanite Jar, missing rim and lower body

IV-2c

AII n/15, magazine (residence)

G; MB IIA

NAA Provenience: Southern Palestine

JH131

Tell el-Dab`a

2532F

Canaanite Jar, missing lower body

IV-2c

AII n/15, magazine (residence)

G; MB IIA

NAA Provenience: Southern Palestine

JH136

Tell el-Dab`a

2660B

Canaanite Jar, lower body

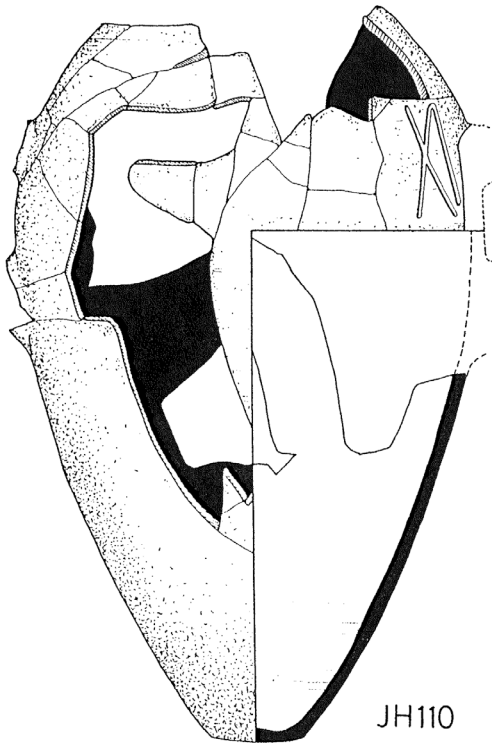
IV-2c

AII n/14-15, pl. 4, magazine find no. 27 (residence)

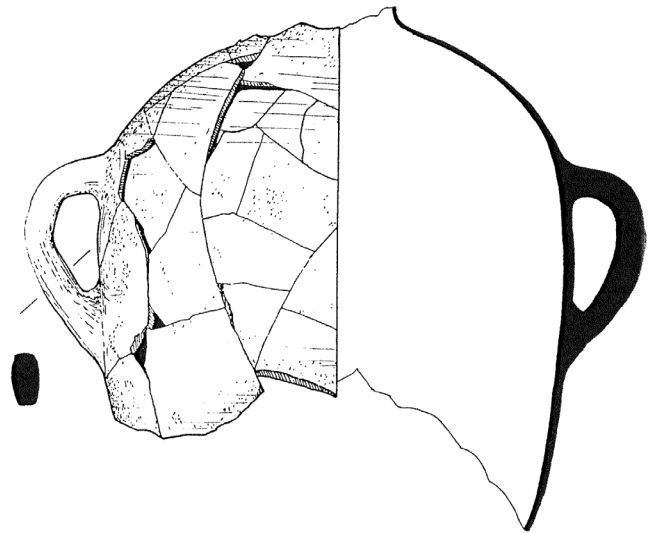
G; MB IIA

NAA Provenience: Southern Palestine

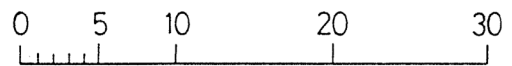
The Foreign Relations of the "Hyksos"



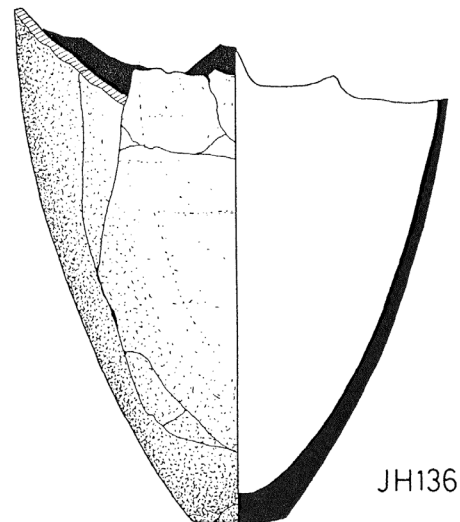
JH110



JH130



JH131



JH136

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Fig. 35: MB IIA Canaanite Jars

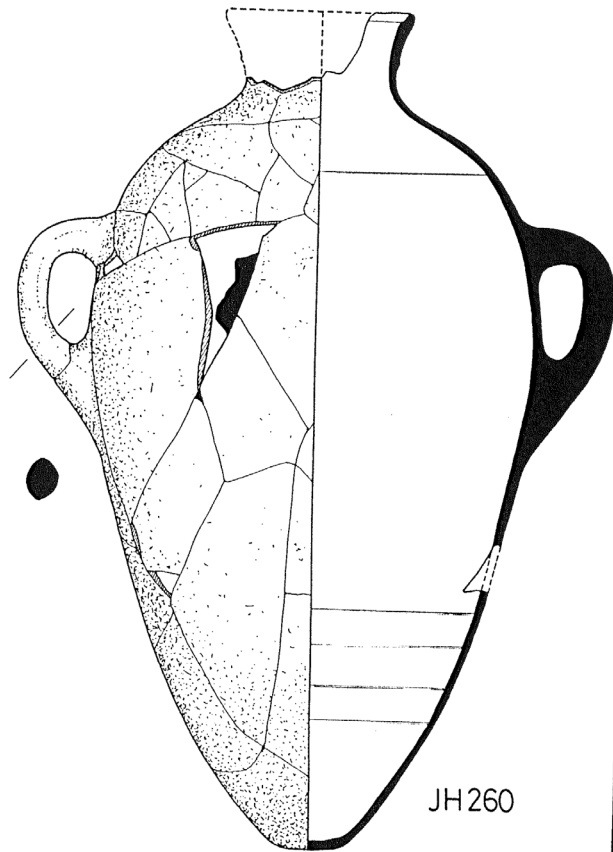
JH260
Tell el-Dab`a
3994
Canaanite Jar, complete up to upper body
IV-2c
FI j/22, gr. 29 (burial)
c; MB IIA
NAA Provenience: Southern Palestine

JH261
Tell el-Dab`a
3990
Canaanite Jar
IV-2c
FI j/22, gr. 29 (burial)
c; MB IIA
NAA Provenience: Southern Palestine

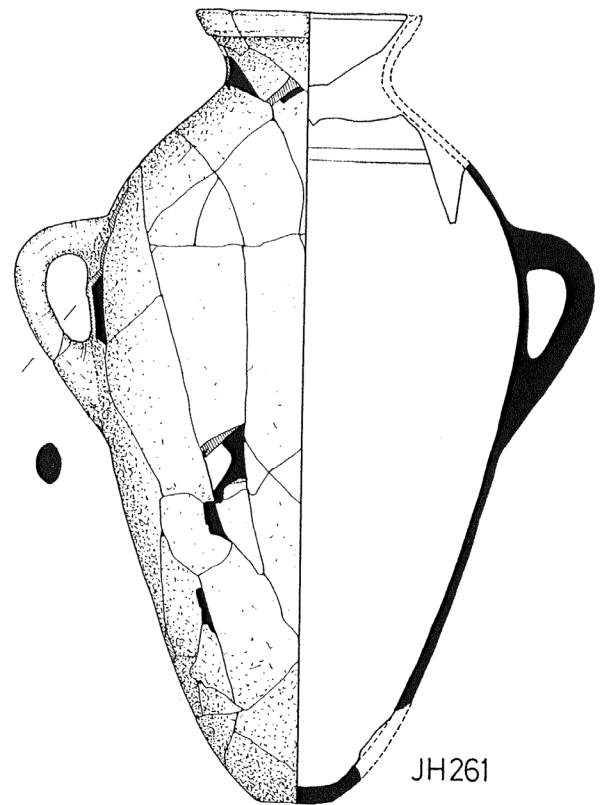
JH262
Tell el-Dab`a
3984
Canaanite Jar, complete up to upper body, with incised mark
IV-2c
FI j/22, gr. 29 (burial)
c; MB IIA
NAA Provenience: Southern Palestine

JH263
Tell el-Dab`a
3968
Canaanite Jar
IV-2c
FI i/22, gr. 31 (burial)
c; MB IIA
NAA Provenience: Southern Palestine

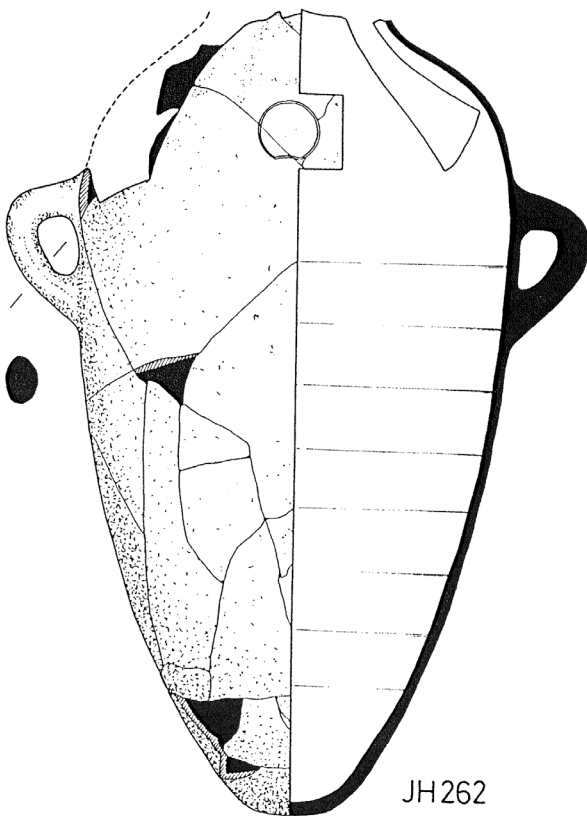
The Foreign Relations of the "Hyksos"



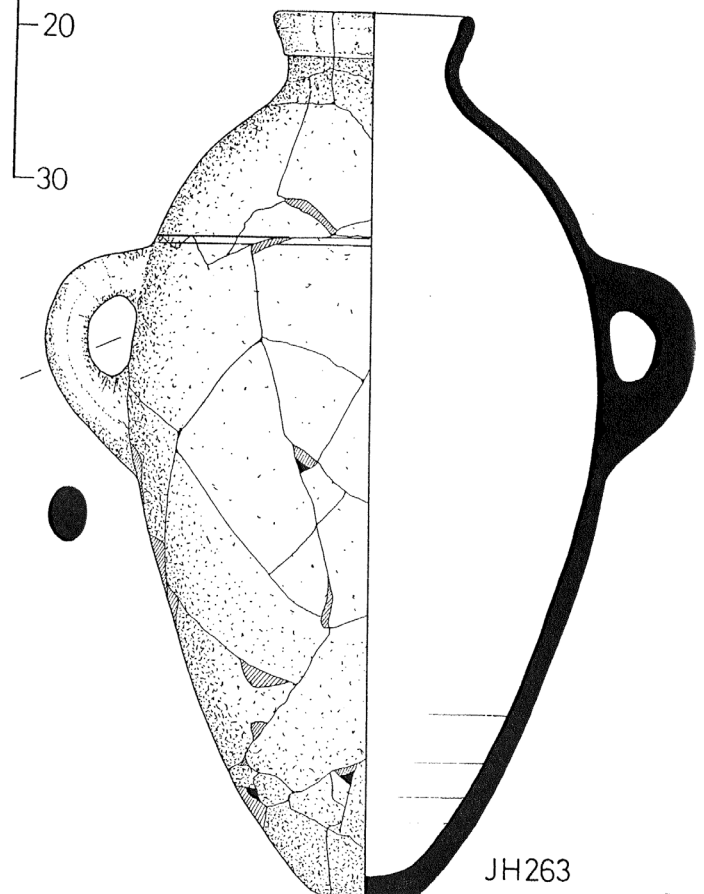
JH260



JH261



JH262



JH263

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Fig. 36: MB IIA Canaanite Jars

JH265=JH266

Tell el-Dab`a

3985

Canaanite Jar, complete up to upper body

IV-2b

FI j/22, gr. 29 (burial)

c; MB IIA

NAA Provenience: most similar to Southern Palestine (ADCORR 4%; mean Euclidean distance 0.067)

JH267

Tell el-Dab`a

3993

Canaanite Jar

IV-2c

FI j/22, gr. 29 (burial)

c; MB IIA

NAA Provenience: Southern Palestine

JH268

Tell el-Dab`a

3992

Canaanite Jar, complete up to upper body

IV-2-3c

FI j/22, gr. 29 (burial)

c; MB IIA

NAA Provenience: Southern Palestine

JH697

Tell el-Dab`a

5301A

Canaanite Jar, complete up to midbody

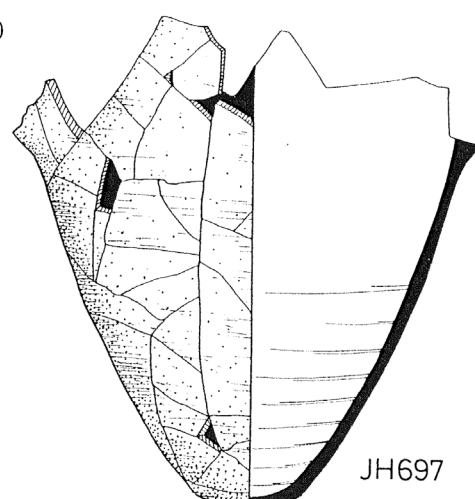
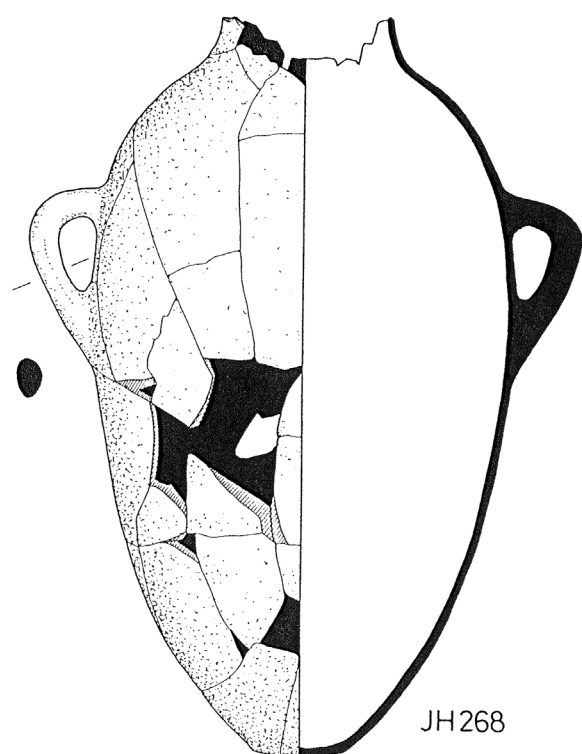
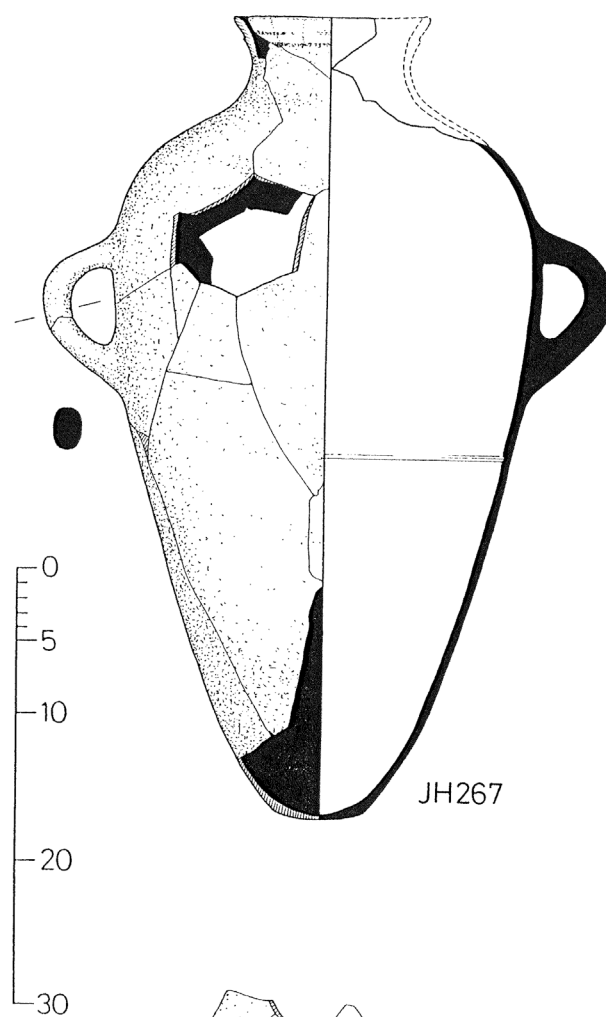
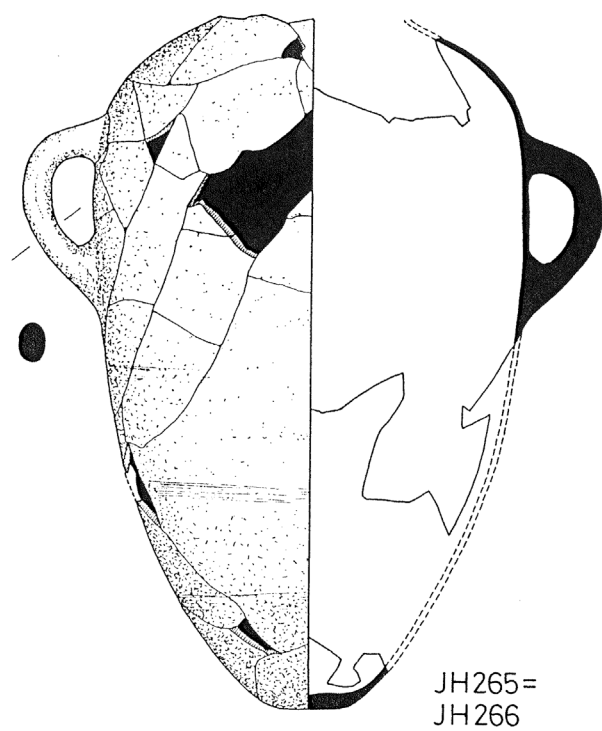
IV-1c

FI k/20, pl. 3, palace magazine (residence)

d1; MB IIA

NAA Provenience: Southern Palestine

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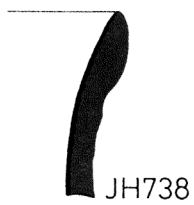
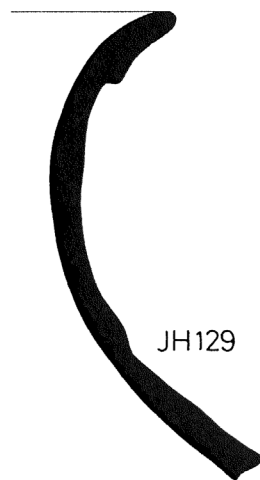
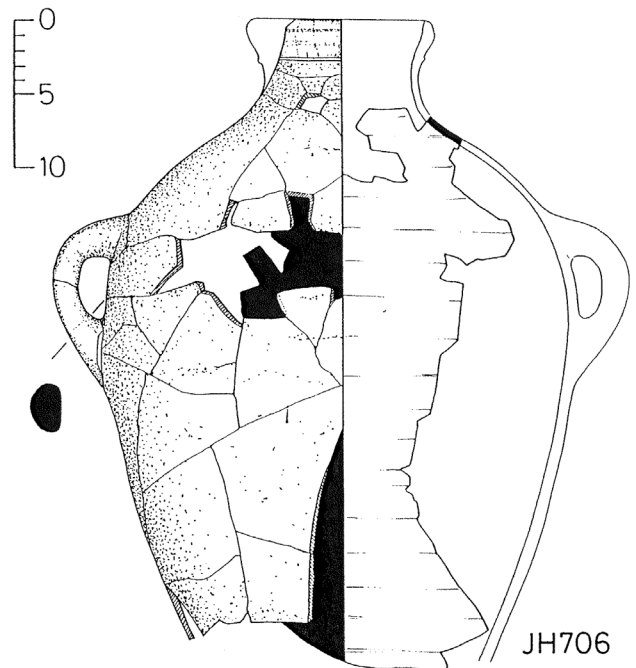
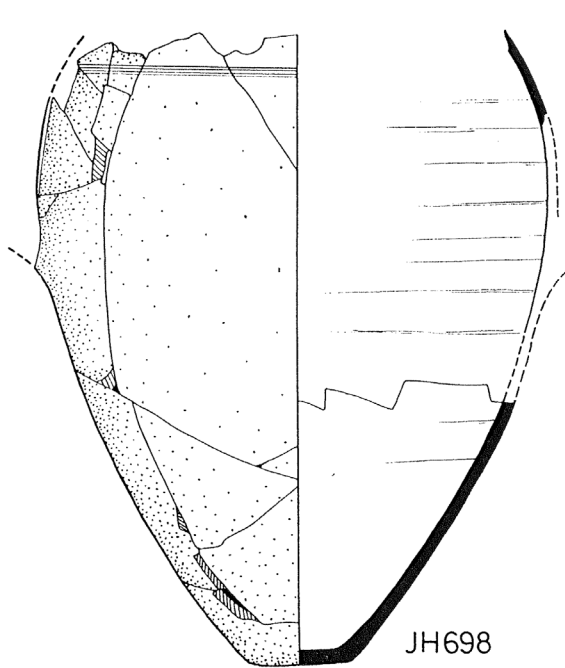


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Fig. 37: MB IIA Canaanite Jars and Rims

<p>JH698 Tell el-Dab'a 5300A Canaanite Jar, complete up to upper body IV-2c FI l/22 (residence) d1; MB IIA NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.7%; mean Euclidean distance 0.084)</p> <p>JH706 Tell el-Dab'a 4782 Canaanite Jar, missing lower body IV-2c FI k/24, gr. 47 (infant burial) c; MB IIA NAA Provenience: Southern Palestine</p> <p>JH119 Tell el-Dab'a K2817 Canaanite Jar rim IV-1b FI l/20, pl. 2-3, filling in pit 40, west balk (palace) d1; MB IIA NAA Provenience: ?; no matches at mean Euclidean distance 0.1</p> <p>JH121 Tell el-Dab'a K2817 Canaanite Jar rim IV-3c FI l/20, pl. 2-3, filling in pit 40, west balk (palace) d1; MB IIA NAA Provenience: ?; most similar to Southern Palestine (ADCORR 1.1%) and Ebla JHEB05, of uncertain provenience (mean Euclidean distance 0.083)</p> <p>JH122 Tell el-Dab'a K2817D Canaanite Jar rim IV-3c FI l/20, pl. 2-3, filling in pit 40, west balk (palace) d1; MB IIA NAA Provenience: ?; most similar to Kamid el-Loz JH145, of local origin (mean Euclidean distance 0.095)</p> <p>JH123 Tell el-Dab'a K2817 Canaanite Jar rim IV-2c FI l/20, pl. 2-3, filling in pit 40, west balk (palace) d1; MB IIA NAA Provenience: ?; no matches at mean Euclidean distance 0.1</p> <p>JH124 Tell el-Dab'a K2817 Canaanite Jar rim IV-2c FI l/20, pl. 2-3, filling in pit 40, west balk (palace) d1; MB IIA NAA Provenience: ?; no matches at mean Euclidean distance 0.1</p> <p>JH125 Tell el-Dab'a K2817</p>	<p>Canaanite Jar rim IV-1c FI l/20, pl. 2-3, filling in pit 40, west balk (palace) d1; MB IIA NAA Provenience: ?; most similar to Tell el-Dab'a JH129, of uncertain provenience (mean Euclidean distance 0.088)</p> <p>JH129 Tell el-Dab'a K2806 Canaanite Jar rim IV-3c FI k/22, pl. 5-6 (residence) d2; MB IIA NAA Provenience: ?; most similar to Tell el-Dab'a JH125, of uncertain provenience (mean Euclidean distance 0.088)</p> <p>JH140 (not illustrated) Tell el-Dab'a K2822 Canaanite Jar rim IV-1b FI k/24, pl. 4 (residence) c; MB IIA NAA Provenience: ?; most similar to Tell el-Dab'a JH108 and JH139, imports from Southern Palestine (mean Euclidean distance 0.084)</p> <p>JH608 (not illustrated) Tell el-Dab'a K3113 Canaanite Jar rim Ib? FI k/24, gr. 49, secondary fill (residence) c; MB IIA NAA Provenience: most similar to Southern Palestine (ADCORR 0.9%; mean Euclidean distance 0.074)</p> <p>JH736 (not illustrated) Tell el-Dab'a K2793(1) Canaanite Jar rim II-a FI k/22, pl. (4)-5, floor? (palace) d1; MB IIA NAA Provenience: ?; most similar to the Upper Egyptian marl clay found at Qena, north of Thebes (see McGovern 1997)</p> <p>JH738 Tell el-Dab'a K2877 Canaanite Jar rim IV-2c FI k/24, pl. 5 (residence) d2; MB IIA NAA Provenience: Southern Palestine</p> <p>JH741 (not illustrated) Tell el-Dab'a K2838 Canaanite Jar rim IV-2c FI k/23, pl. 7 (residence) d2; MB IIA NAA Provenience: ?; most similar to Tell el-Dab'a JH812, of uncertain provenience (mean Euclidean distance 0.09)</p> <p>JH761 Tell el-Dab'a</p>	<p>K919 Canaanite Jar rim IV-2b-c All o/17, pl. 2-3 (residence) G; MB IIA NAA Provenience: Southern Palestine</p> <p>JH781 (not illustrated) Tell el-Dab'a K2566(1) Canaanite Jar rim IV-2b FI i/23, magazine (palace) d1; MB IIA NAA Provenience: ?; most similar to Tell el-Dab'a MB015, of uncertain provenience (mean Euclidean distance 0.081)</p> <p>JH782 Tell el-Dab'a K2566(2) Canaanite Jar rim IV-2c FI i/23, magazine (palace) d1; MB IIA NAA Provenience: Southern Palestine</p> <p>JH792 (not illustrated) Tell el-Dab'a K2563 Canaanite Jar rim IV-1c FI i/22, pl. 7-8 (palace) d1-2; MB IIA NAA Provenience: Southern Palestine</p> <p>JH794 Tell el-Dab'a K995(2) Canaanite Jar rim IV-2c-d All p/18, pl. 2-3 (residence) G; MB IIA NAA Provenience: Southern Palestine</p> <p>JH797 (not illustrated) Tell el-Dab'a K520(1) Canaanite Jar rim IV-3d All m/15 (residence) G; MB IIA NAA Provenience: ?; no matches at mean Euclidean distance of 0.1</p> <p>JH842 Tell el-Dab'a K2342(1) Canaanite Jar rim IV-3c FI j/22, pl. 3, gr. 29 (burial) c; MB IIA NAA Provenience: Southern Palestine</p> <p>JH843 Tell el-Dab'a K2342(2) Canaanite Jar rim IV-1c FI j/22, pl. 3, gr. 29 (burial) c; MB IIA NAA Provenience: Southern Palestine</p>
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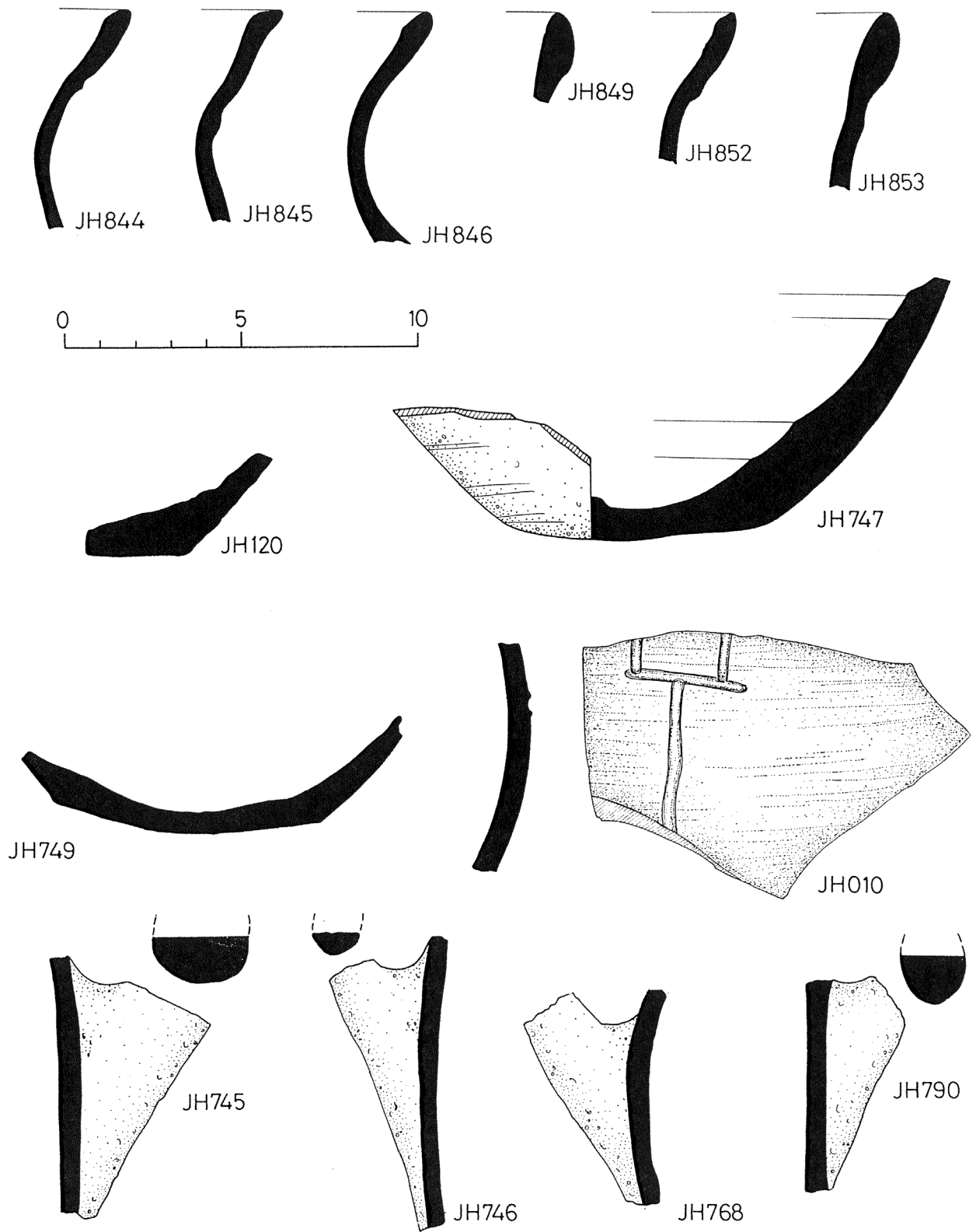


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Fig. 38: MB IIA Canaanite Jar Rims, Bases, Handles, and Body Sherds

JH844 Tell el-Dab'a K2342(3) Canaanite Jar rim IV-3c FI j/22, pl. 3, gr. 29 (burial) c; MB IIA NAA Provenience: Southern Palestine	Canaanite Jar base IV-c FI i/20, pl. 2-3, filling in pit 40, west balk (palace) d1; MB IIA NAA Provenience: most similar to Tell 'Arqa JH523, of local origin (mean Euclidean distance 0.070)	Tell el-Dab'a K2940(1) Canaanite Jar handle IV-2c FI k/23, pl. 7 (residence) d2; MB IIA NAA Provenience: ?; most similar to Southern Palestine (ADCORR 4.2%; mean Euclidean distance 0.076)	FI i/20, pl. 1-2 (residence) c; MB IIA NAA Provenience: most similar to Southern Palestine (ADCORR 0.4%; mean Euclidean distance 0.066)
JH845 Tell el-Dab'a K2342(4) Canaanite Jar rim IV-1c FI j/22, pl. 3, gr. 29 (burial) c; MB IIA NAA Provenience: Southern Palestine	JH699 (not illustrated) Tell el-Dab'a 5300B Canaanite Jar base and fragments IV-2c FI i/22, feature 37? (residence) c; MB IIA NAA Provenience: Southern Palestine	JH746 Tell el-Dab'a K2940(2) Canaanite Jar handle IV-1c FI k/23, pl. 7 (residence) d2; MB IIA NAA Provenience: ?; most similar to Tell el-Dab'a JH120, of uncertain provenience (mean Euclidean distance 0.091)	JH850 (not illustrated) Tell el-Dab'a K1566(3) Canaanite Jar handle stub IV-2b FI i/20, pl. 1-2 (residence) c; MB IIA NAA Provenience: Southern Palestine
JH846 Tell el-Dab'a K2342(5) Canaanite Jar rim IV-1c FI j/22, pl. 3, gr. 29 (burial) c; MB IIA NAA Provenience: Southern Palestine	JH747 Tell el-Dab'a K2091(1) Canaanite Jar base IV-2c FI i/20, pl. 1 (palace) d1; MB IIA NAA Provenience: ?; no matches at mean Euclidean distance 0.1	JH768 Tell el-Dab'a K1389(1) Canaanite Jar handle IV-1d AII m/17, pl. 7-8 (residence) G; MB IIA NAA Provenience: most similar to southern Palestine (ADCORR 0.4%; mean Euclidean distance 0.073)	JH618 (not illustrated) Tell el-Dab'a Unregistered Canaanite Jar, body sherd IV-2b FI i/20, pit 25 (residence) c; MB IIA NAA Provenience: Southern Palestine
JH849 Tell el-Dab'a K1566(2) Canaanite Jar rim IV-2c or VI? FI i/20, pl. 1-2 (residence) c; MB IIA NAA Provenience: Southern Palestine	JH748 (not illustrated) Tell el-Dab'a K2091(2) Canaanite Jar base IV-1c FI i/20, pl. 1 (palace) d1; MB IIA NAA Provenience: ?; no matches at mean Euclidean distance 0.1	JH790 Tell el-Dab'a K1380(1) Canaanite Jar handle II-c AII n/18, pl. 7-8 (residence) G-H; MB IIA NAA Provenience: Southern Palestine	JH619 (not illustrated) Tell el-Dab'a Unregistered Canaanite Jar, body sherd IV-2a FI k/22s (residence) c; MB IIA NAA Provenience: Southern Palestine
JH851 (not illustrated) Tell el-Dab'a K2264 Canaanite Jar rim IV-2b FI i/23, pl. 2-3 (residence) c; MB IIA NAA Provenience: Southern Palestine	JH749 Tell el-Dab'a K2091(3) Canaanite Jar base IV-1c FI i/20, pl. 1 (palace) d1; MB IIA NAA Provenience: Southern Palestine	JH791 (not illustrated) Tell el-Dab'a K1380(2) Canaanite Jar handle IV-2c AII n/18, pl. 7-8 (residence) G; MB IIA NAA Provenience: Southern Palestine	JH693 (not illustrated) Tell el-Dab'a K3096 Canaanite Jar fragments IV-2b FI m/20, pl. 1, pit 1 (residence) c; MB IIA NAA Provenience: Southern Palestine
JH852 Tell el-Dab'a K2341(1) Canaanite Jar rim IV-1b FI i/20, pl. 1-2; FI i/23, pl. 4? (residence) c; MB IIA NAA Provenience: Southern Palestine	JH010 (Pl. 4a) Tell el-Dab'a Canaanite Jar, body sherd with incised mark 4060D IV-2b FI i/23 (residence) b3; MB IIA-B NAA Provenience: Southern Palestine	JH798 (not illustrated) Tell el-Dab'a K520(2) Canaanite Jar, body sherd, incised mark I-c? AII m/15 (residence) G; MB IIA NAA Provenience: ?; no matches at mean Euclidean distance of 0.1	JH910 (not illustrated) Tell el-Dab'a K2771 Canaanite Jar, body sherds IV FI k/20, pl. 3 (palace) d1; MB IIA NAA Provenience: ?; most similar to Tell el-Dab'a JH151, of uncertain provenience (mean Euclidean distance 0.054)
JH853 Tell el-Dab'a K2341(2) Canaanite Jar rim IV-2c FI i/20, pl. 1-2; FI i/23, pl. 4? (residence) c; MB IIA NAA Provenience: Southern Palestine JH120 Tell el-Dab'a K2817	JH254 (not illustrated) Tell el-Dab'a 1420/WA2968 Canaanite Jar handle IV-2c AII i/10, pl. 4 (residence) G; MB IIA NAA Provenience: Southern Palestine JH745	JH848 (not illustrated) Tell el-Dab'a K1566(1) Canaanite Jar handle IV-2c-d	JH737 (not illustrated) Tell el-Dab'a K2793(2) Canaanite Jar shoulder IV-2c FI k/22, pl. (4)-5, floor? (palace) d1; MB IIA NAA Provenience: most similar to Southern Palestine (ADCORR 0.3%; mean Euclidean distance 0.057)

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Fig. 39: MB IIA-B Canaanite Jars

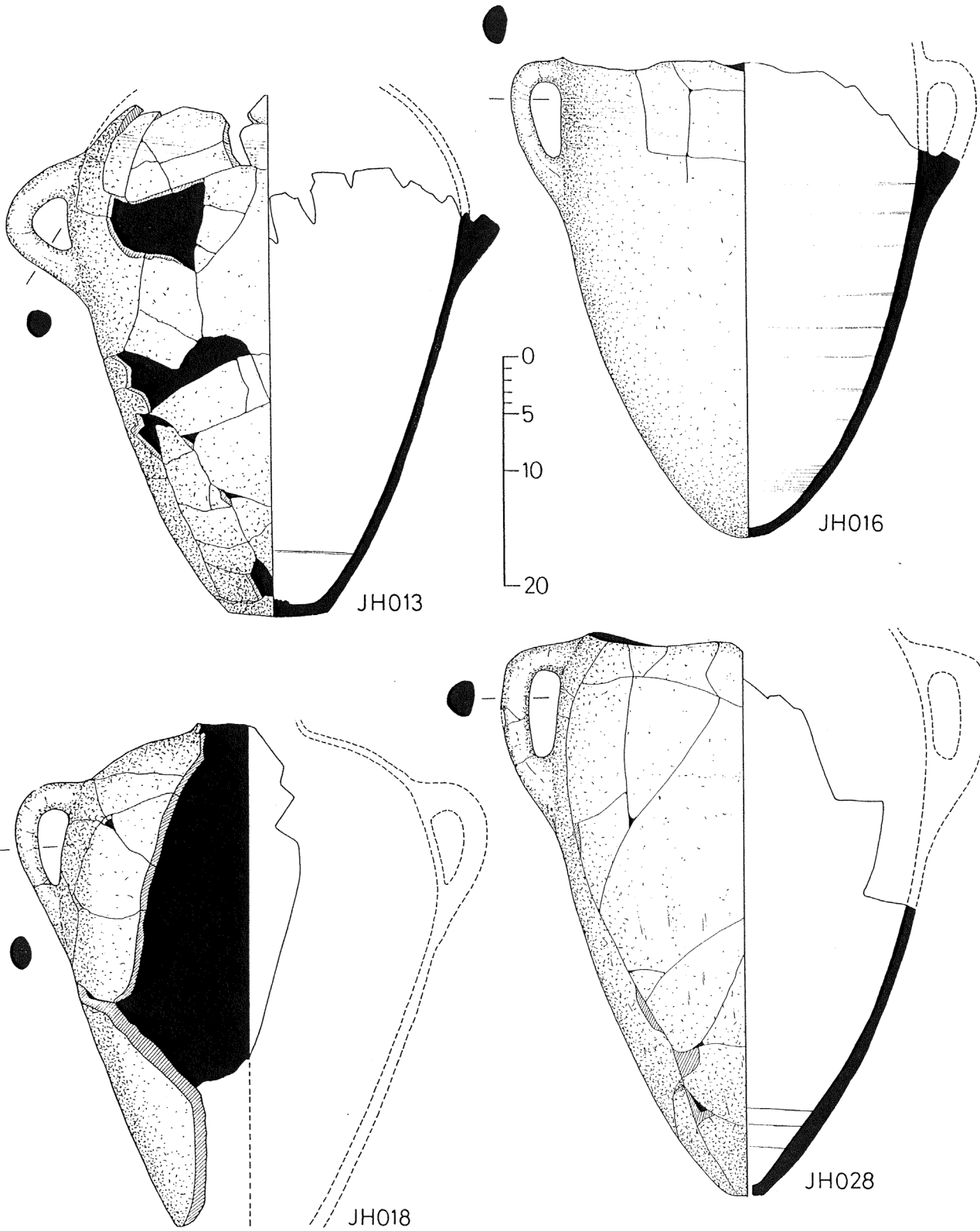
JH013
Tell el-Dab`a
4537A
Canaanite Jar, complete up to midbody
IV-1c
AII l/17, gr. 17 (burial)
E3 or F; MB IIA-B
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.2%; mean Euclidean distance 0.074) and Fayyum-Maadi (ADCORR 0%; mean Euclidean distance 0.050)

JH016
Tell el-Dab`a
4540A
Canaanite Jar, complete up to midbody
IV-2b-c
FI k/20, gr. 13 (deposit in burial chamber entrance)
b2-c; MB IIA-B
NAA Provenience: Southern Palestine

JH018
Tell el-Dab`a
4543A
Canaanite Jar, mid- and upper body
IV-2c
FI k/23, gr. 36A (burial)
b2-3; MB IIA-B
NAA Provenience: Southern Palestine

JH028
Tell el-Dab`a
4549B
Canaanite Jar, complete up to upper body
IV-2c-d
FI k/22, gr. 24 (infant burial)
b3; MB IIA-B
NAA Provenience: most similar to Southern Palestine (ADCORR 2.8%; mean Euclidean distance 0.07)

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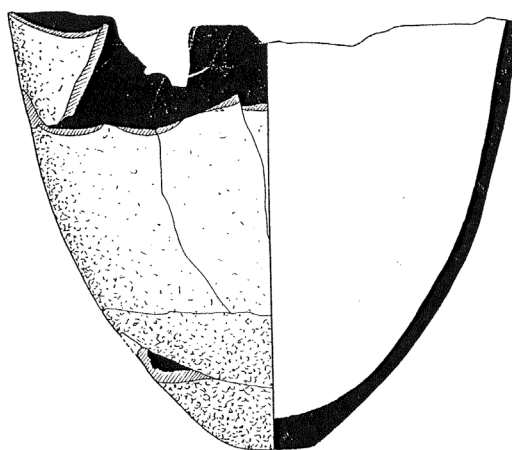
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Fig. 40: MB IIA-B Canaanite Jars

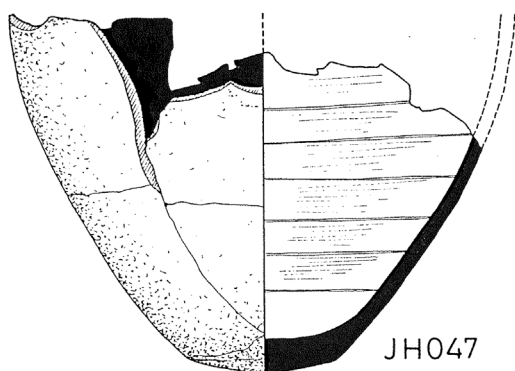
JH045
Tell el-Dab`a
4551B
Canaanite Jar, lower body
IV-2c
FI k/24, pl. 2 (residence)
b3; MB IIA-B
NAA Provenience: Southern Palestine

JH047
Tell el-Dab`a
4551D
Canaanite Jar, lower body
IV-2b-c
FI k/20, pit 20 (residence)
b2-c; MB IIA-B
NAA Provenience: Southern Palestine

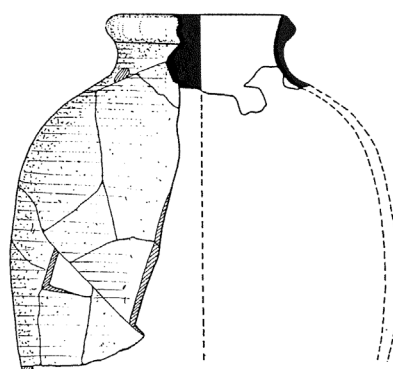
JH052
Tell el-Dab`a
4551K
Canaanite Jar, upper and midbody
IV-2b
FI k/23, pl. 3 (residence)
b3 or c; MB IIA-B
NAA Provenience: Southern Palestine



JH045



JH047



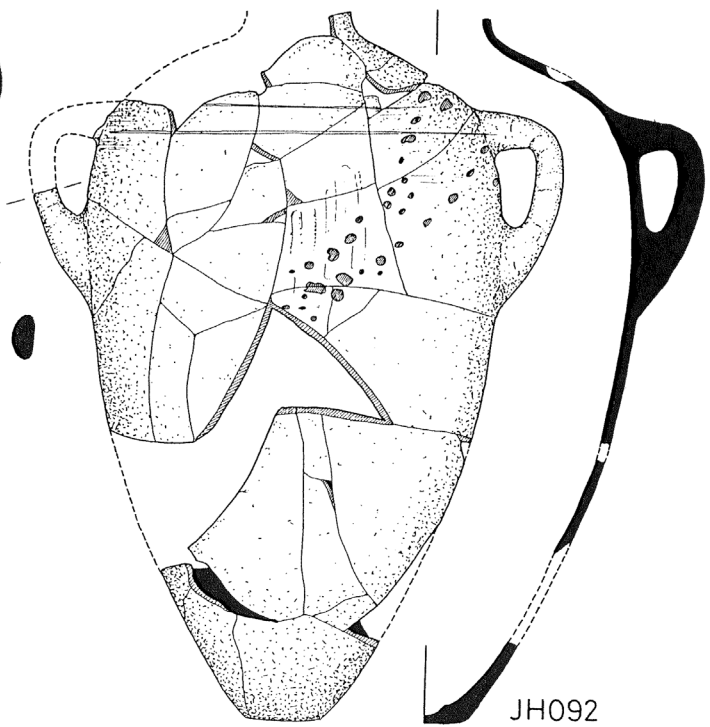
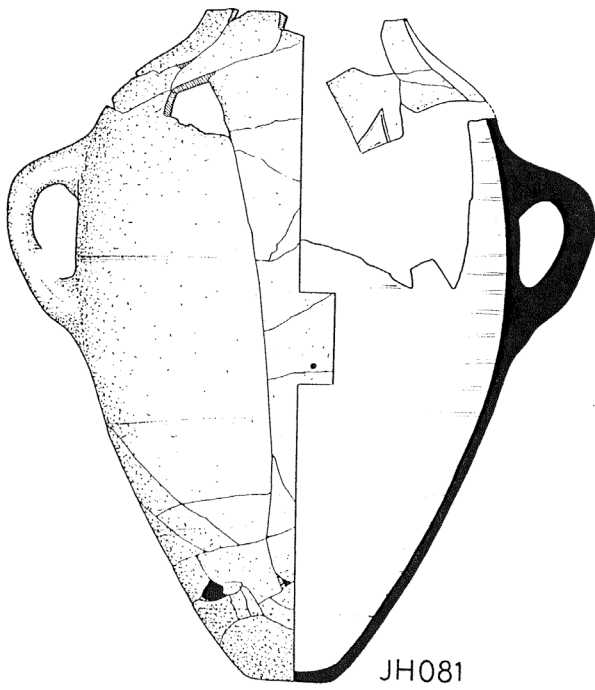
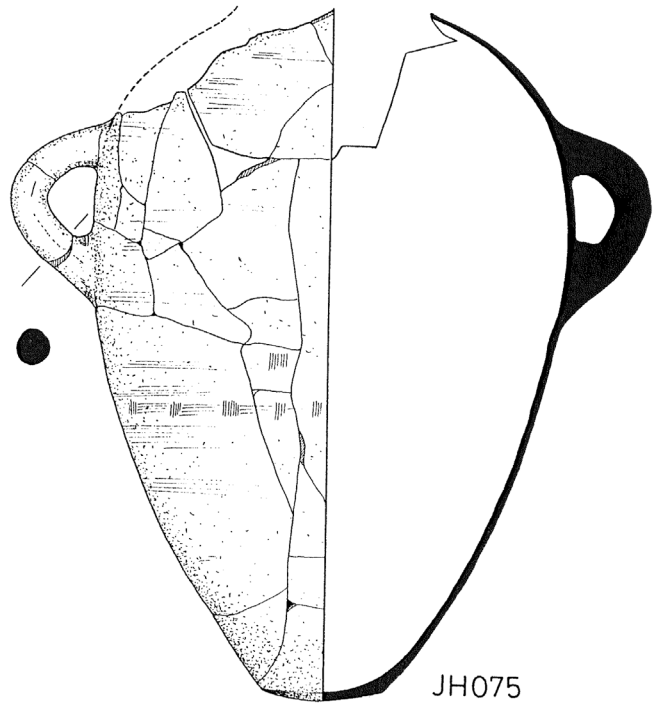
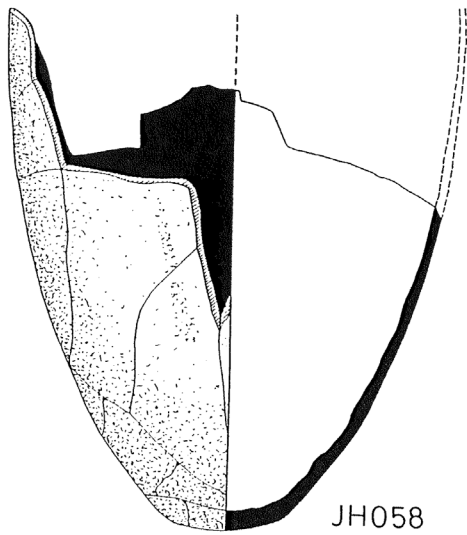
JH052

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Fig. 41: MB IIA-B Canaanite Jars

- JH058
Tell el-Dab`a
4552B
Canaanite Jar, complete up to midbody
IV-1c
FI k/20, gr. 13 (deposit in burial chamber entrance)
b2-3; MB IIA-B
NAA Provenience: Southern Palestine
- JH074 (not illustrated)
Tell el-Dab`a
4098D
Canaanite Jar, upper body
IV-2c
FI j/22, pit 18 (residence)
b3-c; MB IIA-B
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 2.0%; mean Euclidean distance 0.079)
- JH075
Tell el-Dab`a
3955A
Canaanite Jar, complete up to upper body
IV-1c
FI i/22, gr. 33 (infant burial)
b3; MB IIA-B
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.3%) and Tell el-Dab`a JH611, import from Southern Palestine (mean Euclidean distance 0.085)
- JH080 (not illustrated)
Tell el-Dab`a
4552F
Canaanite Jar, rim, shoulder, and handles
IV-1b
AII m/16, gr. 2 (burial)
F; MB IIA-B
NAA Provenience: Southern Palestine
- JH081
Tell el-Dab`a
3954B
Canaanite Jar, complete up to upper body, with incised mark
IV-1c
AII l/16, east balk (residence)
F; MB IIA-B
NAA Provenience: Southern Palestine
- JH092
Tell el-Dab`a
4552G
Canaanite Jar, complete up to upper body, pitted
IV-2c
AII m/16, gr. 2 (burial)
F; MB IIA-B
NAA Provenience: Southern Palestine

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Fig. 42: MB IIA-B Canaanite Jars

JH094 (Pl. 1d)

Tell el-Dab`a

4538

Canaanite Jar

IV-2c

FI l/20, gr. 10 (burial)

b3; MB IIA-B

NAA Provenience: Southern Palestine

JH096

Tell el-Dab`a

4622D

Canaanite Jar, complete up to midbody

IV-2c

FI l/20, gr. 20 (deposit in burial chamber entrance)

b3; MB IIA-B

NAA Provenience: Southern Palestine

JH097

Tell el-Dab`a

4622E

Canaanite Jar, lower body

IV-2c

FI l/20, gr. 20 (deposit in burial chamber entrance)

b3; MB IIA-B

NAA Provenience: Southern Palestine

JH108 (not illustrated)

Tell el-Dab`a

K2810

Canaanite Jar, shoulder

IV-1c

FI k/24, gr. 48 (burial)

b3; MB IIA-B

NAA Provenience: Southern Palestine

JH109

Tell el-Dab`a

4630A

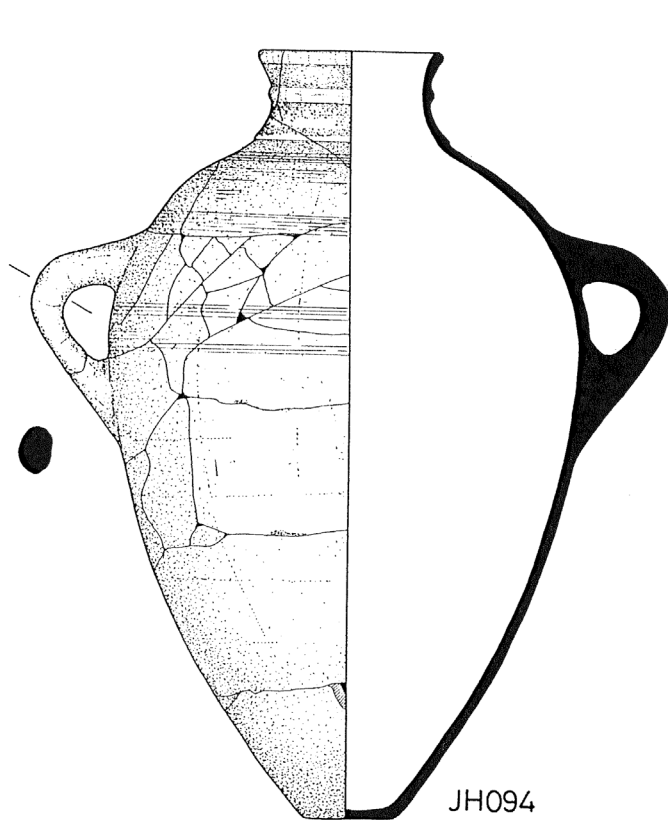
Canaanite Jar, complete up to upper body

IV-2c

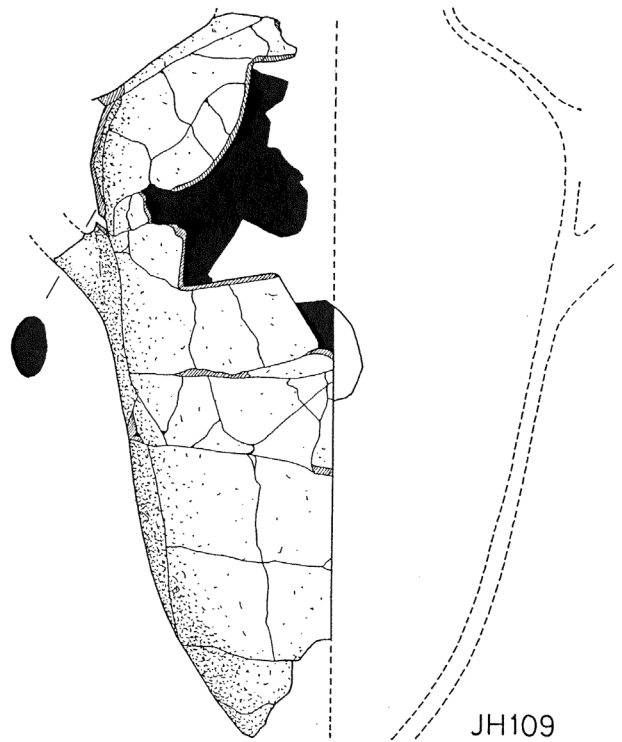
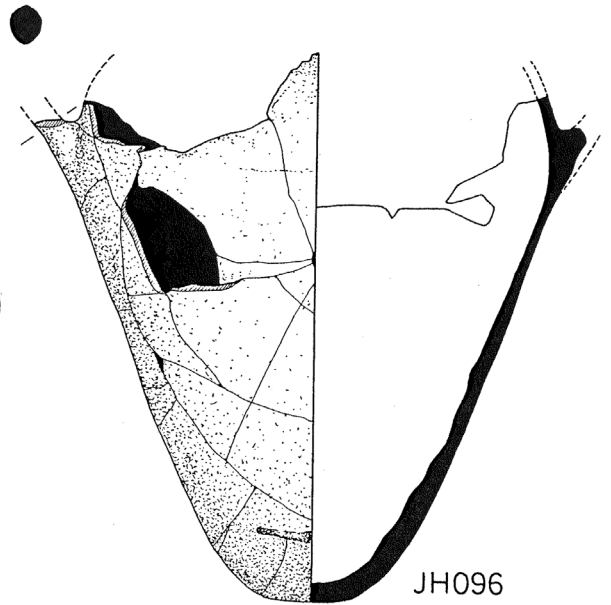
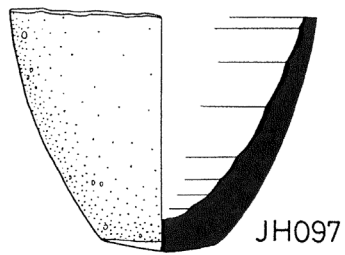
FI k/24, gr. 48 (burial)

b3; MB IIA-B

NAA Provenience: most similar to Southern Palestine (ADCORR 1.4%; mean Euclidean distance 0.067)



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Fig. 43: MB IIA-B Canaanite Jars

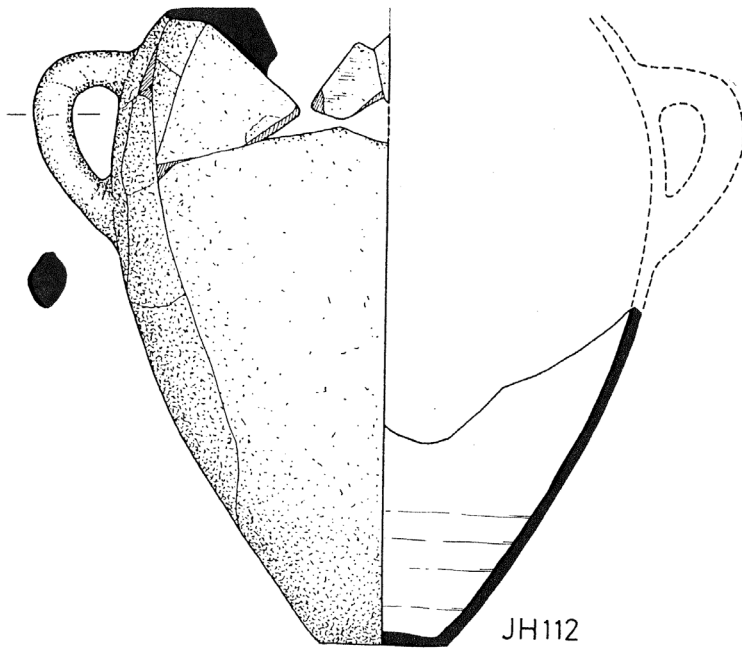
JH112
0Tell el-Dab`a
4630C
Canaanite Jar, complete up to midbody
IV-1c
FI I/21, pl. 2 (residence)
b3-c; MB IIA-B
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

JH113
Tell el-Dab`a
4630D
Canaanite Jar, lower body
IV-3c
FI I/20, gr. 20 (deposit in burial chamber entrance)
b3; MB IIA-B
NAA Provenience: ?; most similar to Ebla JHEB03, of local origin (mean Euclidean distance 0.099)

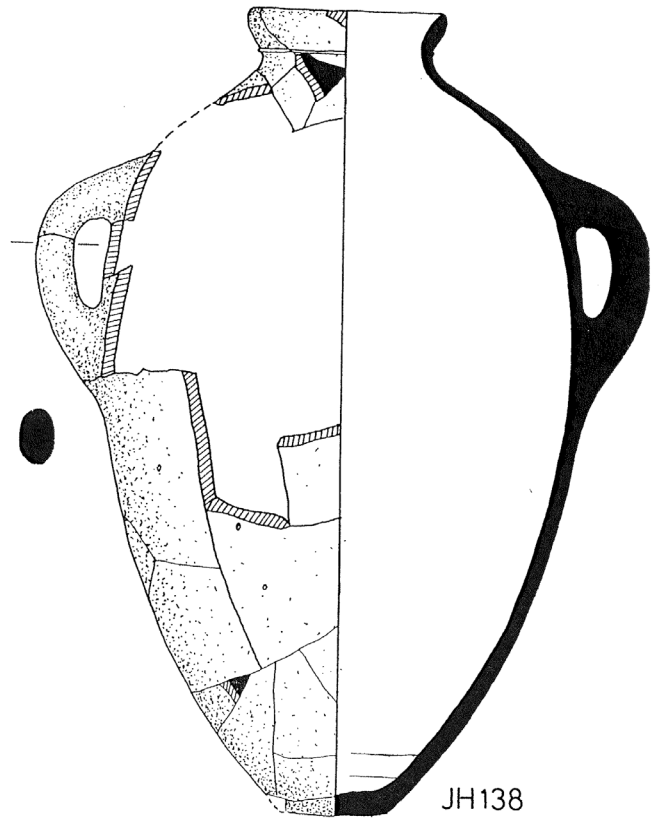
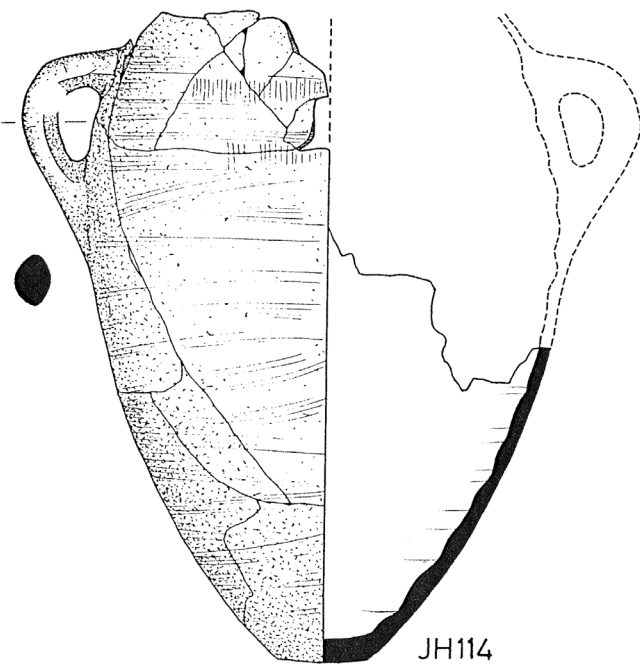
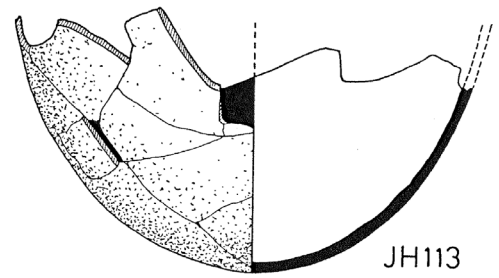
JH114
Tell el-Dab`a
4630E
Canaanite Jar, complete up to midbody
IV-2c
FI I/20, Canaanite Jar 26 (residence)
b3-c; MB IIA-B
NAA Provenience: Southern Palestine

JH138
Tell el-Dab`a
4637D
Canaanite Jar
IV-2c
FI I/20, gr. 20 (deposit in burial chamber entrance)
b1-3; MB IIA-B
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.7%; mean Euclidean distance 0.084)

JH139 (not illustrated)
Tell el-Dab`a
4637E
Canaanite Jar, fragments
IV-2c
FI I.20, gr. 20 (deposit in burial chamber entrance)
b1-3; MB IIA-B
NAA Provenience: most similar to Southern Palestine (ADCORR 0.1%; mean Euclidean distance 0.065)



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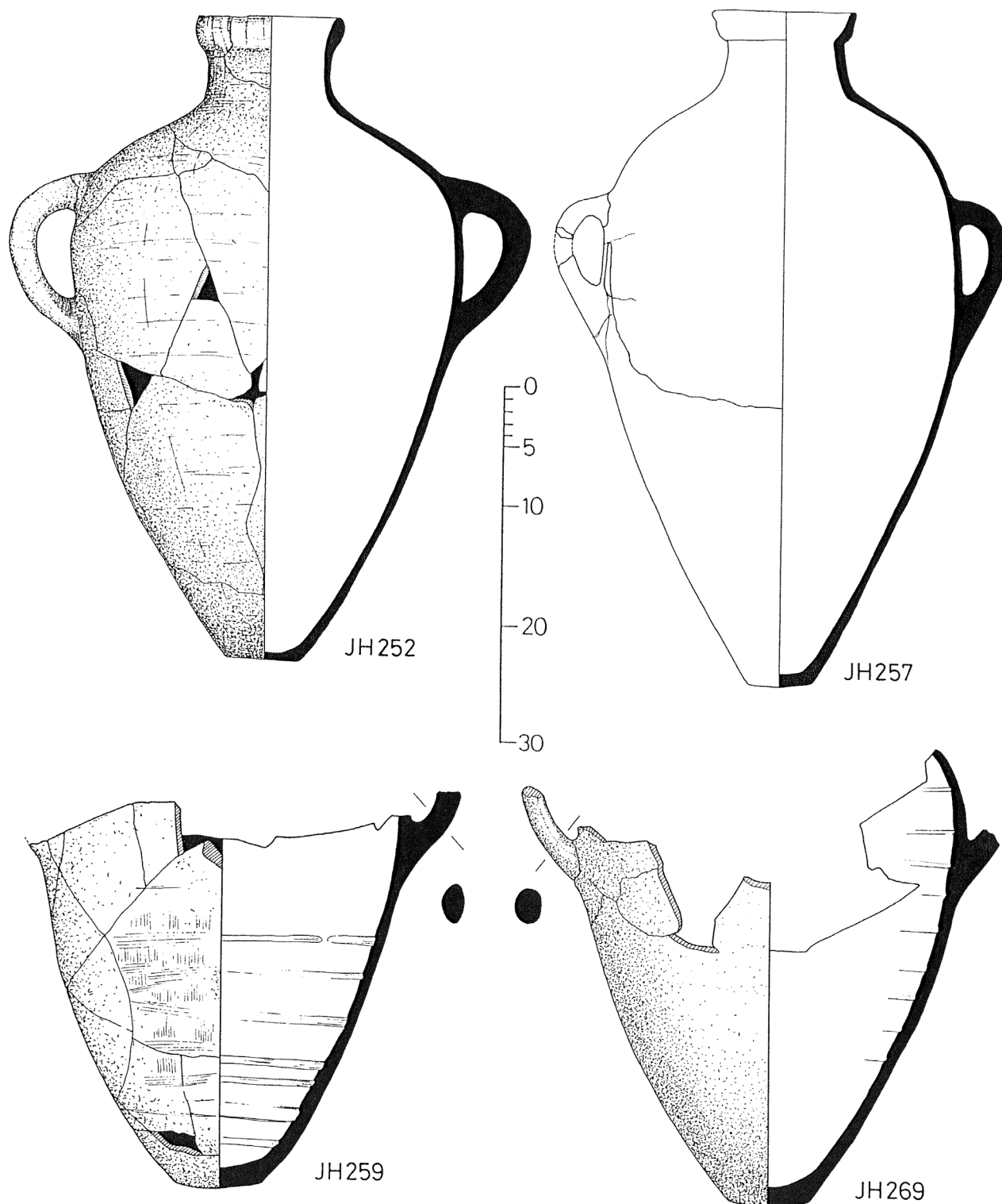
Fig. 44: MB IIA-B Canaanite Jars

JH252
Tell el-Dab`a
2627
Canaanite Jar
IV-2c
AII m/16, gr. 3, bur. 2 (burial)
F; MB IIA-B
NAA Provenience: Southern Palestine

JH257
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 35.29)
1793/WA3212
Canaanite Jar
IV-1b
AII m/10, pl. 6, gr. 8 (burial)
F; MB IIA-B
NAA Provenience: most similar to Southern Palestine (ADCORR 0.8%; mean Euclidean distance 0.074)

JH259
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 20.18)
595/WA2413
Canaanite Jar, complete up to midbody
IV-2c
AII l/11, pl. 4, gr. 2 (burial)
F; MB IIA-B
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

JH269
Tell el-Dab`a
2997
Canaanite Jar, complete up to midbody
IV-2c
AII m/17, "bath" (residence)
E3-F; MB IIA-B
NAA Provenience: most similar to Tell el-Dab`a MB011, import from Southern Palestine (mean Euclidean distance 0.044)



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Fig. 45: MB IIA-B Canaanite Jars

JH611 (Pl. 2a)

Tell el-Dab`a

4779

Canaanite Jar, complete up to upper body, with incised mark

IV-1c

FI k/21s (residence)

b3; MB IIA-B

NAA Provenience: Southern Palestine

JH609

Tell el-Dab`a

4778

Canaanite Jar, complete up to upper body

IV-2c

FI k/24, pl. 2 (residence)

b3; MB IIA-B

NAA Provenience: Southern Palestine

JH612

Tell el-Dab`a

4781

Canaanite Jar, complete up to upper body

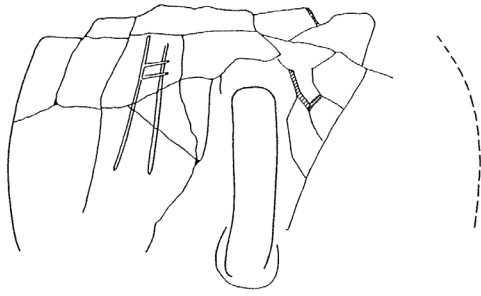
IV-2c

FI l/22 (infant burial)

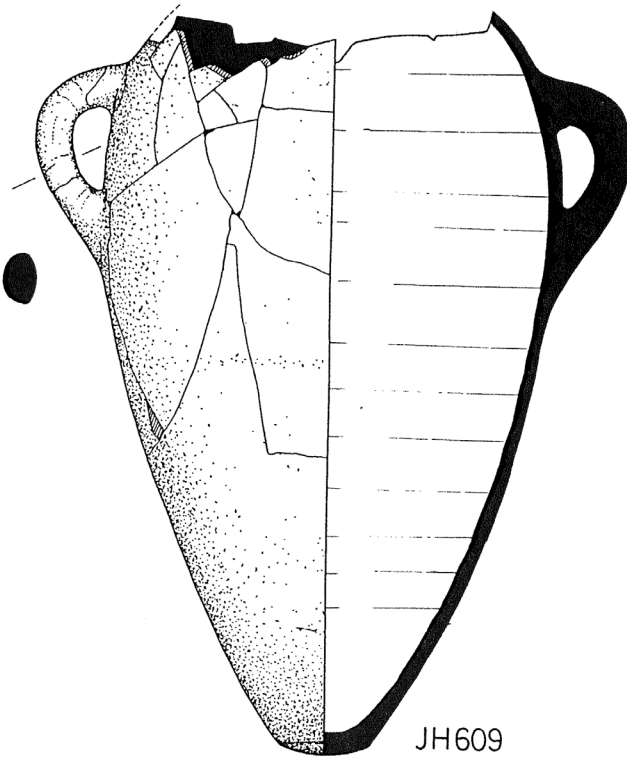
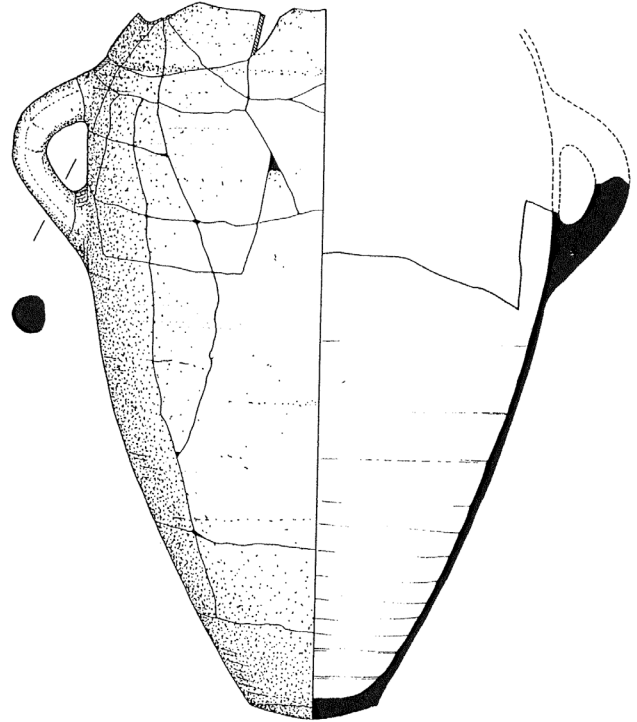
b2-3; MB IIA-B

NAA Provenience: Southern Palestine

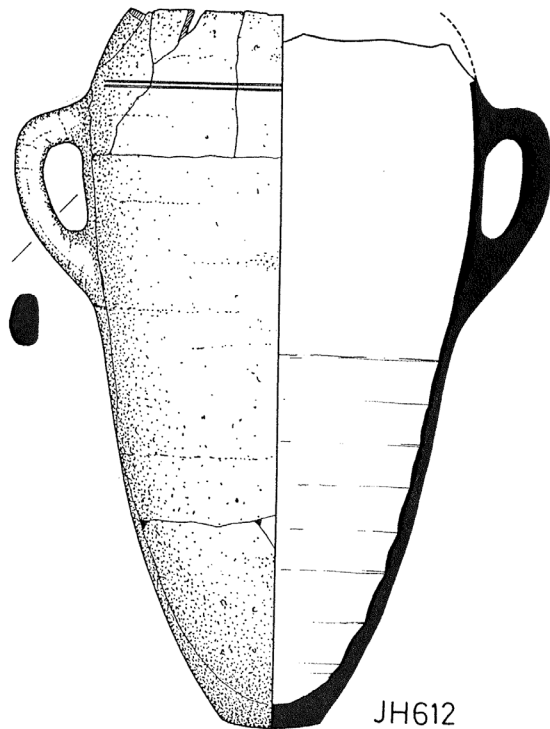
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JH611



JH609



JH612

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Fig. 46: MB IIA-B Canaanite Jars

JH657 (Pl. 2b)

Tell el-Dab`a

4777

Canaanite Jar

IV-2c

FI k/21, gr. 30 (burial)

b3-c; MB IIA-B

NAA Provenience: Southern Palestine

JH700

Tell el-Dab`a

5301D

Canaanite Jar, with incised mark

IV-1c

FI l/20, gr. 20 (deposit in burial chamber entrance)

b1-3; MB IIA-B

NAA Provenience: Southern Palestine

JH705

Tell el-Dab`a

4780

Canaanite Jar, lower body

IV-2c

FI k/24, pl. 2 (residence)

b3; MB IIA-B

NAA Provenience: Southern Palestine

JH707

Tell el-Dab`a

4776

Canaanite Jar, complete up to midbody

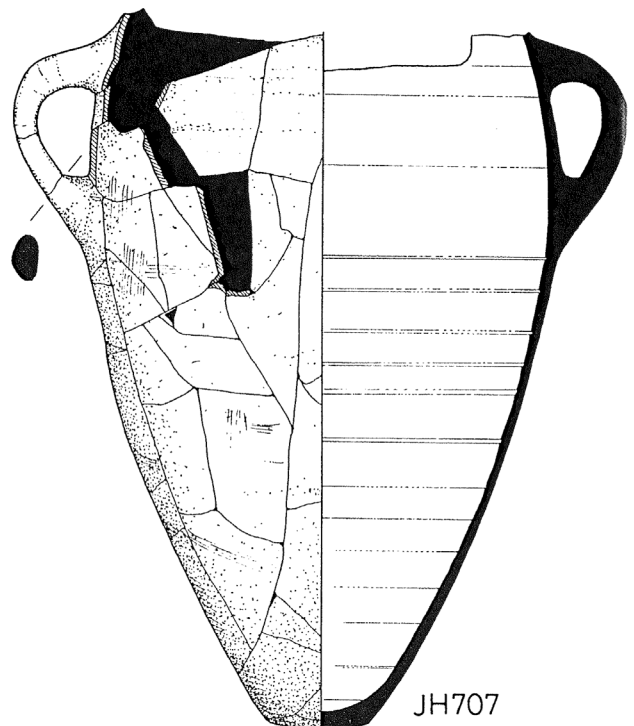
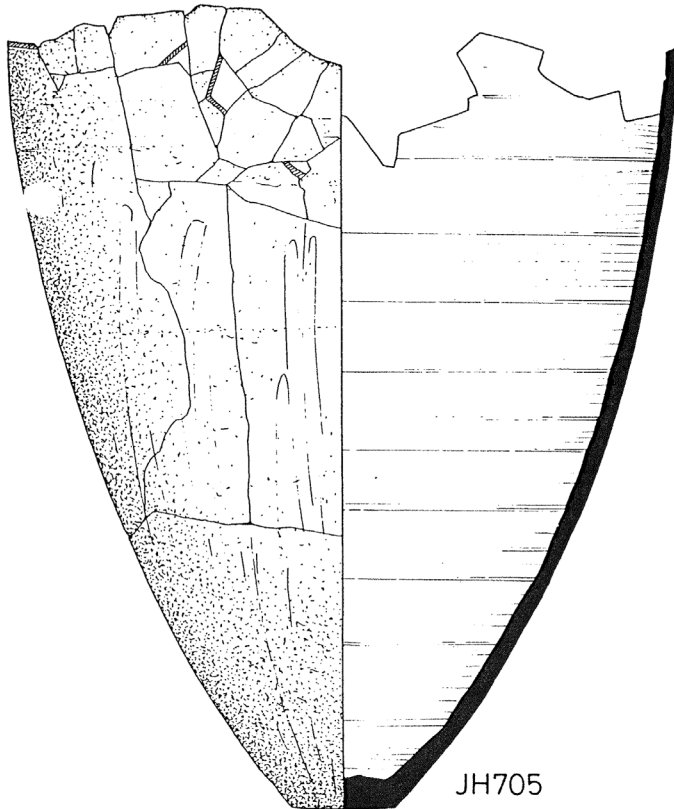
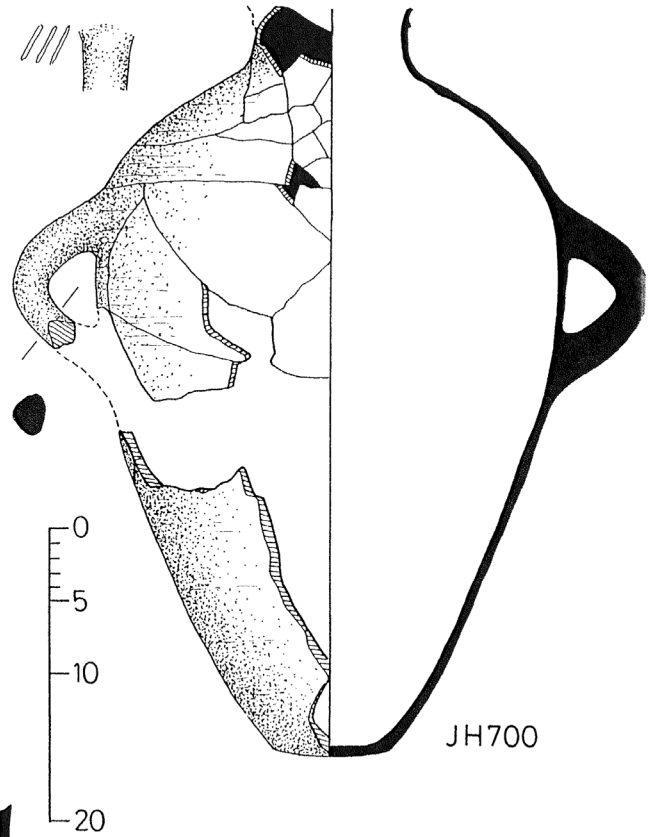
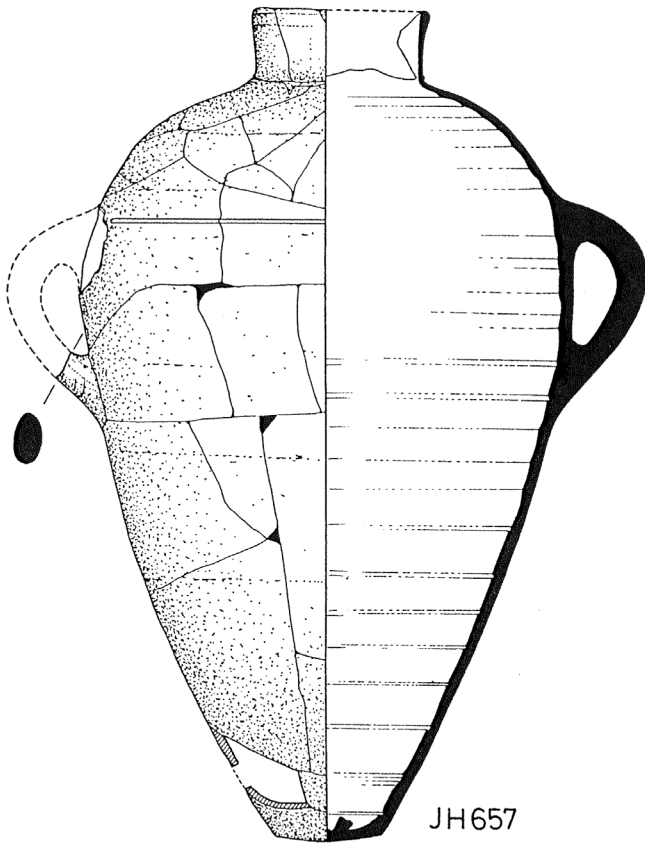
IV-2c

FI k/24, pl. 2, gr. 37 (infant burial)

b3; MB IIA-B

NAA Provenience: Southern Palestine

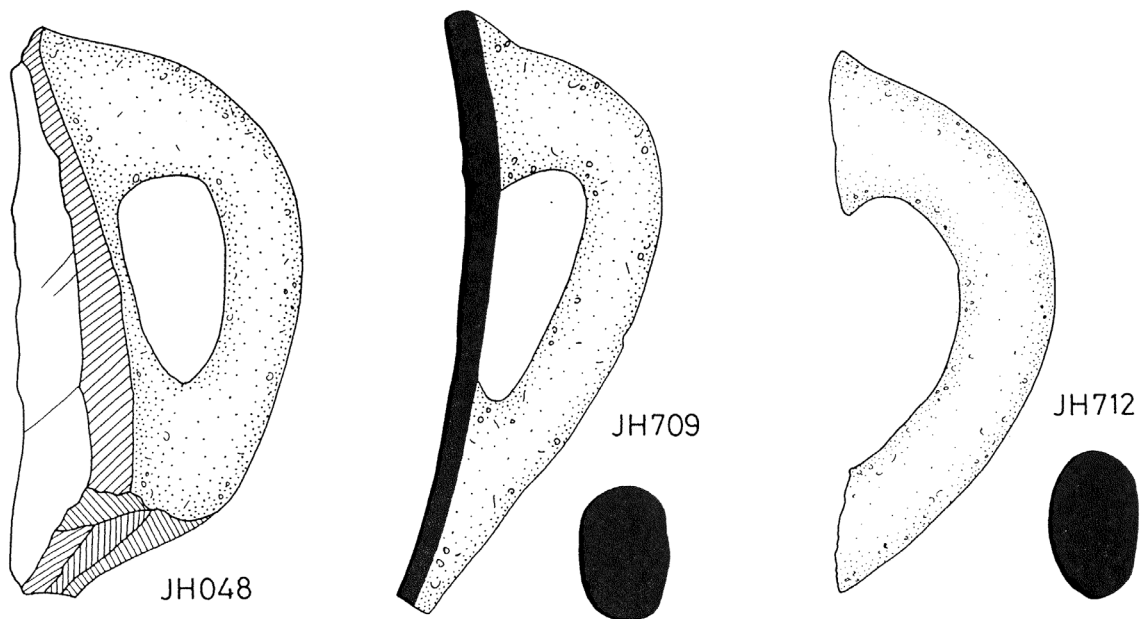
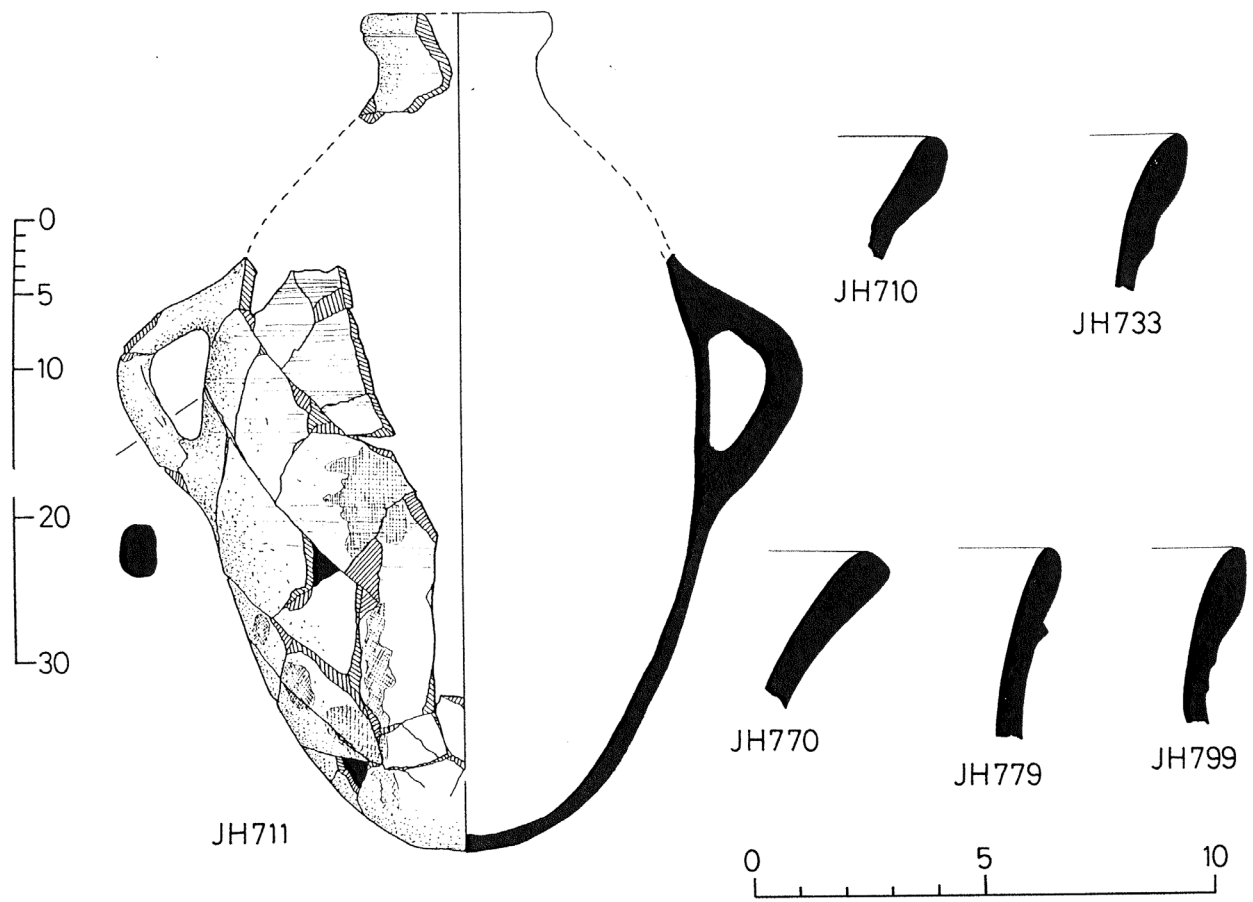
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Fig. 47: MB IIA-B Canaanite Jars, Rims, and Handles

JH711 Tell el-Dab`a 5822O Canaanite Jar, complete up to midbody IV-2d FI l/22, gr. 36 (burial) b3; MB IIA-B NAA Provenience: Southern Palestine	JH779 Tell el-Dab`a K626a,b(2) Canaanite Jar rim IV-2d AII m/16 (residence) E2-F; MB IIA-B NAA Provenience: ?; most similar to Southern Palestine (ADCORR 1.5%) and Tell el-Dab`a JH610, import from Southern Palestine (mean Euclidean distance 0.077)	JH003 (not illustrated) Tell el-Dab`a K388 Canaanite Jar handle IV-1c AII l/14, pl. 4-5 (residence) E3-F; MB IIA-B NAA Provenience: most similar to Southern Palestine (ADCORR 0.5%; mean Euclidean distance 0.077)
JH847 (not illustrated) Tell el-Dab`a K2268 Canaanite Jar, lower body IV-1c AII m/16, gr. 2 (burial) F; MB IIA-B NAA Provenience: Southern Palestine	JH799 Tell el-Dab`a K2108 Canaanite Jar rim IV-2a-b AII p/20, pl. 3 (residence) E3-F; MB IIA-B NAA Provenience: Southern Palestine	JH048 Tell el-Dab`a 4551E Canaanite Jar handle IV-1b-c FI k/20, pit 20 (residence) b2-c; MB IIA-B NAA Provenience: Southern Palestine
JH710 Tell el-Dab`a Canaanite Jar, rim and neck K3957 IV-1c FI/k24, pl. 2 (residence) b3; MB IIA-B NAA Provenience: Southern Palestine	JH708 (not illustrated) Tell el-Dab`a K3956 Canaanite Jar, base and handle IV-3c FI k/24, pl. 2 (residence) b3; MB IIA-B NAA Provenience: Southern Palestine	JH111 (not illustrated) Tell el-Dab`a K2810A Canaanite Jar, handle and body sherds I-e3 FI l/20, pl. 1 (residence) b3; MB IIA-B NAA Provenience: most similar to Egyptian Nile Delta (ADCORR 1.1%; mean Euclidean distance 0.058)
JH733 Tell el-Dab`a K2083 Canaanite Jar rim IV-2c AII a/21 (residence) b; MB IIA-B NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.6%; mean Euclidean distance 0.087)	JH750 (not illustrated) Tell el-Dab`a K2575(1) Canaanite Jar base IV-3c FI i/22, pl. 3 (residence) b3; MB IIA-B NAA Provenience: ?; most similar to Southern Palestine (ADCORR 1.3%)	JH709 Tell el-Dab`a K3956 Canaanite Jar handle IV-3b FI k/24, pl. 2 (residence) b3; MB IIA-B NAA Provenience: Southern Palestine
JH770 Tell el-Dab`a K1453 Canaanite Jar rim IV-2d FI i/21, pl. 1 (residence) b; MB IIA-B NAA Provenience: Southern Palestine	JH774 (not illustrated) Tell el-Dab`a K718 Canaanite Jar base IV-2b-c AII o/16, pl. 1-2 (temple) E3-F; MB IIA-B NAA Provenience: Southern Palestine	JH712 Tell el-Dab`a K3324 Canaanite Jar, handle JH 712-716: IV-1c, IV-2b (2 examples), IV-2c (2 examples) FI k/24, pl. 2 (residence) b3; MB IIA-B NAA Provenience: Southern Palestine

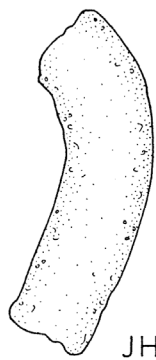


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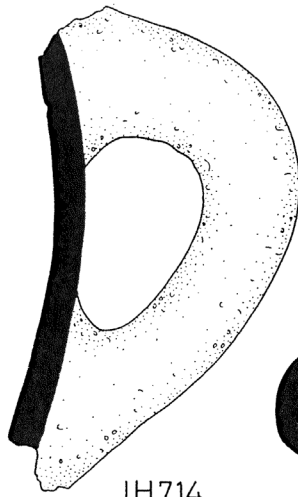
Fig. 48: MB IIA-B Canaanite Jar Handles

JH713	see JH712	E3 or G; MB IIA-B
Tell el-Dab`a	FI k/24, pl. 2 (residence)	NAA Provenience: Southern Palestine
K3324	b3; MB IIA-B	
Canaanite Jar handle	NAA Provenience: Southern Palestine	JH786
see JH712		Tell el-Dab`a
FI k/24, pl. 2 (residence)	JH731 (not illustrated)	K2569
b3; MB IIA-B	Tell el-Dab`a	Canaanite Jar handle
NAA Provenience: Southern Palestine	K968	IV-2d
	Canaanite Jar handle	FI i/22 (residence)
JH714	II-f (IV?)	b3; MB IIA-B
Tell el-Dab`a	AII r/18, pl. 2-3 (residence)	NAA Provenience: Southern Palestine
K3324	F; MB IIA-B	
Canaanite Jar handle	NAA Provenience: Southern Palestine	JH874
see JH712		Tell el-Dab`a
FI k/24, pl. 2 (residence)	JH751	4948
b3; MB IIA-B	Tell el-Dab`a	Canaanite Jar handle, with seal
NAA Provenience: Southern Palestine	K2575(2)	impression
	Canaanite Jar handle	IV-2c
JH715	IV-2c-d	FI K/24, pit 52 (residence)
Tell el-Dab`a	FI i/22, pl. 3 (residence)	b3; MB IIA-B
K3324	b3; MB IIA-B	NAA Provenience: Southern Palestine
Canaanite Jar handle	NAA Provenience: ?; most similar to Tell	
see JH712	`As JH493, of uncertain provenience	JH772 (not illustrated)
FI k/24, pl. 2 (residence)	(mean Euclidean distance 0.069)	Tell el-Dab`a
b3; MB IIA-B		K444b(1)
NAA Provenience: Southern Palestine	JH773 (not illustrated)	Canaanite Jar, body sherd
	Tell el-Dab`a	IV-2c
JH716	K444b(2)	AII o/15, pl. 2-3 (residence)
Tell el-Dab`a	Canaanite Jar handle	E3 or G; MB IIA-B
K3324	IV-2b	NAA Provenience: Southern Palestine
Canaanite Jar handles	AII o/15, pl. 2-3 (residence)	

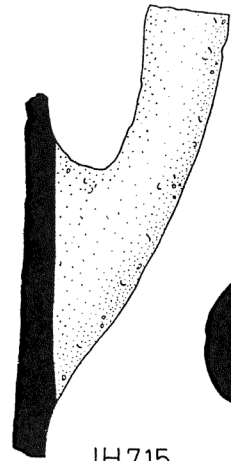
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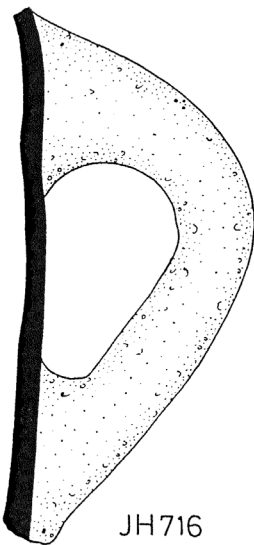
JH713



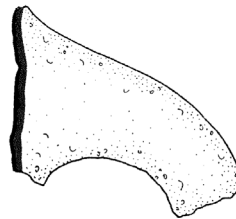
JH714



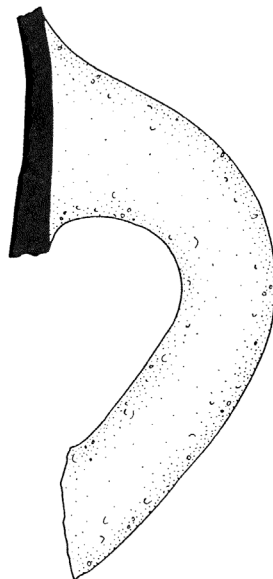
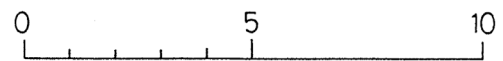
JH715



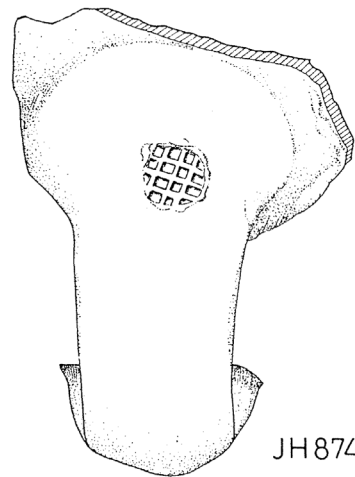
JH716



JH751



JH786



JH874

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Fig. 49: MB IIB Canaanite Jars

JH011=JH904

Tell el-Dab`a

4108E

Canaanite Jar, rim and neck

IV-1b

AII l/17, pl. 5 (residence)

E2-3; MB IIB

NAA Provenience: Southern Palestine

JH014

Tell el-Dab`a

4538A

Canaanite Jar, complete up to upper body

IV-1c

FI k/23 (residence?)

b2; MB IIB

NAA Provenience: Southern Palestine

JH015

Tell el-Dab`a

4539A

Canaanite Jar, complete up to midbody

IV-2b

FI k/22, gr. 14 (infant burial)

b1; MB IIB

NAA Provenience: Southern Palestine

JH017

Tell el-Dab`a

4542A

Canaanite Jar, mid- and upper body

IV-3c

AII k/12 (residence)

E1; MB IIB

NAA Provenience: Southern Palestine

JH019 (not illustrated)

Tell el-Dab`a

4545A

Canaanite Jar, sherds up to upper body

IV-2c

FII j/20, gr. 8 (burial)

b1; MB IIB

NAA Provenience: Southern Palestine

JH020 (not illustrated)

Tell el-Dab`a

4546A

Canaanite Jar, handle, rim, and body sherds

IV-2c

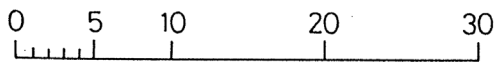
FII j/20, gr. 8 (burial)

b1; MB IIB

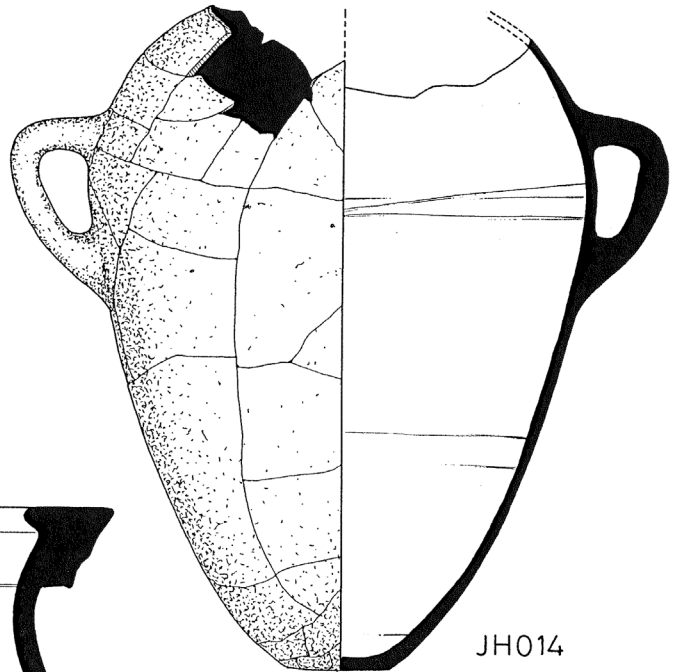
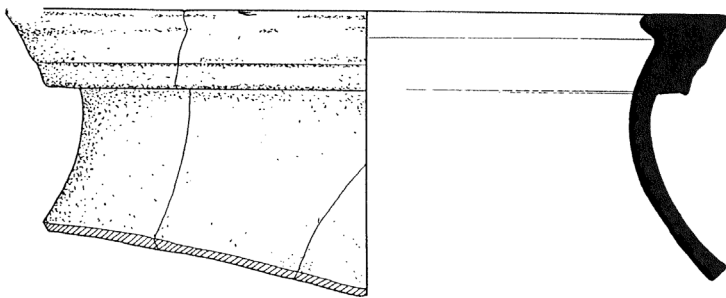
NAA Provenience: Southern Palestine

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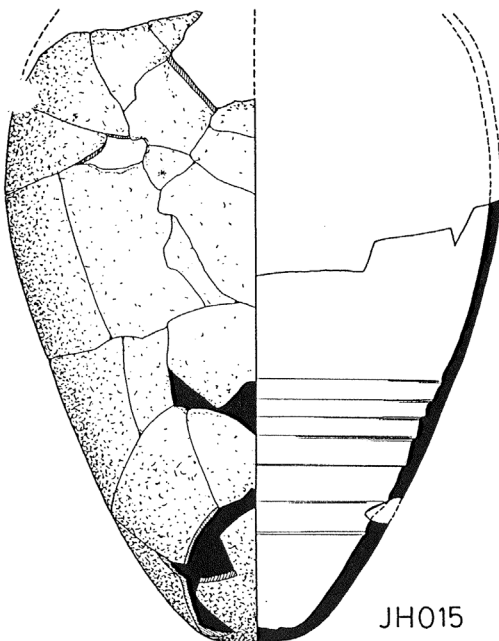
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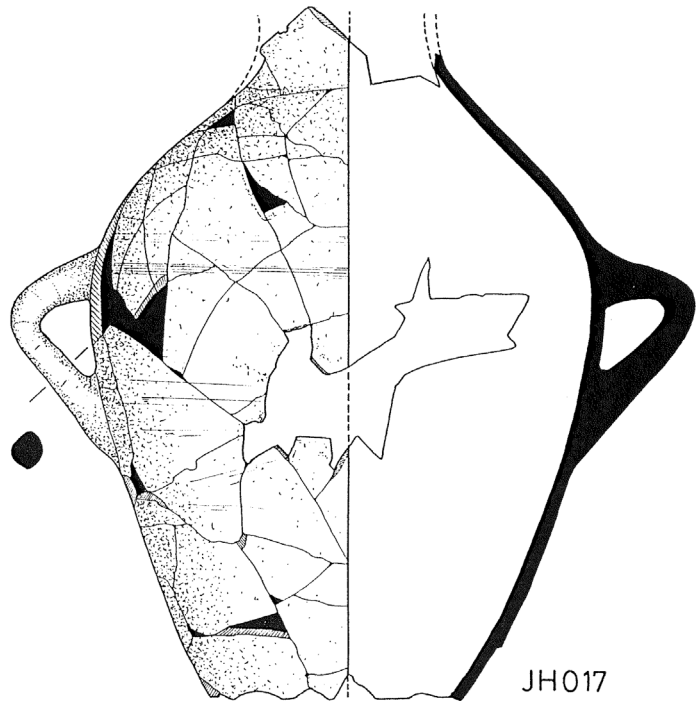
JH011 = JH904



JH014



JH015



JH017

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Fig. 50: MB IIB Canaanite Jars

JH026
Tell el-Dab`a
4549F
Canaanite Jar, missing handles
IV-2c
FI k/23, gr. 25 (Canaanite Jar burial)
a2-b1; MB IIB
NAA Provenience: Southern Palestine

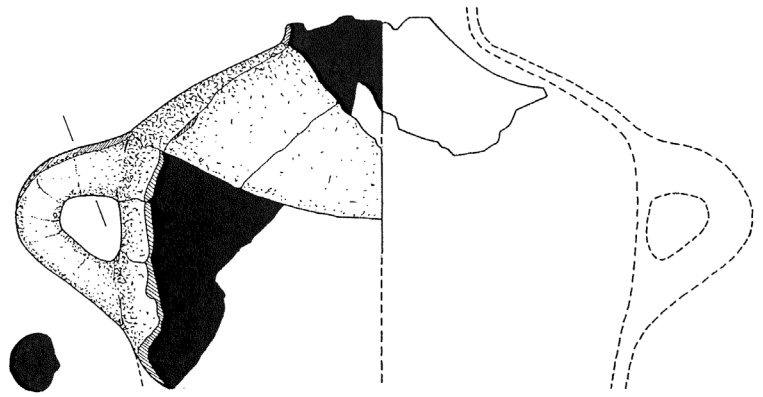
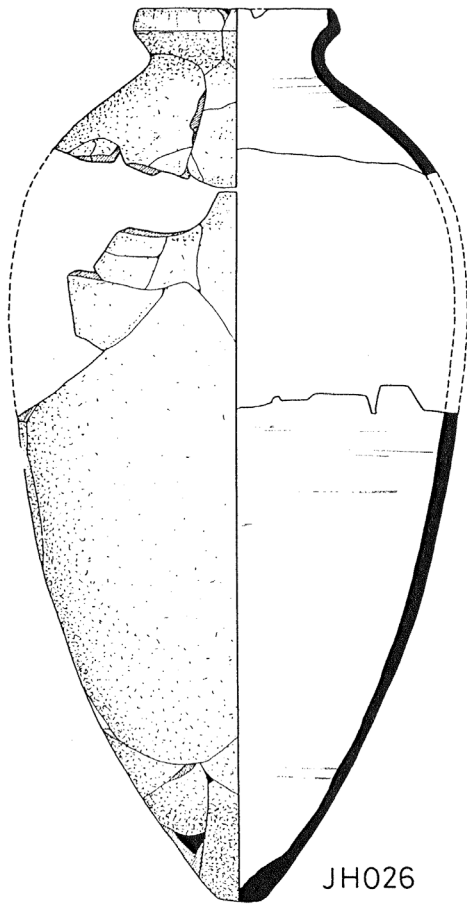
JH037
Tell el-Dab`a
4548A
Canaanite Jar, shoulder, neck, and handle
IV-2c
FI k/22, gr. 14 (burial)
b1; MB IIB
NAA Provenience: Southern Palestine

JH038 (not illustrated)
Tell el-Dab`a
4548B
Canaanite Jar, body sherds and handle
IV-2b-c
FI k/20, gr. 14 (burial)
b1; MB IIB
NAA Provenience: most similar to Southern Palestine (ADCORR 0.2%; mean Euclidean distance 0.061)

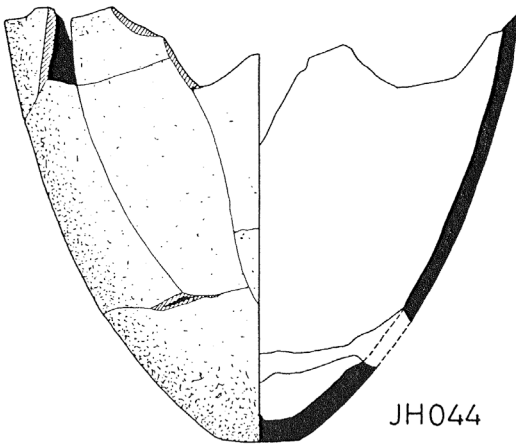
JH044
Tell el-Dab`a
4551A
Canaanite Jar, lower body
IV-2b
AII o/20 (residence)
E1; MB IIB
NAA Provenience: Southern Palestine

JH050
Tell el-Dab`a
4551G
Canaanite Jar, complete up to midbody
IV-2c
AII l/17 (residence)
E2-3; MB IIB
NAA Provenience: Southern Palestine

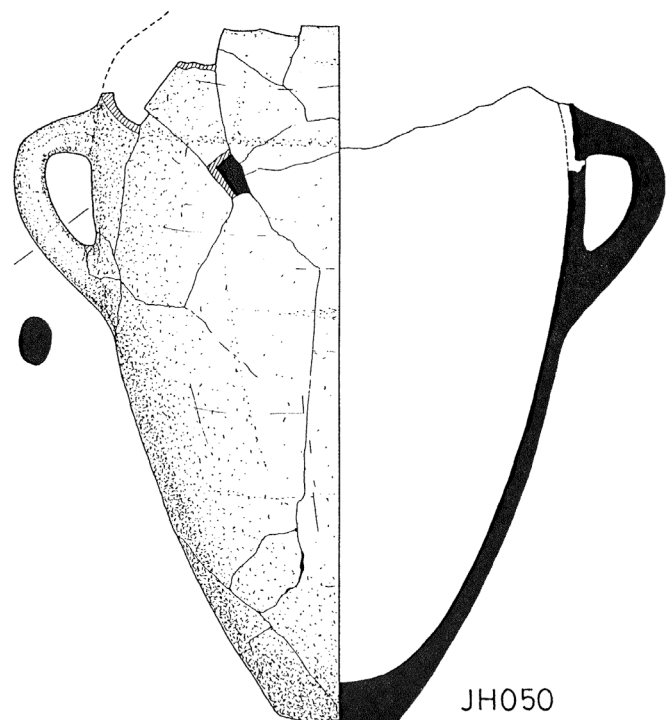
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JH037



JH044



JH050

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Fig. 51: MB IIB Canaanite Jars

JH051
Tell el-Dab`a
2675
Canaanite Jar, complete up to midbody
IV-2c
AII m/17, gr. 4 (burial)
E1; MB IIB
NAA Provenience: Southern Palestine

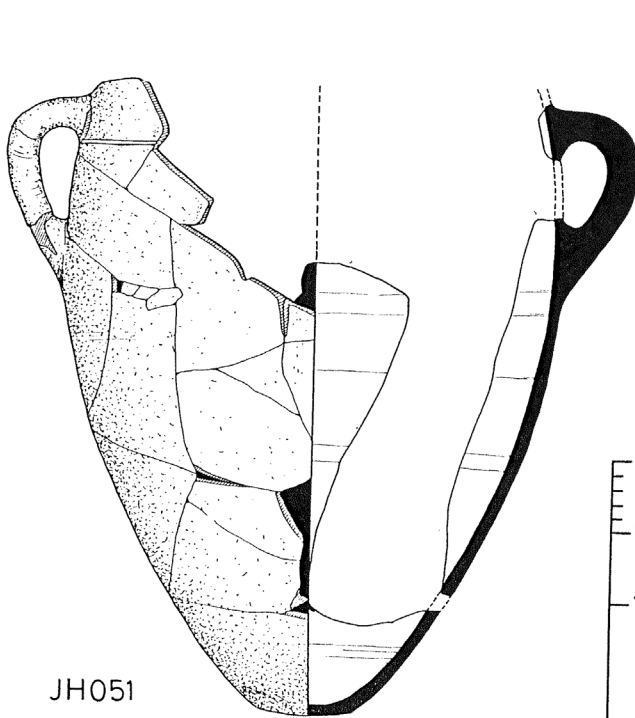
JH060=JH691
Tell el-Dab`a
4426A
Canaanite Jar, complete up to upper body
IV-2b
FI k/23s, gr. 2 (infant burial)
a2-b1; MB IIB
NAA Provenience: Southern Palestine

JH061
Tell el-Dab`a
4505A
Canaanite Jar, upper and midbody
IV-2c
FI k/23, gr. 3 (infant burial)
b1; MB IIB
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 1.2%) and Tell el-Dab`a JH119, of uncertain provenience (mean Euclidean distance 0.097)

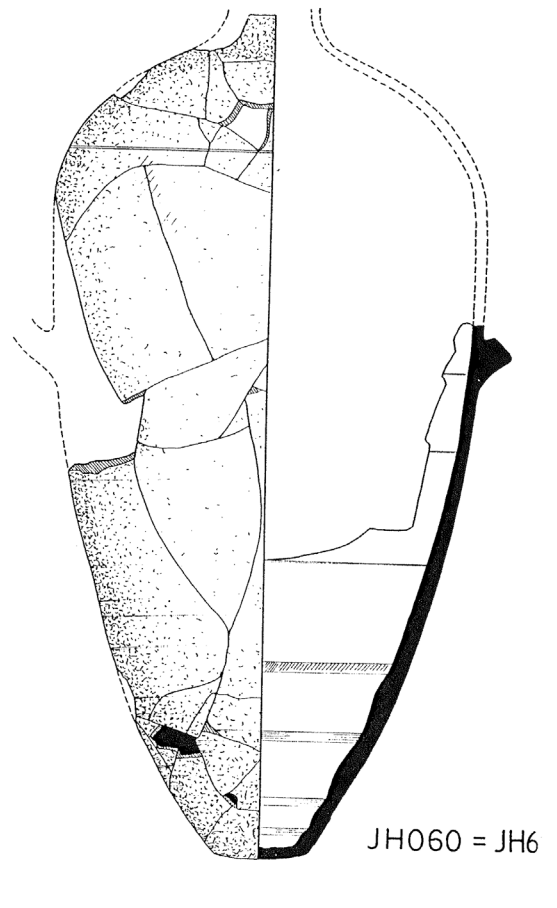
JH062 (not illustrated)
Tell el-Dab`a
4552C
Canaanite Jar, lower body
I-e3
AII l/17, pl. 6 (residence)
E3; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH065
Tell el-Dab`a
4034A
Canaanite Jar, complete up upper body
IV-2-3c
AII o/20 (residence)
E1 or earlier; MB IIB
NAA Provenience: most similar to Southern Palestine (ADCORR 0.8%) and Tell el-Dab`a JH803, import from Southern Palestine (mean Euclidean distance 0.079)

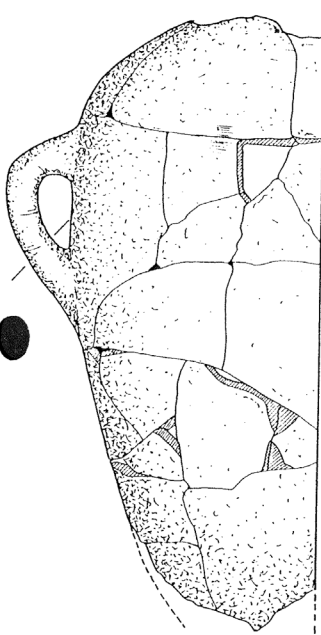
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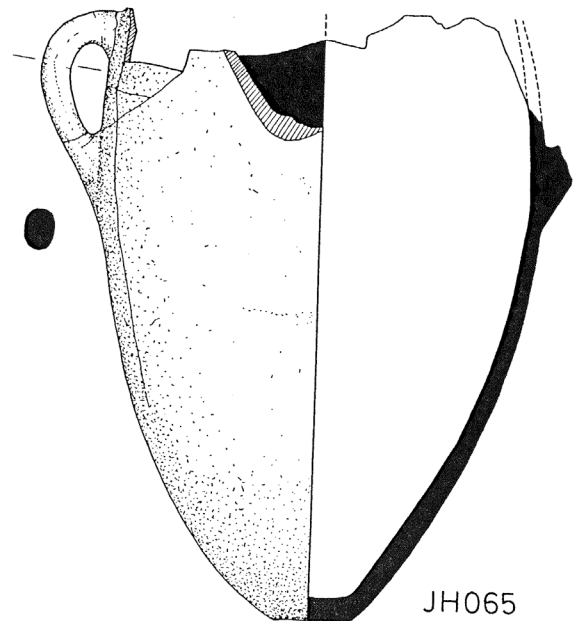
JH051



JH060 = JH6



JH061



JH065

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Fig. 52: MB IIB Canaanite Jars

JH069

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 81.39)

2497H

Canaanite Jar

IV-2c

AII m/12, gr. 9 (burial)

E2; MB IIB

NAA Provenience: Southern Palestine

JH070

Tell el-Dab`a

3953B

Canaanite Jar, complete up to upper body

IV-1c

AII l/17, gr. 6 (infant burial)

E1; MB IIB

NAA Provenience: Southern Palestine

JH077

Tell el-Dab`a

3959B

Canaanite Jar, complete up to upper body

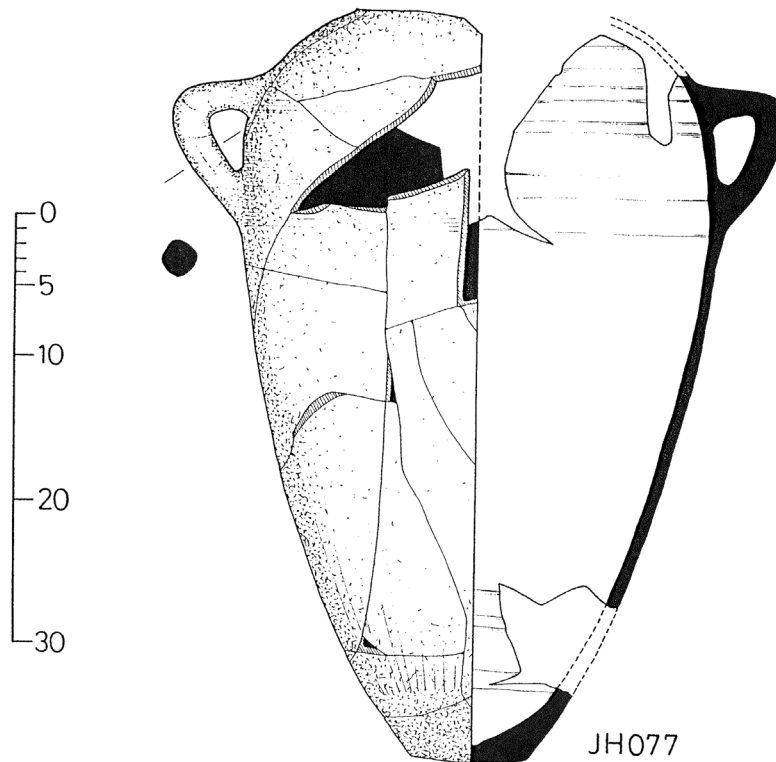
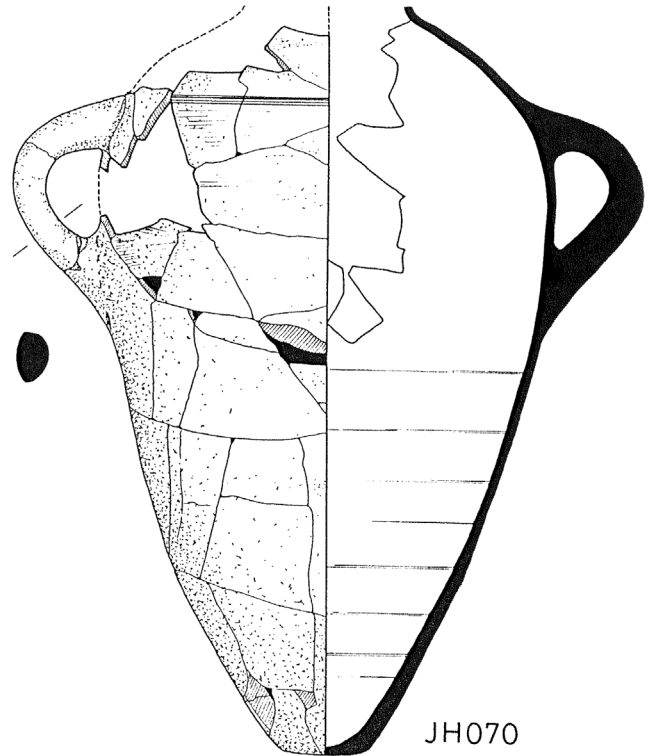
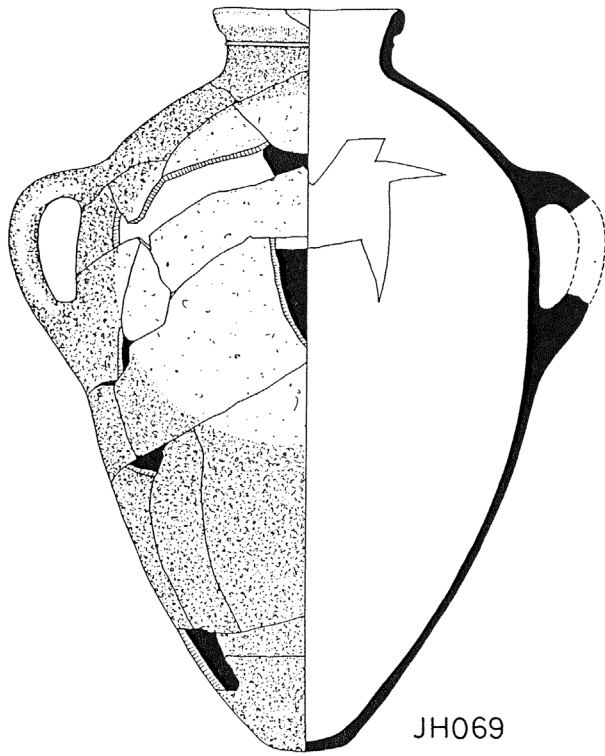
IV-2b

FI i/23, gr. 26 (infant burial)

b2; MB IIB

NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.9%) and Tell el-Dab`a JH831, of uncertain provenience (mean Euclidean distance 0.072)

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Fig. 53: MB IIB Canaanite Jars

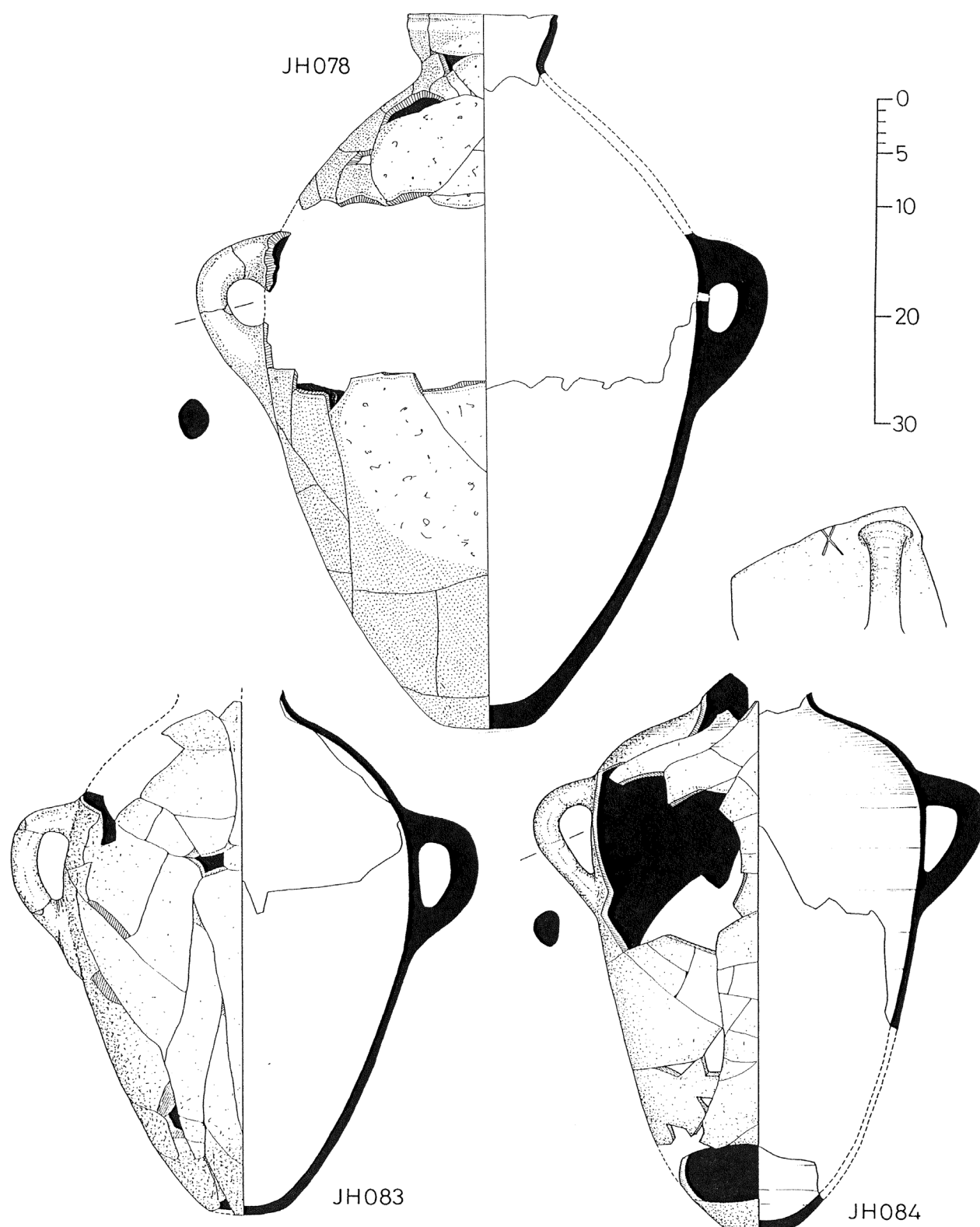
JH078
Tell el-Dab`a
2179A
Canaanite Jar, missing part of midbody
IV-2c
AII n/15, magazine, gr. 1 (burial)
D3-E1; MB IIB
NAA Provenience: Southern Palestine

JH079 (not illustrated)
Tell el-Dab`a
4552E
Canaanite Jar, lower body
IV-2b
AII k/12, secondary context (residence)
E1; MB IIB
NAA Provenience: ?; most similar to Tel Ifshar JH557, of local origin (mean Euclidean distance 0.066) and Tell el-Dab`a JH802, import from Southern Palestine (mean Euclidean distance 0.067)

JH083
Tell el-Dab`a
4030D
Canaanite Jar, complete up to upper body
IV-2c
AII l/17, gr. 15 (infant burial)
E2-3; MB IIB
NAA Provenience: Southern Palestine

JH084
Tell el-Dab`a
4099C
Canaanite Jar, complete up to upper body, with incised mark
IV-2c
FI j/21, gr. 4 (deposit in burial chamber entrance)
b1-2; MB IIB
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.6%) and Ruweise JH490, import from Southern Palestine (mean Euclidean distance 0.089)

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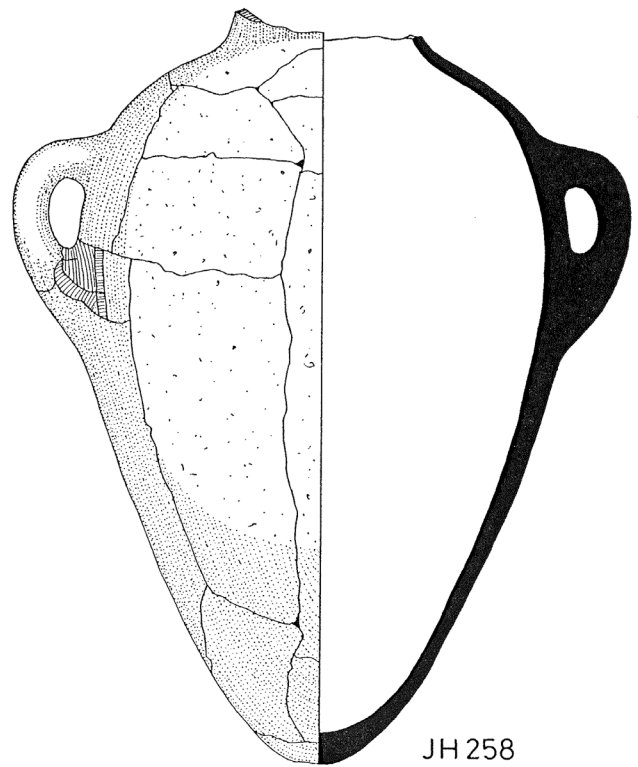
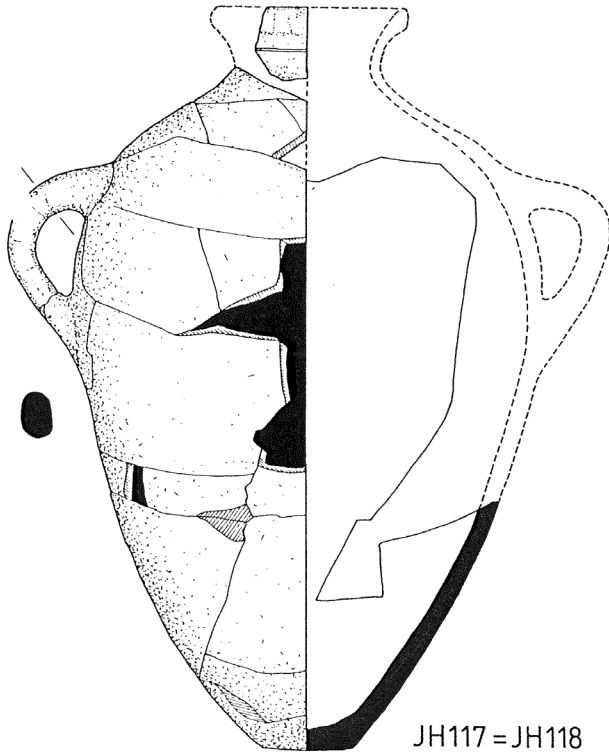
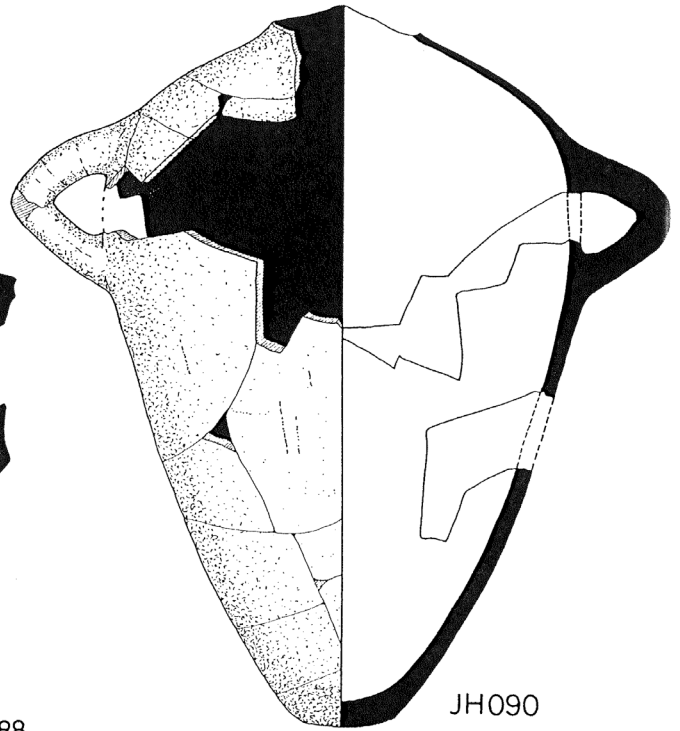
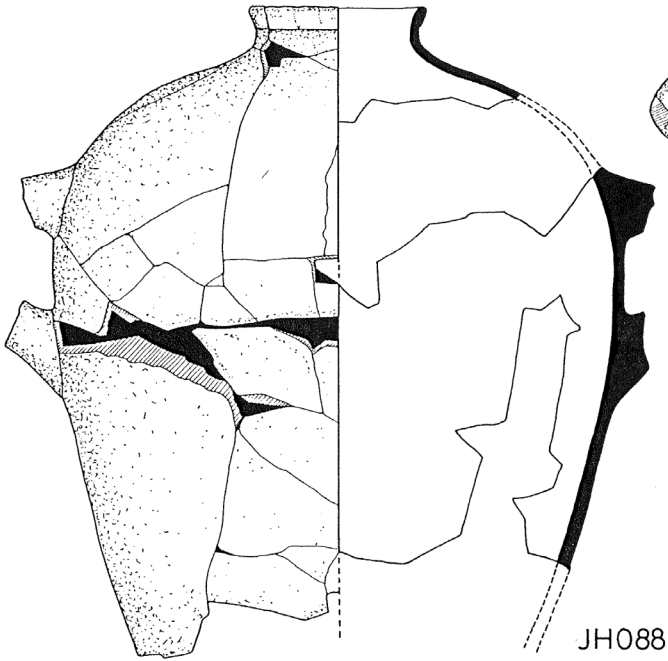
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Fig. 54: MB IIB Canaanite Jars

- JH088
Tell el-Dab`a
4098A
Canaanite Jar, missing lower body
IV-2c
AII l/17, gr. 14 (infant burial)
E2; MB IIB
NAA Provenience: Southern Palestine
- JH090
Tell el-Dab`a
4032B
Canaanite Jar, complete up to upper body
IV-2c
FI j/22, gr. 2 (infant burial)
b1; MB IIB
NAA Provenience: Southern Palestine
- JH117=JH118 (Pl. 2c)
Tell el-Dab`a
4409
Canaanite Jar, complete up to upper body
IV-2c
FI i/23, gr. 25 (infant burial)
b2-3; MB IIB
NAA Provenience: Southern Palestine
- JH258
Tell el-Dab`a
1662/WA3134
Canaanite Jar, complete up to upper body
IV-2c
AII l/14, gr. 7 (burial)
E3; MB IIB
NAA Provenience: Southern Palestine

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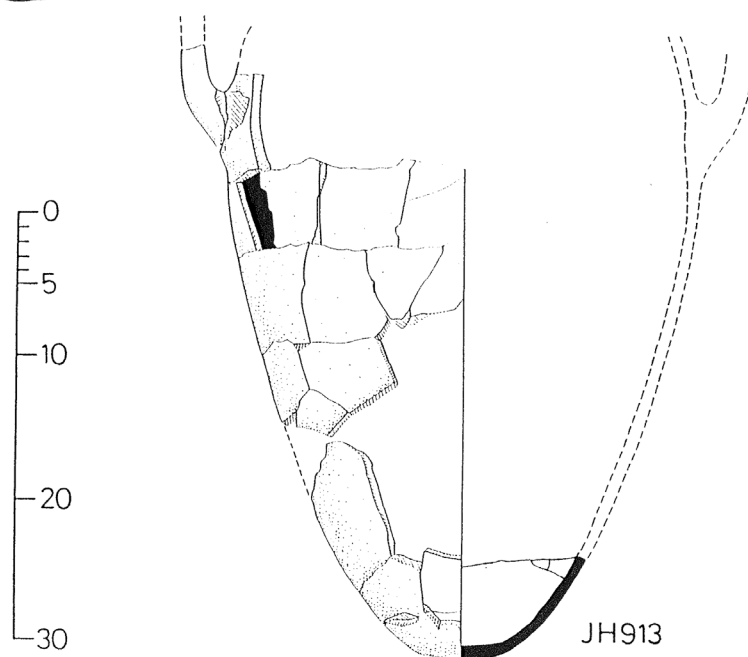
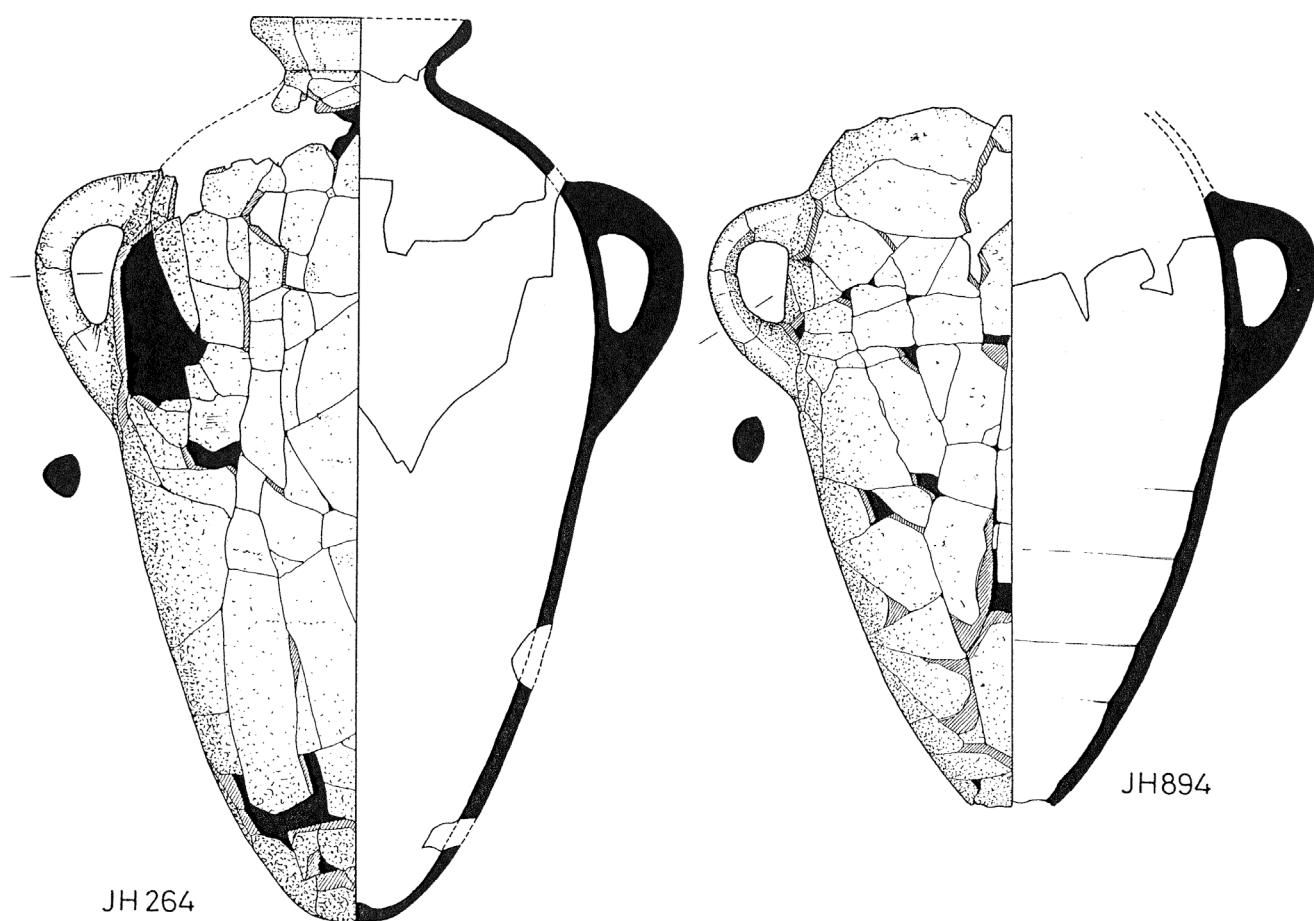
Fig. 55: MB IIB Canaanite Jars

JH264 (Pl. 2d)
Tell el-Dab`a
3960
Canaanite Jar
IV-2c
AII n/19, gr. 5 (deposit in burial chamber entrance)
E; MB IIB
NAA Provenience: Southern Palestine

JH894
Tell el-Dab`a
5243]
Canaanite Jar, complete up to upper body
IV-2c
AII o/20, pl. 5 (residence)
E1-2; MB IIB
NAA Provenience: Southern Palestine

JH913
Tell el-Dab`a
5894F
Canaanite Jar, complete up to upper body
IV-2b-c
AII k/17, gr. 29 (infant burial)
D3-E1; MB IIB
NAA Provenience: Southern Palestine

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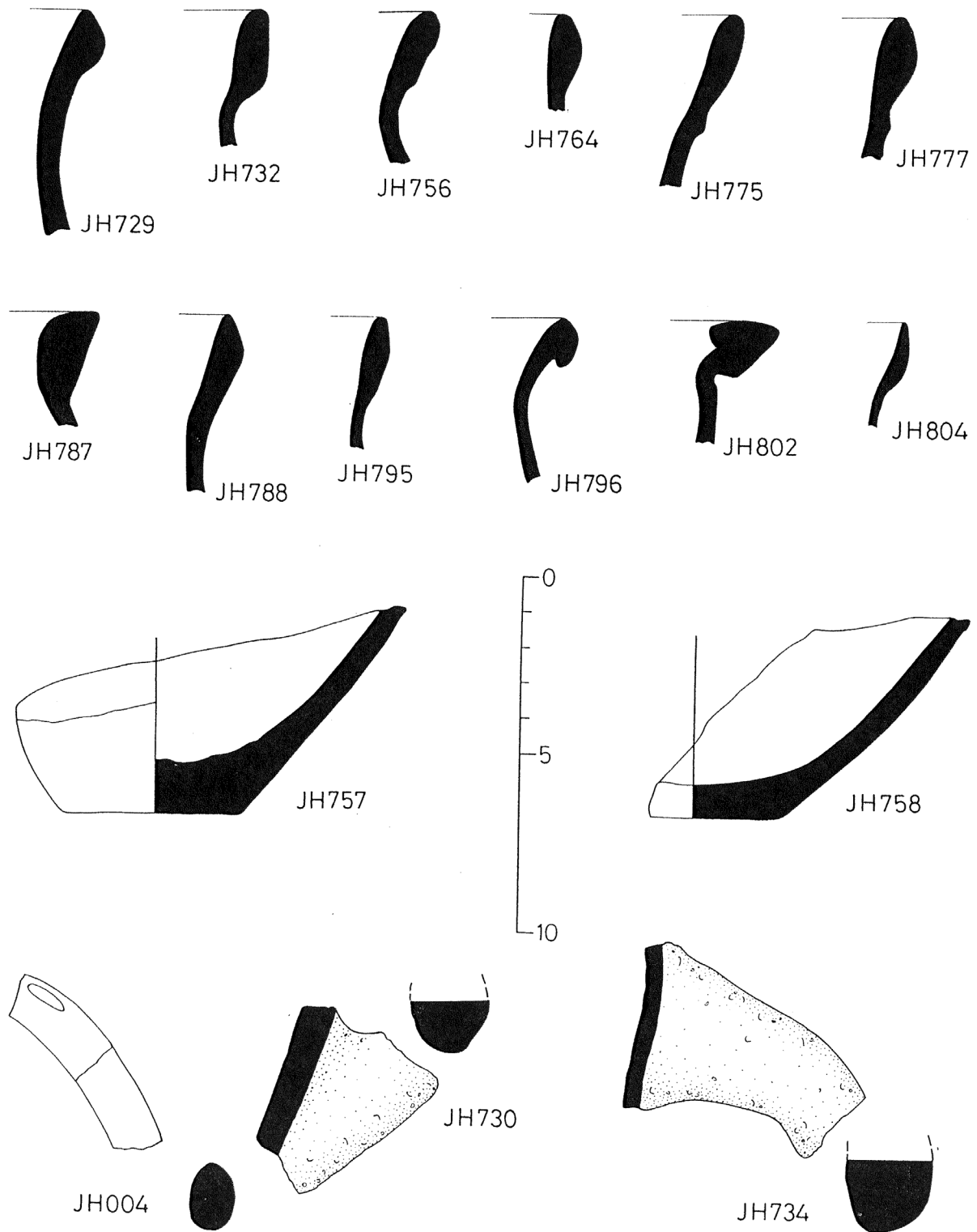


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Fig. 56: MB IIB Canaanite Jar Rims, Bases, and Handles

JH729 Tell el-Dab`a K934 Canaanite Jar rim IV-3c AII m/17, pl. 4 (residence) E2-3; MB IIB NAA Provenience: Southern Palestine	K1086 Canaanite Jar rim IV-1b AII n/18, pl. 3 (residence) D3-E1; MB IIB NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.2%; mean Euclidean distance 0.098)	IV-2c AII o/20 (residence) E2; MB IIB NAA Provenience: Southern Palestine
JH732 Tell el-Dab`a K2121 Canaanite Jar rim IV-2c FI i/23 (residence) E3, b; MB IIB NAA Provenience: ?; no matches at mean Euclidean distance 0.1	JH777 Tell el-Dab`a K788 Canaanite Jar rim I-c? AII l/13-14 (residence) E1; MB IIB NAA Provenience: Southern Palestine	JH757 Tell el-Dab`a K927(1) Canaanite Jar base IV-2c-d AII m/17, pl. 2-3 (residence) E3; MB IIB NAA Provenience: Southern Palestine
JH742 (not illustrated) Tell el-Dab`a K2086 Canaanite Jar rim IV-2c FI j/22, pl. 1 (residence) b1; MB IIB NAA Provenience: Southern Palestine	JH787 Tell el-Dab`a K1489(1) Canaanite Jar rim IV-2c-d AII n/19 (residence) D3-E1; MB IIB NAA Provenience: ?; most similar to Tell Ibn Hani JH949, of local origin (mean Euclidean distance 0.096)	JH758 Tell el-Dab`a K927(2) Canaanite Jar base IV-2c AII m/17, pl. 2-3 (residence) E3; MB IIB NAA Provenience: Southern Palestine
JH756 Tell el-Dab`a K901 Canaanite Jar rim IV-2b AII m/17, pl. 2-3 (residence) E1; MB IIB NAA Provenience: Southern Palestine	JH788 Tell el-Dab`a K1489(2) Canaanite Jar rim IV AII n/19 (residence) D3-E1; MB IIB NAA Provenience: Southern Palestine	JH004 Tell el-Dab`a K395 Canaanite Jar handle IV-3b AII m/14, pl. 4-5 (residence) E3; MB IIB NAA Provenience: Southern Palestine
JH759 (not illustrated) Tell el-Dab`a K998 Canaanite Jar rim IV-1b AII m/17, pl. 2-3 (residence) E2; MB IIB NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.9%; mean Euclidean distance 0.091)	JH795 Tell el-Dab`a K2061(1) Canaanite Jar rim IV-2c AII n/17 (residence) E2-3; MB IIB NAA Provenience: Southern Palestine	JH730 Tell el-Dab`a K833 Canaanite Jar handle IV-3c AII n/18 (residence) E3; MB IIB NAA Provenience: ?; most similar to Southern Palestine (ADCORR 1.6%; mean Euclidean distance 0.081)
JH764 Tell el-Dab`a K2094(1) Canaanite Jar rim IV-2d FI i/23 (residence) b1-2; MB IIB NAA Provenience: most similar to Tell el-Dab`a JH742, import from Southern Palestine (mean Euclidean distance 0.079)	JH796 Tell el-Dab`a K2061(2) Canaanite Jar rim IV-2c AII n/17 (residence) E2-3; MB IIB NAA Provenience: ?; most similar to Tell el-Dab`a JH152, of local Nile alluvial origin (mean Euclidean distance 0.090)	JH734 Tell el-Dab`a K2122(1) Canaanite Jar handle IV-2c FI i/22, pl. 0-1 (residence) b1; MB IIB NAA Provenience: Southern Palestine
JH765 (not illustrated) Tell el-Dab`a K2094(2) Canaanite Jar rim IV-2c FI i/23 (residence) b1-2; MB IIB NAA Provenience: Southern Palestine	JH802 Tell el-Dab`a K2041 Canaanite Jar rim IV-2-3 AII p/20 (residence) E1; MB IIB NAA Provenience: Southern Palestine	JH739 (not illustrated) Tell el-Dab`a K2743(1) Canaanite Jar handle IV-2c FI k/22, pl. 1-2 (residence) b2; MB IIB NAA Provenience: most similar to Southern Palestine (ADCORR 0.2%; mean Euclidean distance 0.066)
JH775 Tell el-Dab`a	JH804 Tell el-Dab`a K2053 Canaanite Jar rim	JH740 (not illustrated) Tell el-Dab`a K2743(2) Canaanite Jar handle IV-2-3c FI k/22, pl. 1-2 (residence) b2; MB IIB NAA Provenience: Southern Palestine

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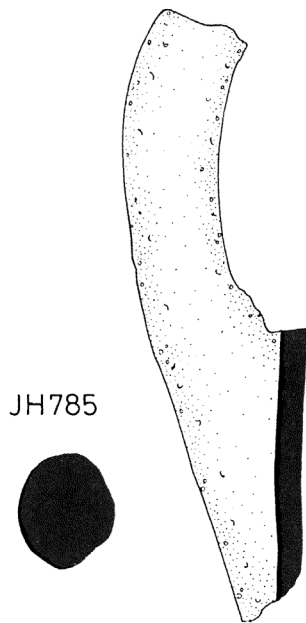
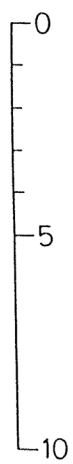
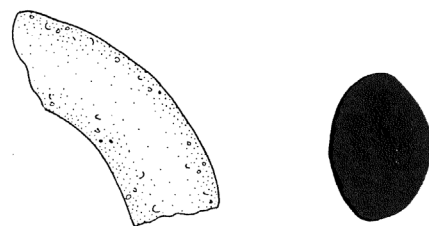
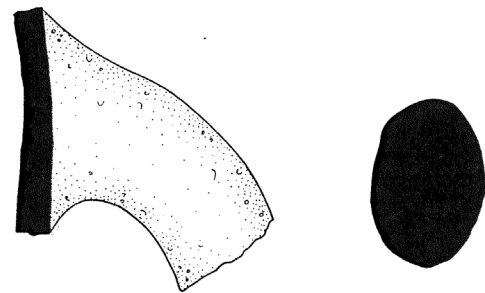
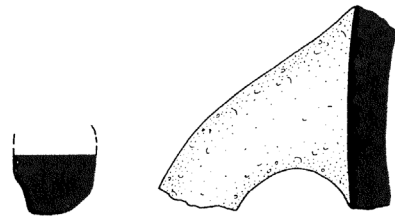
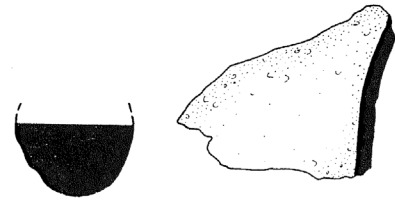
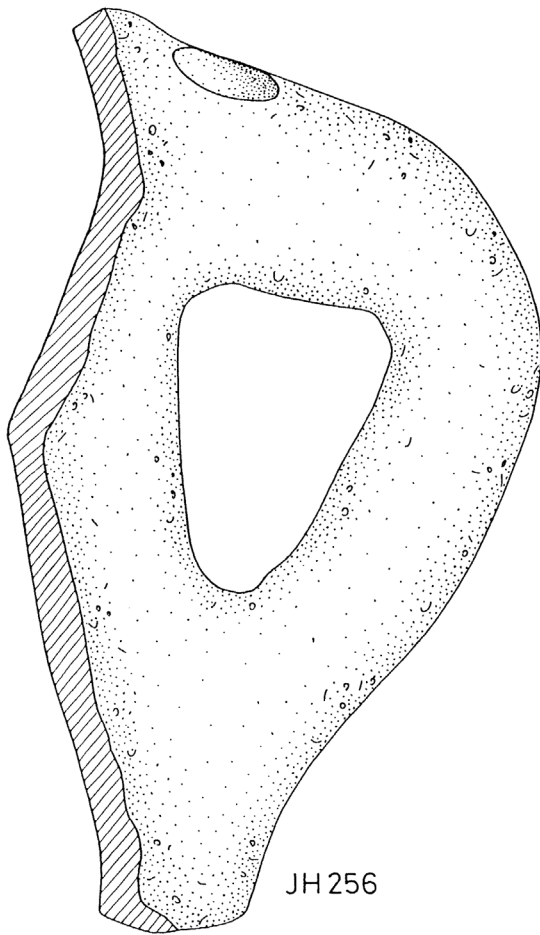


The Foreign Relations of the “Hyksos”

Fig. 57: MB IIB Canaanite Jar Handles

JH256 (Pl. 4c) Tell el-Dab`a (<i>Tell el-Dab`a V</i> : fig. 108) 2089/WA3401 Canaanite Jar handle, with scarab impression IV-2c AII n/10, pl. 3, gr. 6 (infant burial) E2; MB IIB NAA Provenience: Southern Palestine	JH771 (not illustrated) Tell el-Dab`a K1950 Canaanite Jar handle IV-2b AII o/20, pl. 1-2 (residence) E3; MB IIB NAA Provenience: Southern Palestine	JH801 (not illustrated) Tell el-Dab`a K2099 Canaanite Jar handle IV-2c AII n/19 (residence) E2; MB IIB NAA Provenience: Southern Palestine
JH743 Tell el-Dab`a K2014(1) Canaanite Jar handle IV-1b AII n/19, pl. 2-3 (residence) E1; MB IIB NAA Provenience: Egyptian Nile alluvium	JH776 Tell el-Dab`a K792 Canaanite Jar handle IV-2b-c AII l/13-14 (residence) E1; MB IIB NAA Provenience: Southern Palestine	JH803 (not illustrated) Tell el-Dab`a K2052 Canaanite Jar handle IV-1c AII p/21 (residence) E1; MB IIB NAA Provenience: Southern Palestine
JH744 Tell el-Dab`a K2014(2) Canaanite Jar handle IV-2c AII n/19, pl. 2-3 (residence) E1; MB IIB NAA Provenience: Southern Palestine	JH785 Tell el-Dab`a K2573 Canaanite Jar handle IV-2c FI j/23N (residence) b1; MB IIB NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.2%; mean Euclidean distance 0.092)	JH001 (not illustrated) Tell el-Dab`a K395 Canaanite Jar body sherd IV-2c AII m/14, pl. 4-5 (residence) E3; MB IIB NAA Provenience: Southern Palestine
JH760 Tell el-Dab`a K803 Canaanite Jar handle IV-2c AII m/17, pl. 2-3 (residence) E1; MB IIB NAA Provenience: ?; no matches at mean Euclidean distance 0.1	JH800 (not illustrated) Tell el-Dab`a K2118 Canaanite Jar handle IV-3c FI i/23 (residence) b2; MB IIB NAA Provenience: Southern Palestine	JH914 (not illustrated) Tell el-Dab`a 5822P Canaanite Jar body sherds IV-2c AII k/17, gr. 29 (infant burial) E2-3; MB IIB NAA Provenience: Southern Palestine

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Fig. 58: MB IIB-C Canaanite Jars

JH012
Tell el-Dab`a
4536A
Canaanite Jar, complete up to midbody
IV-2c
FI k/24 (residence?)
a2; MB IIB-C
NAA Provenience: Southern Palestine

JH023
Tell el-Dab`a
4541A
Canaanite Jar, complete up to upper body
IV-2b
FI k/24, no. 11, detail 1, offering pit
a2; MB IIB-C (residence?)
NAA Provenience: Southern Palestine

JH024=JH692
Tell el-Dab`a
4547A
Canaanite Jar, complete up to midbody
IV-1c
FI k/23, gr. 1 (infant burial)
b1-a2; MB IIB-C
NAA Provenience: Southern Palestine

JH025
Tell el-Dab`a
4548E
Canaanite Jar, complete up to midbody
IV-2c
FI i/22, pit 12, probably disturbed (deposit in burial chamber entrance)
a2; MB IIB-C
NAA Provenience: Southern Palestine

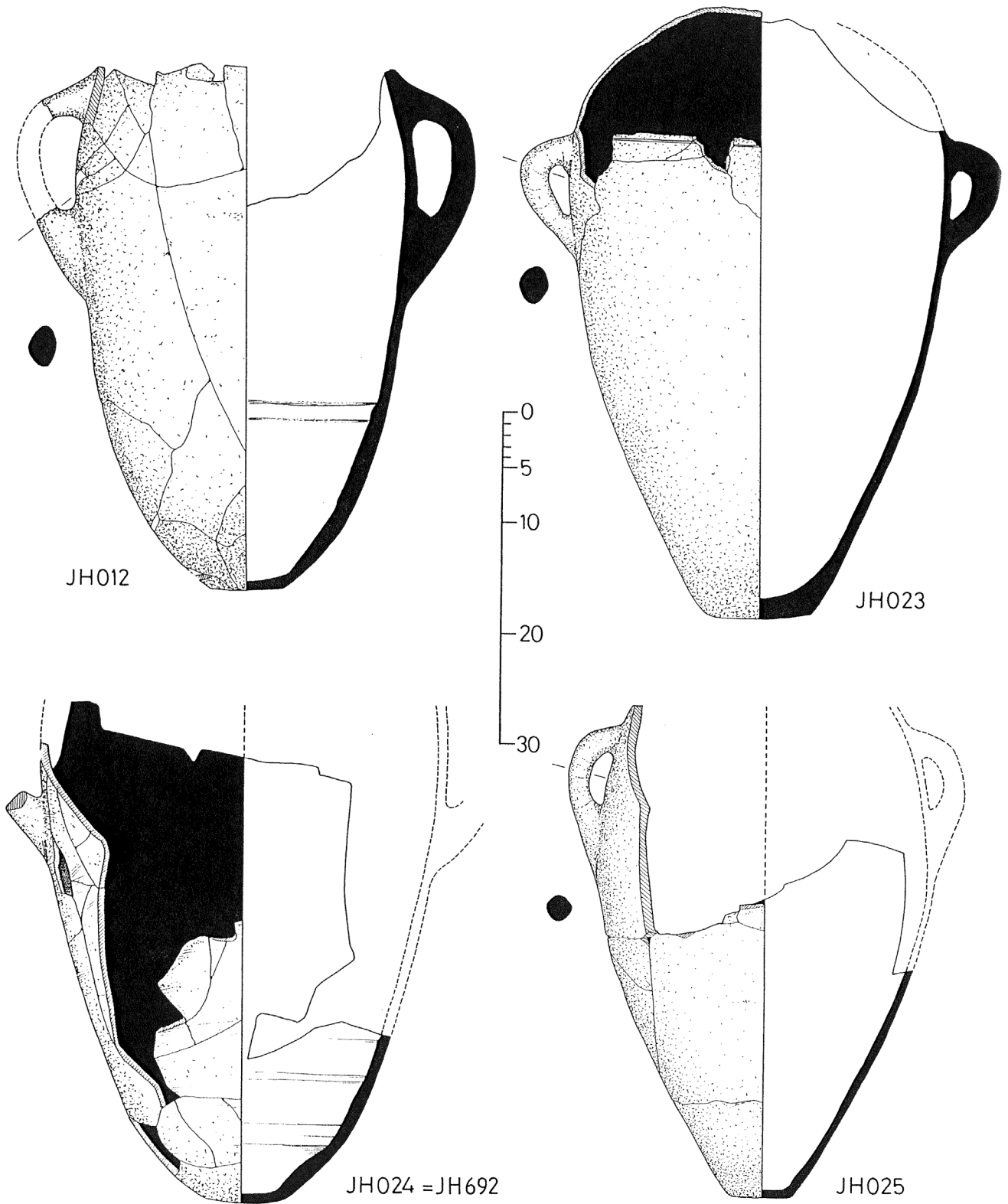
JH029 (not illustrated)
Tell el-Dab`a
4549C
Canaanite Jar, complete up to midbody
IV-2c-d
FI i/22(-23), pit 10 (deposit in burial chamber entrance)
a2; MB IIB-C
NAA Provenience: Egyptian Nile alluvium

JH030 (not illustrated)
Tell el-Dab`a
4549D
Canaanite Jar handle
IV-1-2c
FI i/22-23, pit 10, probably disturbed (residence?)
a2; MB IIB-C
NAA Provenience: Southern Palestine

JH031 (not illustrated)
Tell el-Dab`a
4549E
Canaanite Jar handle
IV-2c-d
FI i/22-23, pit 10
a2; MB IIB-C
NAA Provenience: Southern Palestine

JH032 (not illustrated)
Tell el-Dab`a
4549A
Canaanite Jar, body sherds and handle
IV-2c
FI i/22 (residence)
a2; MB IIB-C
NAA Provenience: Southern Palestine

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Fig. 59: MB IIB-C Canaanite Jars

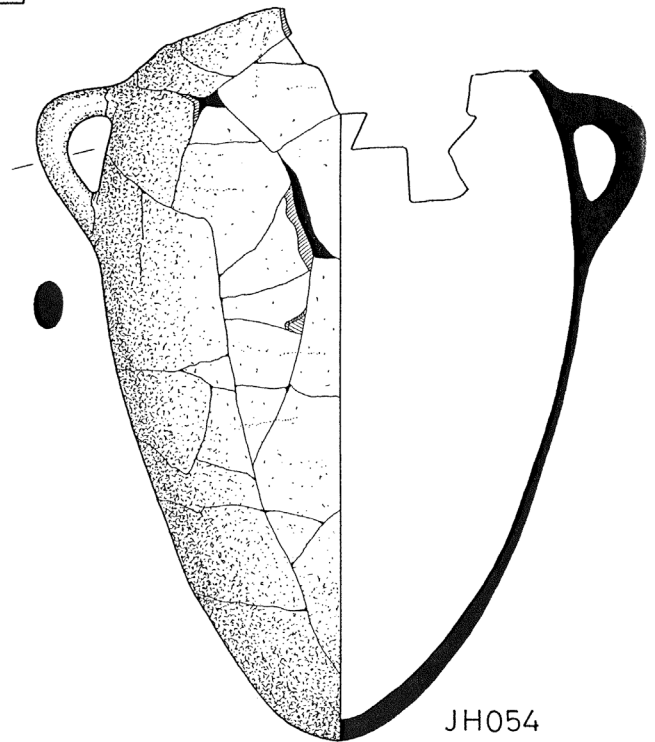
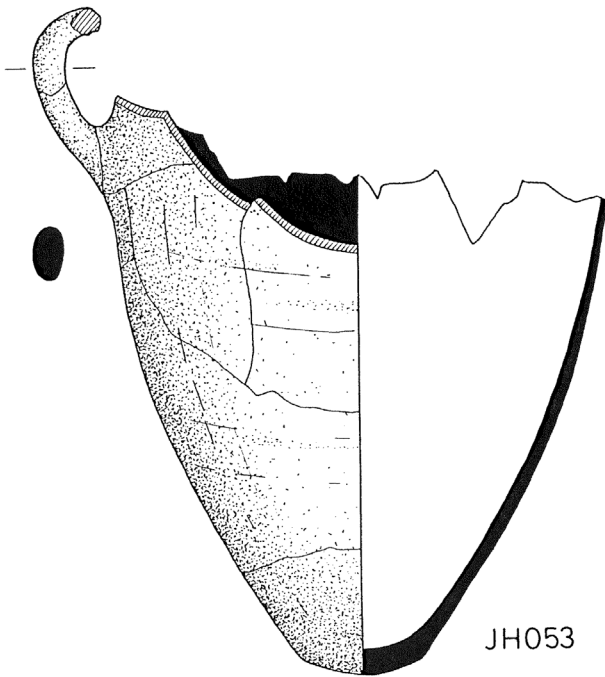
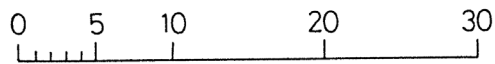
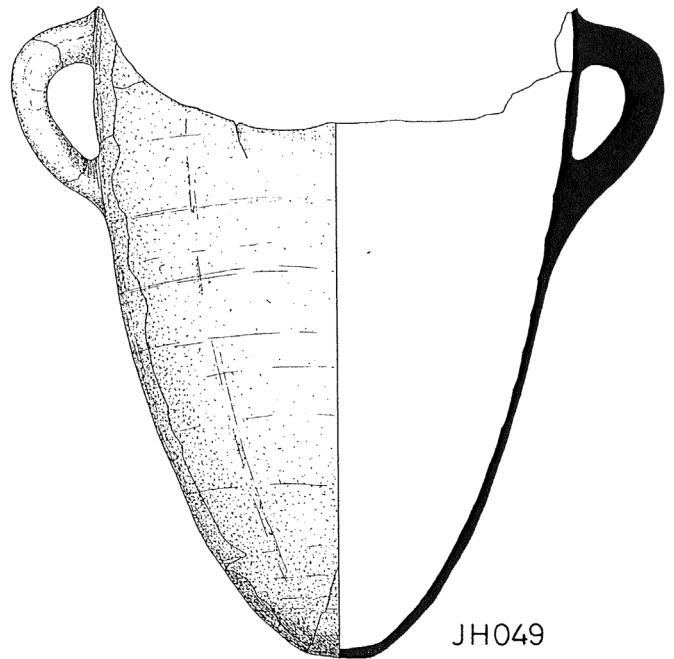
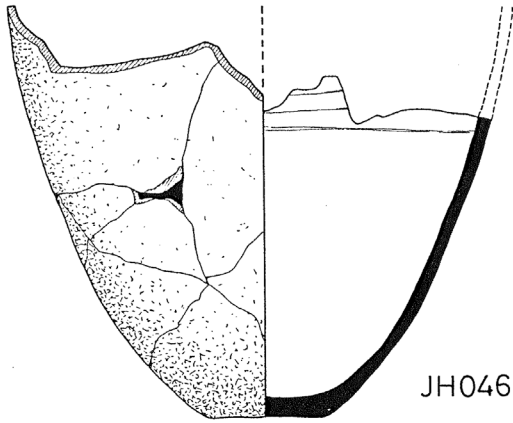
JH046
Tell el-Dab`a
4551C
Canaanite Jar, lower body
IV-2b
FI k/20, gr. 19 (infant burial)
b3-a2; MB IIB-C
NAA Provenience: ?; most similar to Tell el-Dab`a MB028, of uncertain provenience (mean Euclidean distance 0.076)

JH049
Tell el-Dab`a
4551F
Canaanite Jar, complete up to midbody
IV-2c
AII l/16 (residence?)
D2-3; MB IIB-C
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.1%; mean Euclidean distance 0.083)

JH053
Tell el-Dab`a
4551H
Canaanite Jar, complete up to midbody
IV-2b
AII m/17, gr. 1 (burial)
D2-3; MB IIB-C
NAA Provenience: most similar to Southern Palestine (ADCORR 3.0%) and Tell el-Dab`a JH616, import from Southern Palestine (mean Euclidean distance 0.068)

JH054
Tell el-Dab`a
Canaanite Jar, complete up to upper body
2652A
IV-2c
AII l/16, gr. 6 (burial)
D2-3; MB IIB-C
NAA Provenience: Southern Palestine

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Fig. 60: MB IIB-C Canaanite Jars

JH059

Tell el-Dab`a

4426B

Canaanite Jar, complete up to midbody

IV-2c

FI k/23, gr. 16 (infant burial)

a2; MB IIB-C

NAA Provenience: Southern Palestine

JH064

Tell el-Dab`a

4426C

Canaanite Jar, complete up midbody

IV-2c

FI k/23, assemblage 4 (residence)

a2; MB IIB-C

NAA Provenience: Southern Palestine

JH076

Tell el-Dab`a

2497F

Canaanite Jar, complete up to midbody

IV-c-d2

AII m/12, gr. 6 (infant burial)

D3; MB IIB-C

NAA Provenience: ?; most similar to Southern Palestine (ADCORR 2.1%; mean Euclidean distance 0.092)

JH082

Tell el-Dab`a

2497J

Canaanite Jar, complete up to upper body

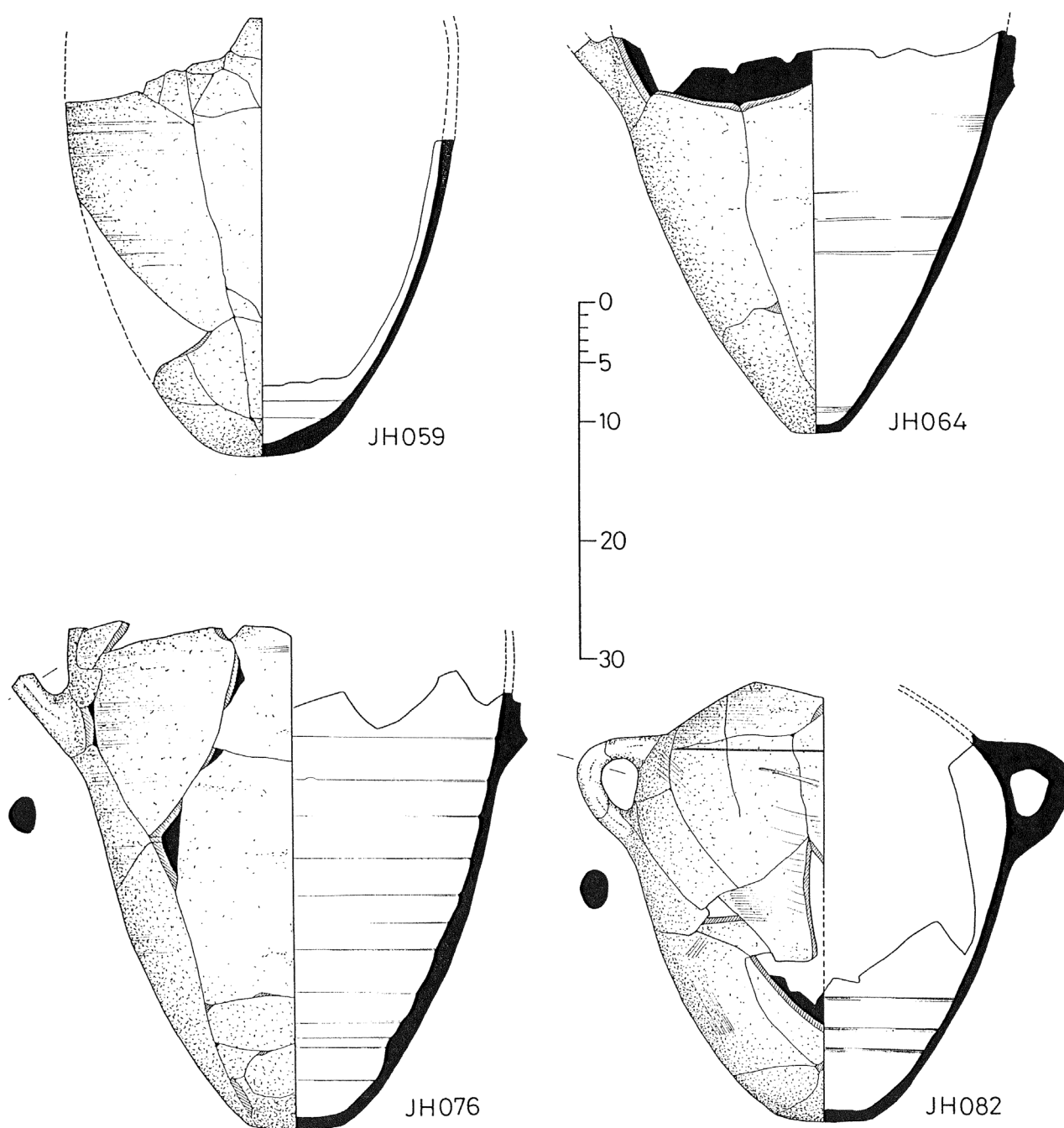
I-c

AII m/11, gr. 4 (infant burial)

D3; MB IIB-C

NAA Provenience: Egyptian Nile alluvium

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Fig. 61: MB IIB-C Canaanite Jars

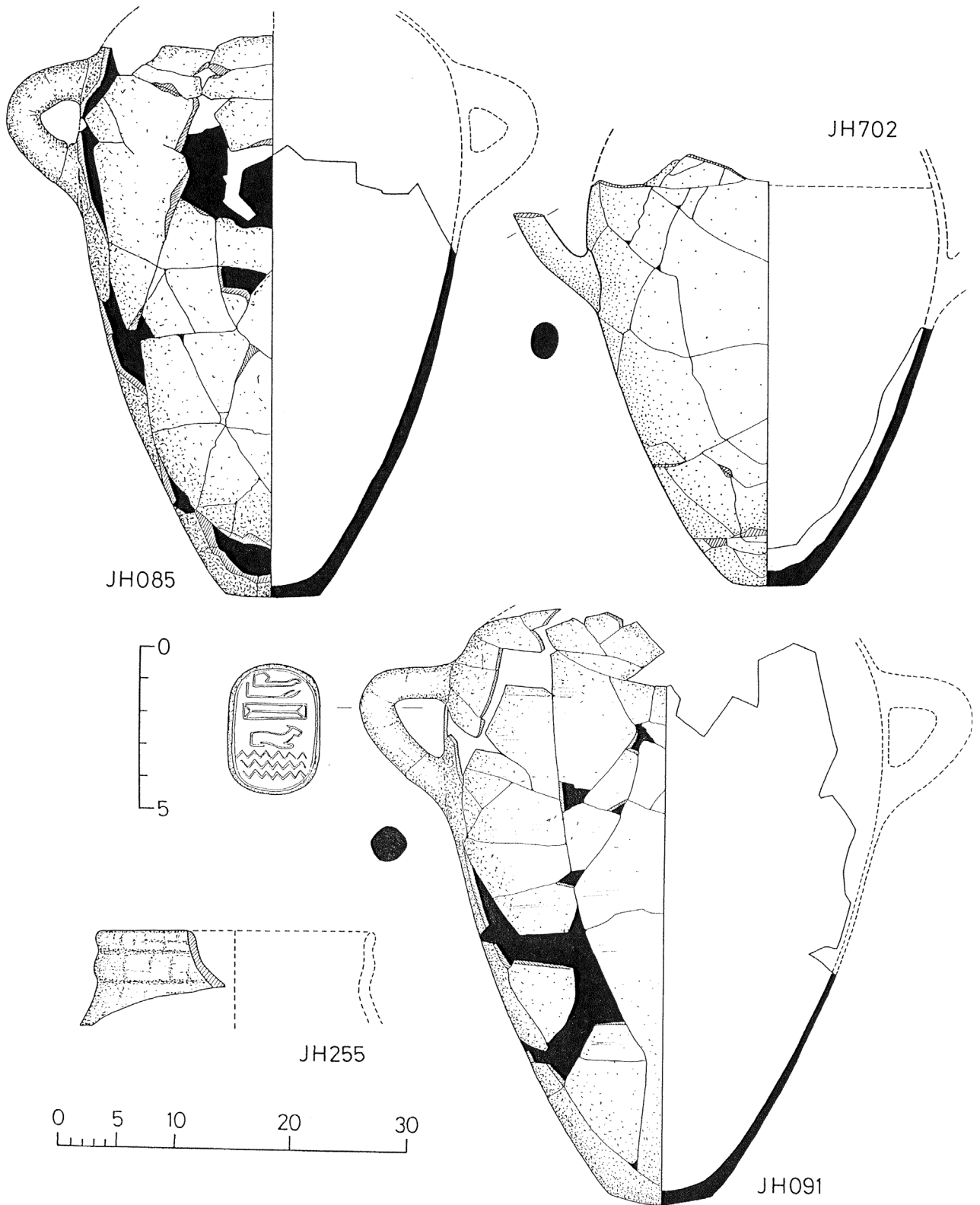
JH085
Tell el-Dab`a
4099A
Canaanite Jar, complete up to midbody
IV-2c
AII l/17, gr. 10 (infant burial)
D3; MB IIB-C
NAA Provenience: Southern Palestine

JH091
Tell el-Dab`a
4537
Canaanite Jar, complete up to upper body, with scarab impression
IV-1b
AII l/17, gr. 8 (infant burial)
D2-3; MB IIB-C
NAA Provenience: Southern Palestine

JH255
Tell el-Dab`a
2788B
Canaanite Jar rim
IV-2b
AII m-n/16, offering pit 2 (deposit in burial chamber entrance)
D2-3; MB IIB-C
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 1.5%) and Tell el-Dab`a MB015, of uncertain provenience (mean Euclidean distance 0.088)

JH702
Tell el-Dab`a
5449
Canaanite Jar, complete up to midbody
IV-2c
AII k/17, pit 7 (infant burial)
D2-3; MB IIB-C
NAA Provenience: Southern Palestine

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Fig. 62: MB IIB-C Canaanite Jars

JH703

Tell el-Dab`a

5203

Canaanite Jar, complete up to upper body, with incised mark

IV-2c

FI k/23s, gr. 4 (infant burial)

a2; MB IIB-C

NAA Provenience: Southern Palestine

JH898

Tell el-Dab`a

5450

Canaanite Jar, missing handles

IV-2c

AII k/17, gr. 22 (infant burial)

D3; MB IIB-C

NAA Provenience: Southern Palestine

JH980 (Pl. 3a)

Tell el-Dab`a

5268

Canaanite Jar

IV-2c

FI m/19, gr. 7 (burial)

a2; MB IIB-C

NAA Provenience: Southern Palestine

JH981 (Pl. 3b)

Tell el-Dab`a

5267

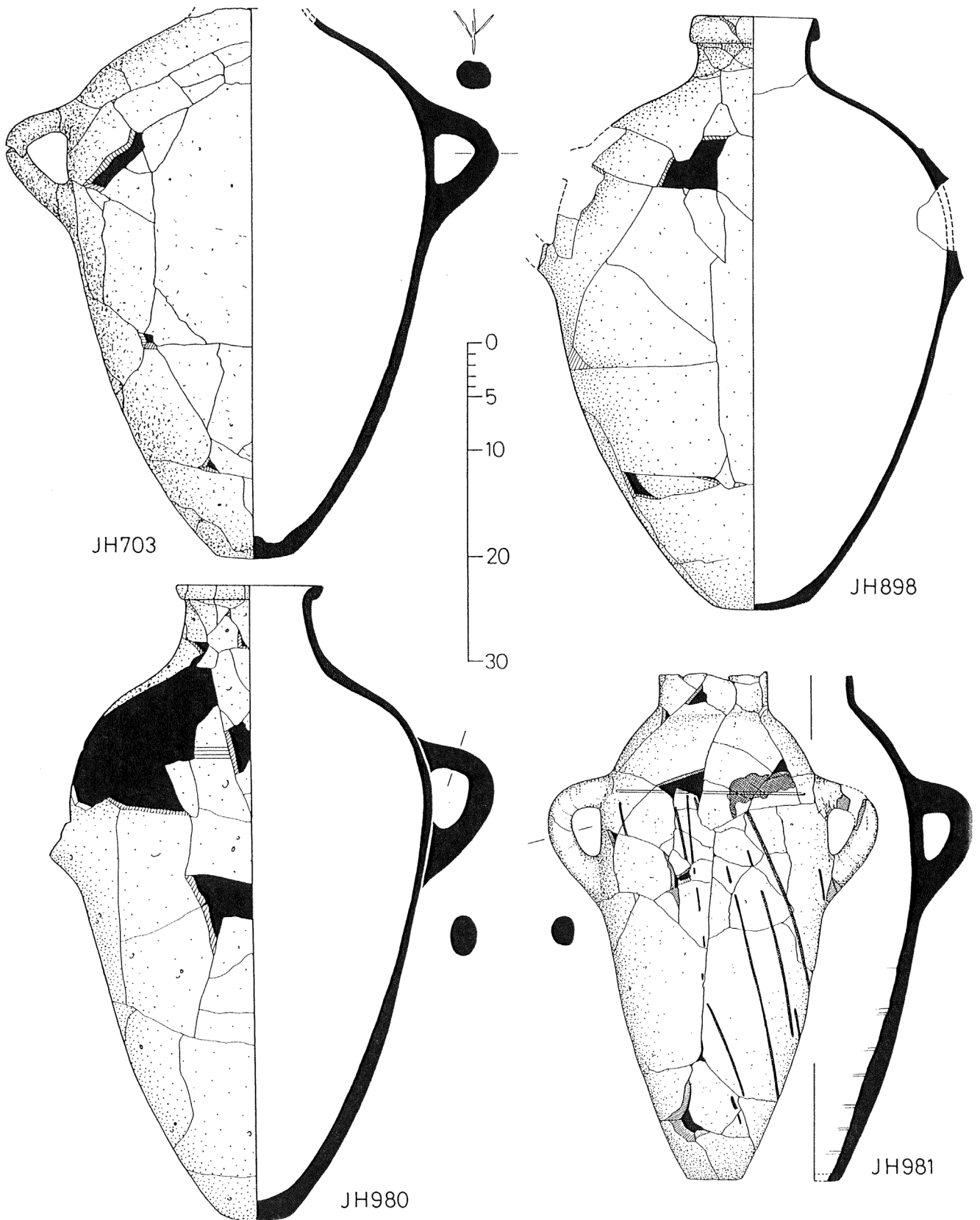
Canaanite Jar, missing rim, with streaks of red paint

IV-3c

FI m/19, gr. 7 (burial)

a2; MB IIB-C

NAA Provenience: ?; most similar to Tell el-Dab`a JH128, of uncertain provenience (mean Euclidean distance 0.093)



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Fig. 63: MB IIB-C Canaanite Jar Handles and Body Sherds

JH613
Tell el-Dab`a
K3959
Canaanite Jar, handle and body sherds
IV-2b
AII k/17, pl. 2 (residence)
D3; MB IIB-C
NAA Provenience: Southern Palestine

JH753
Tell el-Dab`a
K971(1)
Canaanite Jar handle
IV-2b
AII n/18 (residence)
D2-3; MB IIB-C
NAA Provenience: Southern Palestine

JH762
Tell el-Dab`a
K2016(1)
Canaanite Jar handle
I-c
AII n/19, pl. 1 (residence)
D3; MB IIB-C
NAA Provenience: Egyptian Nile alluvium

JH783
Tell el-Dab`a
K775(1)
Canaanite Jar handle
IV-2c
AII l/13-14 (residence)
D2-3; MB IIB-C
NAA Provenience: Southern Palestine

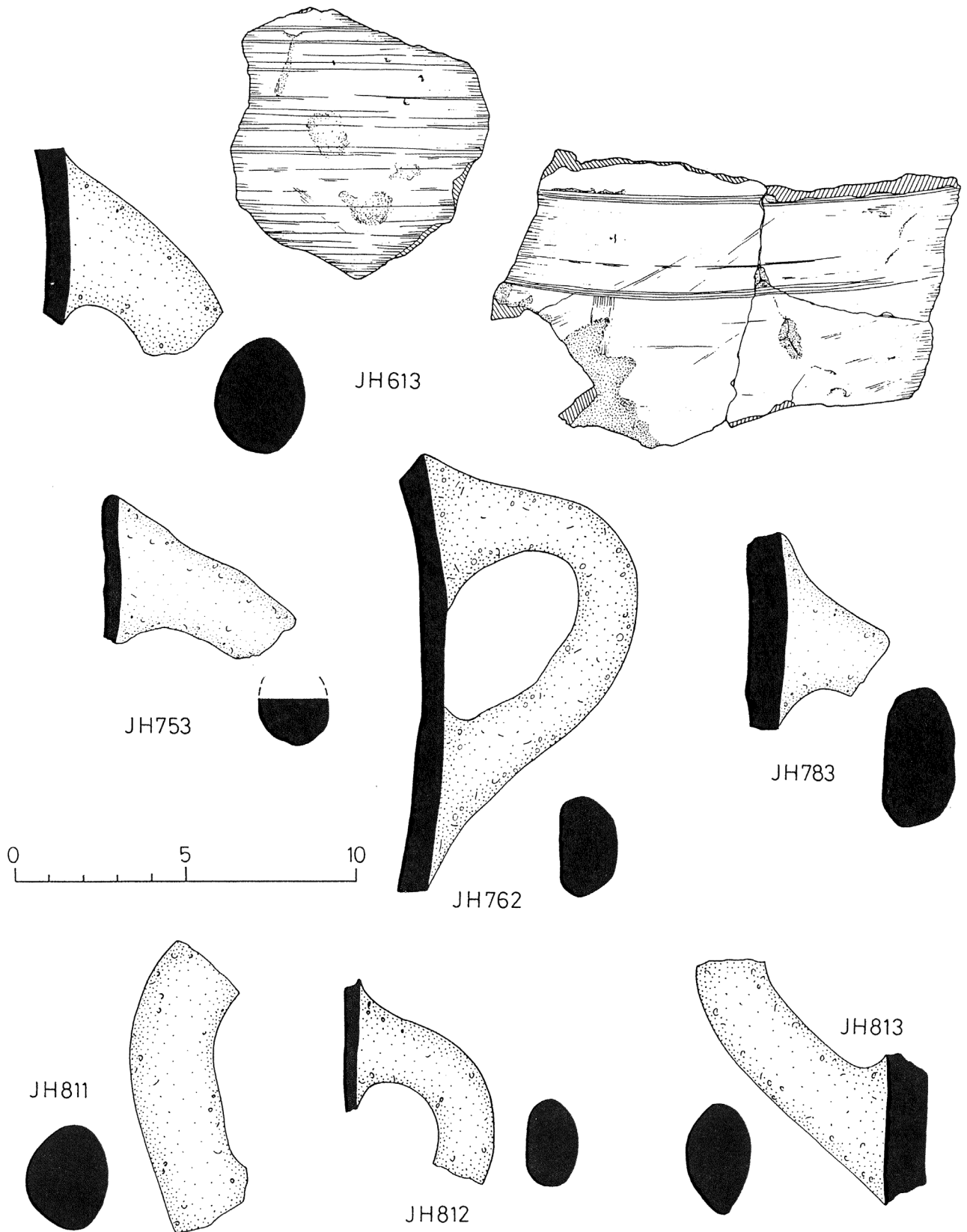
JH784 (not illustrated)
Tell el-Dab`a
K775(2)
Canaanite Jar handle
IV-1b
AII l/13-14 (residence)
D2-3; MB IIB-C
NAA Provenience: Egyptian Nile alluvium

JH811
Tell el-Dab`a
K3369
Canaanite Jar handle
IV-1b
AII k/17, pl. 2-3 (residence)
D3; MB IIB-C
NAA Provenience: Southern Palestine

JH812
Tell el-Dab`a
K3369
Canaanite Jar handle
IV-3b
AII k/17, pl. 2-3 (residence)
D3; MB IIB-C
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.4) and Tell el-Dab`a JH741, of uncertain provenience (mean Euclidean distance 0.09)

JH813
Tell el-Dab`a
K3369
Canaanite Jar handle
IV-2c
AII k/17, pl. 2-3 (residence)
D3; MB IIB-C
NAA Provenience: Southern Palestine

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Fig. 64: MB IIB-C Canaanite Jar Handles, Rims, and Bases

JH814
Tell el-Dab`a
K3369
Canaanite Jar handle
IV-2c
AII k/17, pl. 2-3 (residence)
D3; MB IIB-C
NAA Provenience: Southern Palestine

JH815
Tell el-Dab`a
K3341
Canaanite Jar handle
IV-2b
AII k/16, pl. 2-3 (residence)
D3; MB IIB-C
NAA Provenience: Egyptian Nile alluvium

JH816
Tell el-Dab`a
K3341
Canaanite Jar handle
IV-2b
AII k/16, pl. 2-3 (residence)
D3; MB IIB-C
NAA Provenience: Southern Palestine

JH763 (not illustrated)
Tell el-Dab`a
K2016(2)
Canaanite Jar rim
IV-2c
AII n/19, pl. 1 (residence)
D3; MB IIB-C
NAA Provenience: Southern Palestine

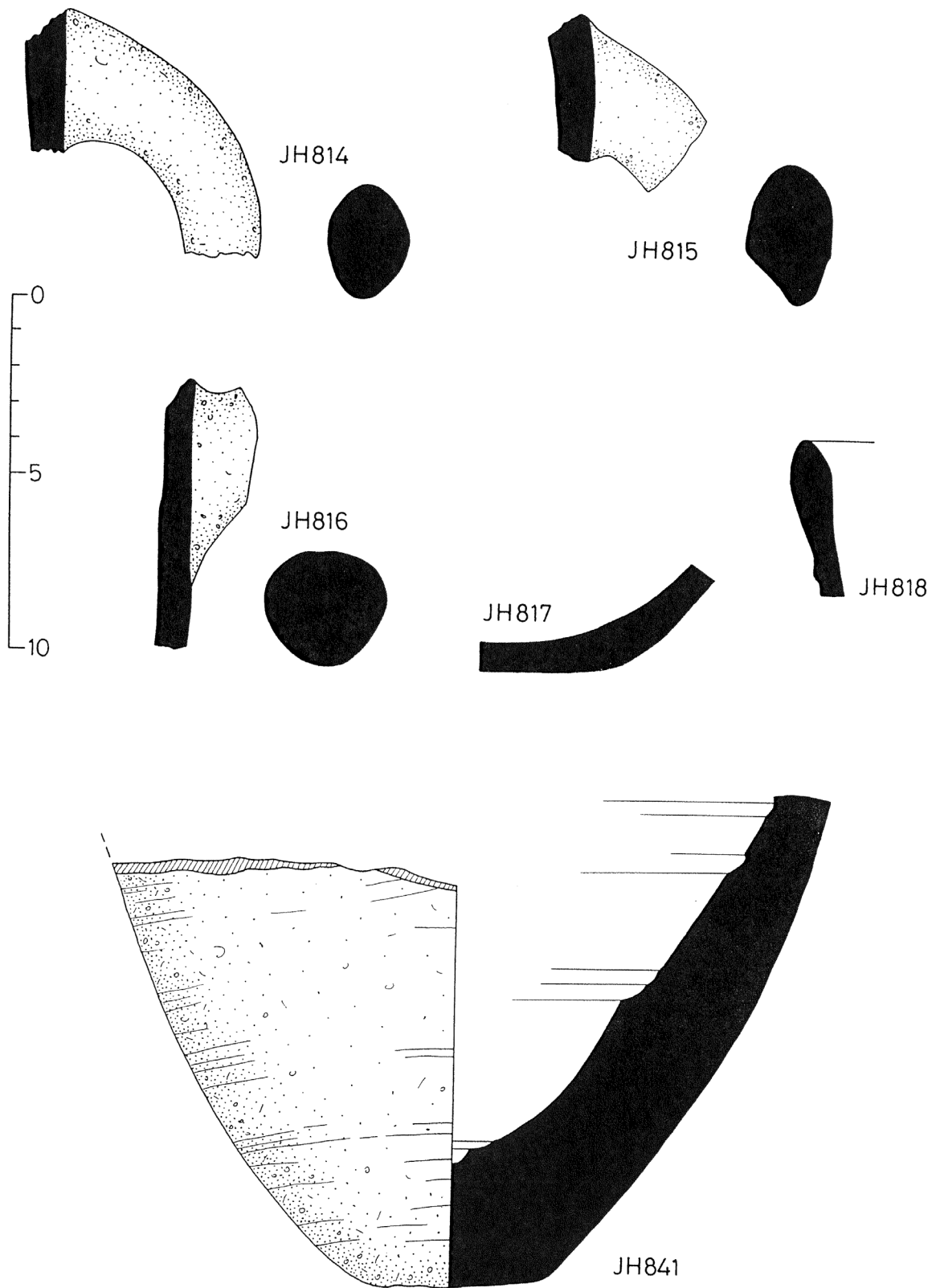
JH818
Tell el-Dab`a
K3341
Canaanite Jar rim
IV-2b
AII k/16, pl. 2-3 (residence)
D3; MB IIB-C
NAA Provenience: Southern Palestine

JH817
Tell el-Dab`a
K3341
Canaanite Jar base
IV-2b
AII k/16, pl. 2-3 (residence)
D3; MB IIB-C
NAA Provenience: Southern Palestine

JH841
Tell el-Dab`a
K2222
Canaanite Jar, lower body
IV-2c
North of AN z/21, pit filling (residence)
D2-3 (typological dating); MB IIC
NAA Provenience: Southern Palestine

JH615 (not illustrated)
Tell el-Dab`a
5448
Canaanite Jar, body sherd
IV-2b-c
AII k/17 (residence)
D3; MB IIB-C
NAA Provenience: Southern Palestine

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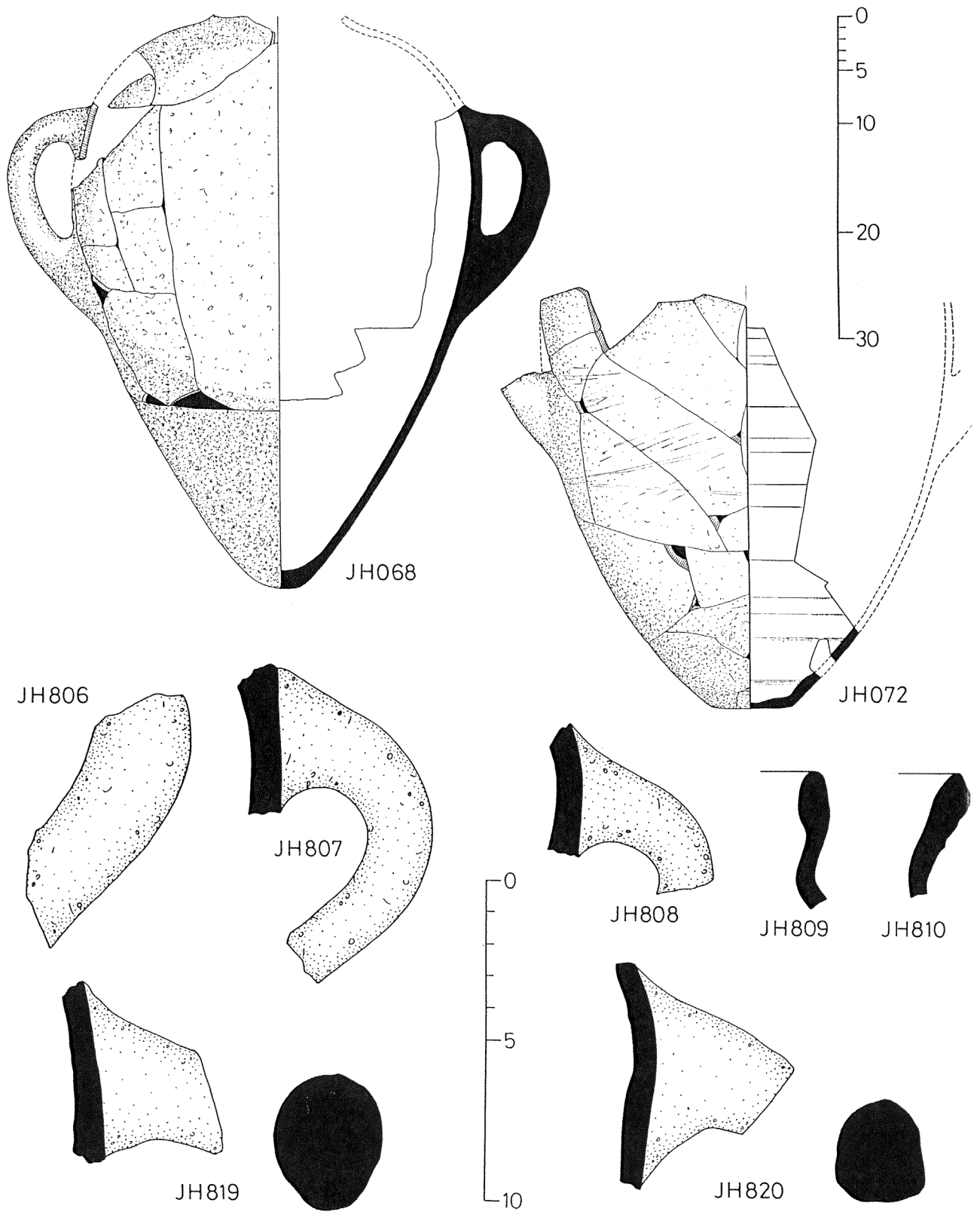


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Fig. 65: MB IIC Canaanite Jars, Handles, and Rims

JH068 Tell el-Dab`a (<i>Tell el-Dab`a V</i> : fig. 290) 2497L Canaanite Jar, complete up to upper body IV-2c AII n/11, gr. 1 (infant burial) D2; MB IIC NAA Provenience: Southern Palestine	JH808 Tell el-Dab`a K3376 Canaanite Jar handle IV-1c AII k/17 (residence) D2; MB IIC NAA Provenience: Egyptian Nile alluvium	AII i/11, pl. 4-5 (residence) D2; MB IIC NAA Provenience: Egyptian Nile alluvium
JH072 Tell el-Dab`a 2497G Canaanite Jar, complete up to midbody IV-2c AII m/12, gr. 4 (infant burial) D3; MB IIC NAA Provenience: ?; most similar to Tell el-Dab`a JH818, import from Southern Palestine (mean Euclidean distance 0.09)	JH819 Tell el-Dab`a K3197 Canaanite Jar handle IV-2c AII k/9, pl. 7 (residence) D2; MB IIC NAA Provenience: Southern Palestine	JH617 (not illustrated) Tell el-Dab`a K3960 Canaanite Jar, handle and base IV-2c AII k/17, pl. 1, gr. 1 (infant burial) D2; MB IIC NAA Provenience: Southern Palestine
JH806 Tell el-Dab`a K3376 Canaanite Jar handle IV-1c AII k/17 (residence) D2; MB IIC NAA Provenience: ?; most similar to Tel Ifshar JH562, possibly import from Southern Palestine (mean Euclidean distance 0.092)	JH820 Tell el-Dab`a K3197 Canaanite Jar handle IV-2d AII k/9, pl. 7 (residence) D2; MB IIC NAA Provenience: Southern Palestine	JH912 (not illustrated) Tell el-Dab`a 5250B Canaanite Jar base IV-2c AII i/11, pl. 6 (residence) D2; MB IIC NAA Provenience: ?; no matches at mean Euclidean distance 0.1
JH807 Tell el-Dab`a K3376 Canaanite Jar handle IV-1b AII k/17 (residence) D2; MB IIC NAA Provenience: Egyptian Nile alluvium	JH809 Tell el-Dab`a K3635 Canaanite Jar rim IV-2c AII i/11, pl. 4-5 (residence) B; MB IIC NAA Provenience: Southern Palestine	JH694 (not illustrated) Tell el-Dab`a 5245B Canaanite Jar body sherds IV-2c AII k/16, pl. 1 (residence) D2; MB IIC NAA Provenience: Southern Palestine
	JH810 Tell el-Dab`a K3635 Canaanite Jar rim I-b2	JH695 (not illustrated) Tell el-Dab`a 5245A Canaanite Jar body sherds IV-2c AII k/16 (residence) D2; MB IIC NAA Provenience: Southern Palestine

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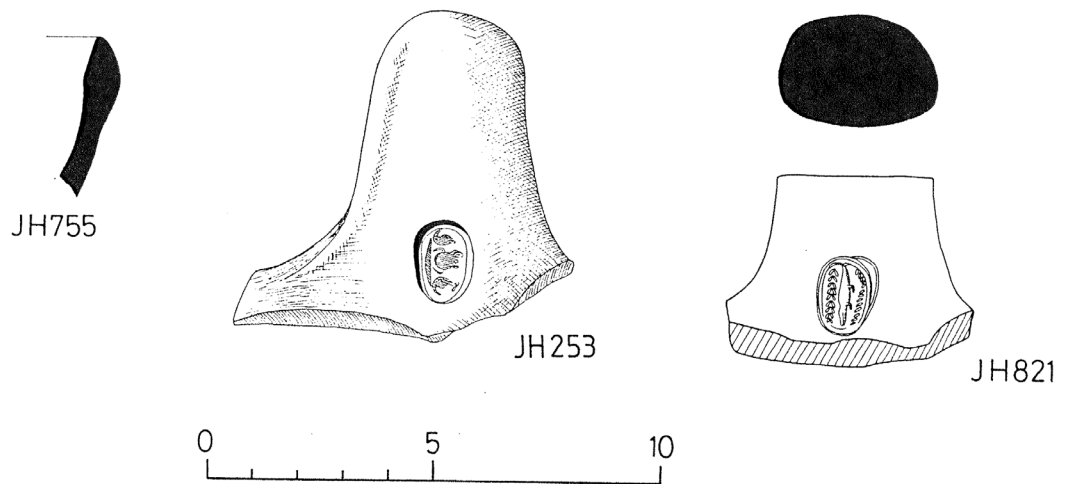
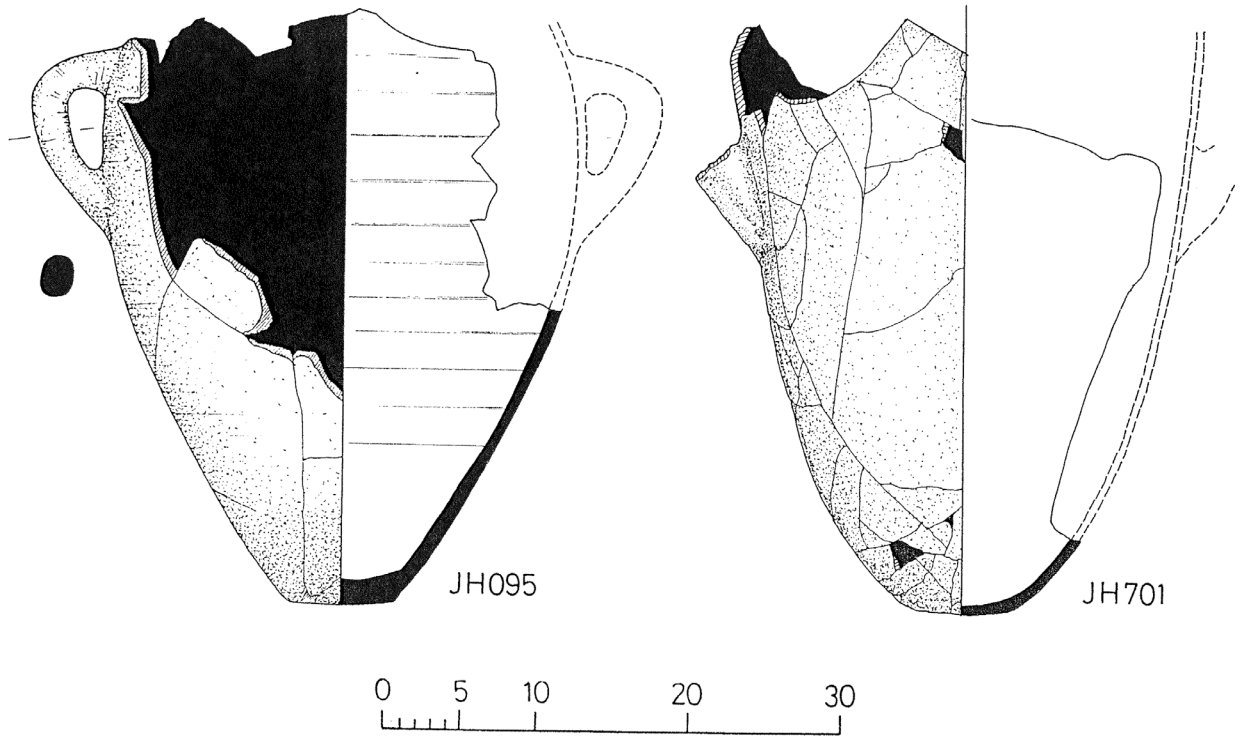


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Fig. 66: Canaanite Jars, Rims and Handles of Later or Questionable Date

<p>JH095 Tell el-Dab`a 4553A Canaanite Jar, complete up to midbody IV-2c FI l/21, gr. 18 (burial) b3?; MB IIA-B? NAA Provenience: ?; most similar to Tell el-Dab`a JH915, of uncertain provenience (mean Euclidean distance 0.067) and Tell el-Dab`a JH824, import from Southern Palestine (mean Euclidean distance 0.083)</p>	<p>JH132 (not illustrated) Tell el-Dab`a 4636A Canaanite Jar, handle and lower body IV-2c No context Undated NAA Provenience: most similar to Qatna JH482, import from Southern Palestine (mean Euclidean distance 0.070)</p>
<p>JH701 Tell el-Dab`a 5301E Canaanite Jar, complete up to midbody IV-2c FI k/24, pit 39 (infant burial?) b3 or later; MB IIB or later NAA Provenience: Southern Palestine</p>	<p>JH133 (not illustrated) Tell el-Dab`a 4636B Canaanite Jar, handle and lower body IV-2c No context Undated NAA Provenience: Southern Palestine</p>
<p>JH755 Tell el-Dab`a K970 Canaanite Jar rim IV AII p/17 (residence) H?; MB IIA? NAA Provenience: Southern Palestine</p>	<p>JH134 (not illustrated) Tell el-Dab`a 4636C Canaanite Jar, lower body IV-2d No context Undated NAA Provenience: most similar to Southern Palestine (ADCORR 3.8%; mean Euclidean distance 0.049)</p>
<p>JH253 (Pl. 4d) Tell el-Dab`a 807/WA1734 Canaanite Jar handle, with scarab impression IV-2c AII l or m/14, surface (residence?) Undated NAA Provenience: Southern Palestine</p>	<p>JH135 (not illustrated) Tell el-Dab`a 4636D Canaanite Jar, lower body IV-2c No context Undated NAA Provenience: Southern Palestine</p>
<p>JH821 Tell el-Dab`a 5923=K3189 Canaanite Jar handle, with scarab impression IV-2b AII i/11, pl. 2-4 (residence) B; LB II-Iron I NAA Provenience: ?; most similar to Southern Palestine (ADCORR 1.4%; mean Euclidean distance 0.088)</p>	<p>JH696 (not illustrated) Tell el-Dab`a 5822Q Canaanite Jar fragments IV-2c FI l/22 (residence) b1?; MB IIB? NAA Provenience: ?; no matches at mean Euclidean distance 0.1</p>

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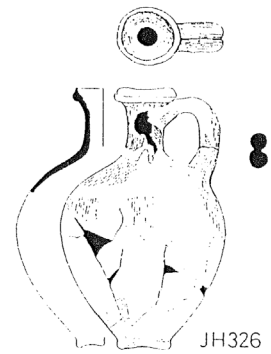
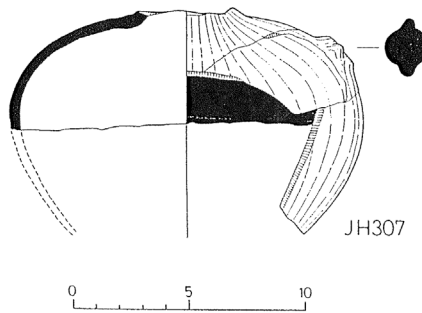
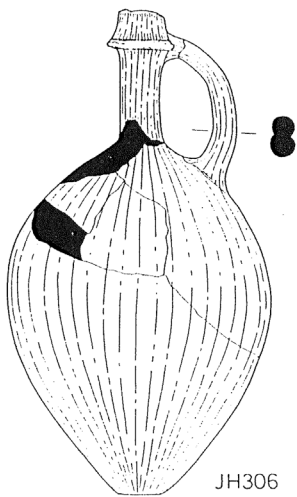
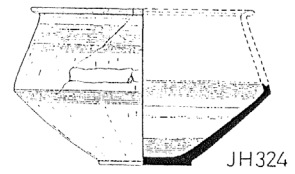
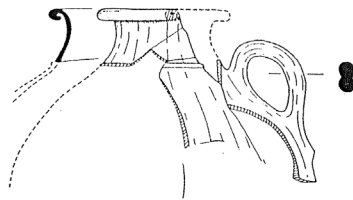
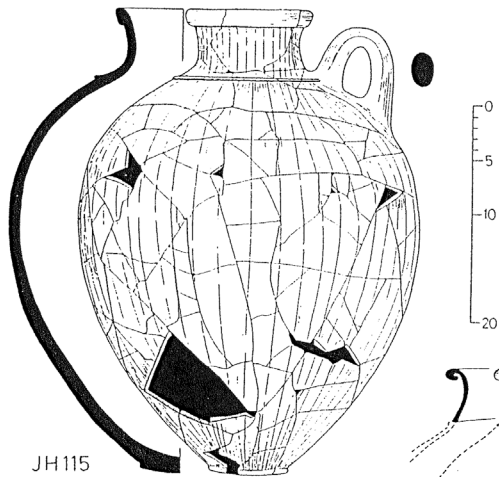
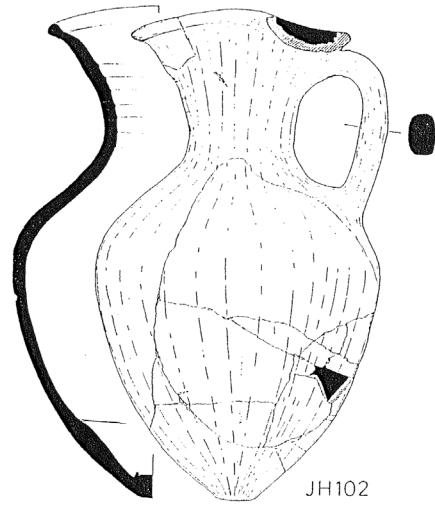
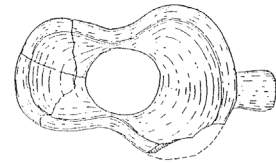
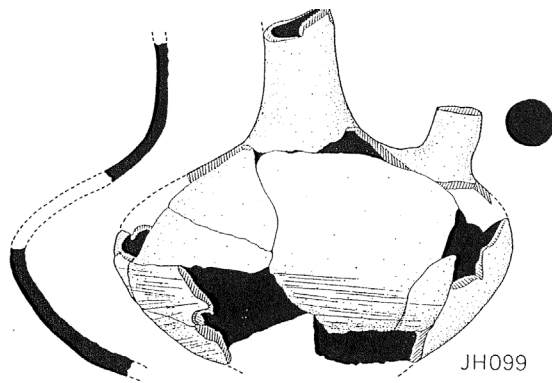


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Fig. 67: MB IIA Polished Jugs, Juglets, and Bowl

<p>JH099 Tell el-Dab`a 4623 Red Polished Jug, body IV-b FI k/23, pit 41 (residence) c; MB IIA NAA Provenience: most similar to Southern Palestine (ADCORR 0.7%; mean Euclidean distance 0.071)</p>	<p>JH306 Tell el-Dab`a 1737/WA3177 Red Polished Juglet IV-2b AII n/13, pl. 6 (residence) G; MB IIA NAA Provenience: Southern Palestine</p>
<p>JH102 (Pl. 8a) Tell el-Dab`a 4628 Red Polished Juglet I-e3 FI l/21, gr. 34 (burial) c; MB IIA NAA Provenience: Egyptian Nile alluvium</p>	<p>JH307 Tell el-Dab`a 1738/WA3178 Brown Polished Juglet, missing rim and base I-d? AII n/13, pl. 6 (residence) G; MB IIA NAA Provenience: Southern Palestine</p>
<p>JH115 (Pl. 10c) Tell el-Dab`a 4503 Red/Brown Polished Amphora Jug IV-2b FI k/20, gr. 28A (burial) c; MB IIA NAA Provenience: Southern Palestine</p>	<p>JH324 Tell el-Dab`a 2538 Red Polished Carinated Bowl IV? AII m/15, gr. 9 (burial) G; MB IIA NAA Provenience: Egyptian Nile alluvium</p>
<p>JH116 Tell el-Dab`a 4599 Red Polished Amphora Jug, upper and midbody IV-1c FI k/20, beneath gr. 28A (palace) d1; MB IIA NAA Provenience: ?; most similar to Abydos JHOX23, of uncertain provenience (mean Euclidean distance 0.094)</p>	<p>JH326 Tell el-Dab`a 2555 Black Polished Juglet IV-b AII m/15, gr. 11 (burial) G; MB IIA NAA Provenience: ?; most similar to Tell el-Hesi DBPC20, of local origin (mean Euclidean distance 0.084)</p>

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Fig. 68: MB IIA Polished Juglets

JH330

Tell el-Dab`a

2859

Red Polished Juglet, missing rim, neck, and base

I-d

AII n-o/15 (burial)

G; MB IIA

NAA Provenience: Egyptian Nile alluvium

JH335

Tell el-Dab`a

2436

Brown Polished Juglet

Macroscopic fabric assignment not available

AII 1/15, gr. 5 (burial)

End of G; MB IIA

NAA Provenience: most similar to Tell el-Dab`a JH329, import from Southern Palestine (mean Euclidean distance 0.070)

JH372

Tell el-Dab`a

2528

Red Polished Jug, missing rim

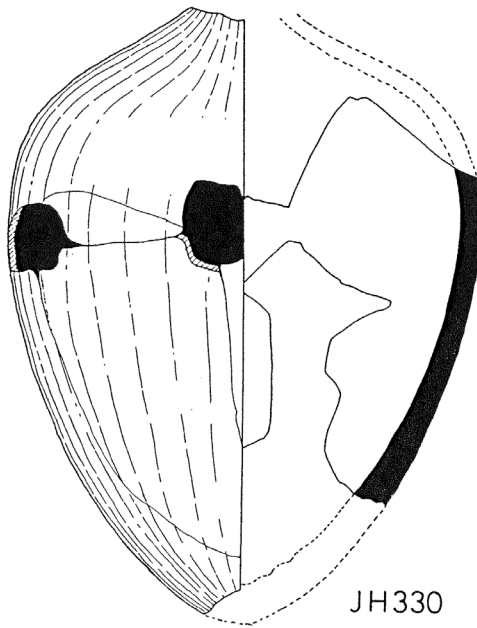
IV-2b

AII n/15, pl. 4, magazine (residence)

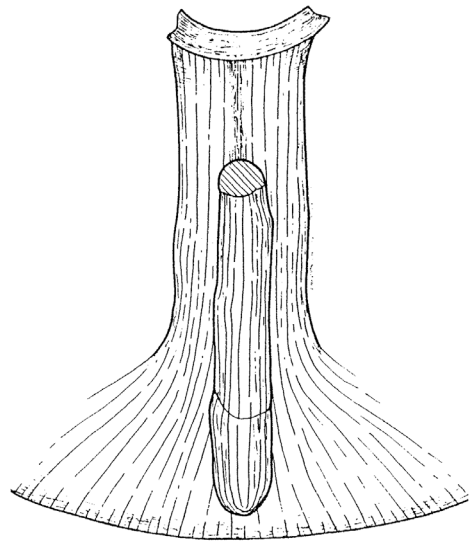
G; MB IIA

NAA Provenience: Southern Palestine

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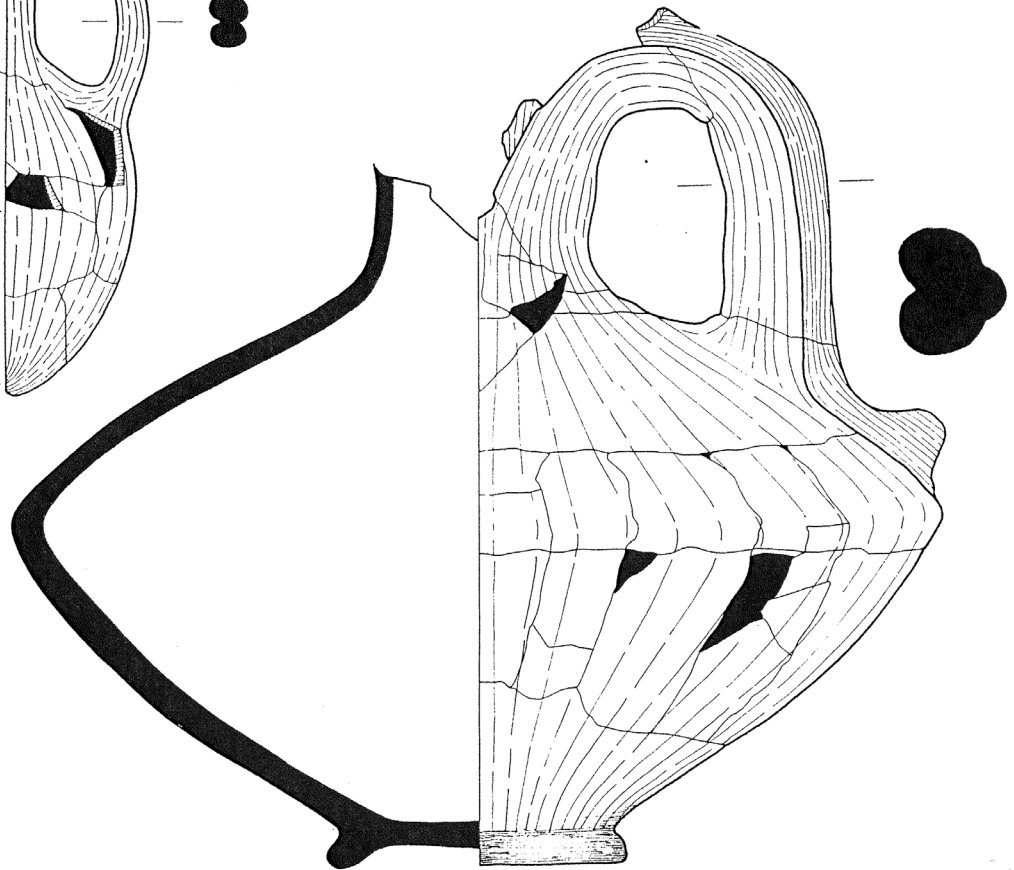
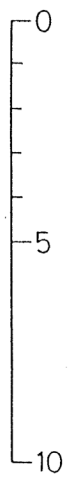
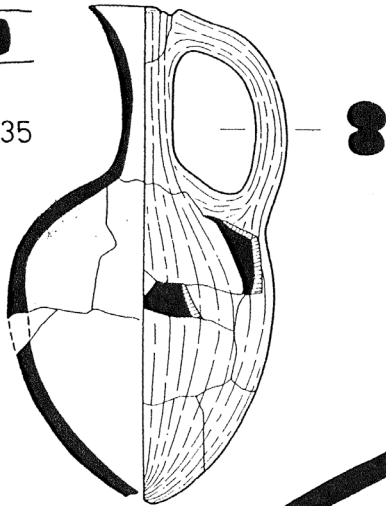
JH330



JH372



JH335



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Fig. 69: MB IIA Polished Juglets and Bowls

JH689
Tell el-Dab`a
4178
Juglet, probably yellow polished
IV-3b
FI i/22, gr. 39 (deposit in burial chamber entrance)
c; MB IIA
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

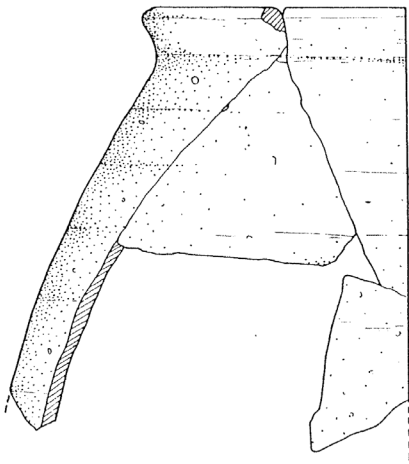
JH726
Tell el-Dab`a
4951A
Brown Polished Low Neck Bowl, polish worn off
IV-2b
FI m/20, gr. 1 (burial)
d1; MB IIA
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

JH728
Tell el-Dab`a
4894
Brown Polished Deep Globular Bowl
I-e3
FI l/22, gr. 40 (burial)
End of c; MB IIA
NAA Provenience: Egyptian Nile alluvium

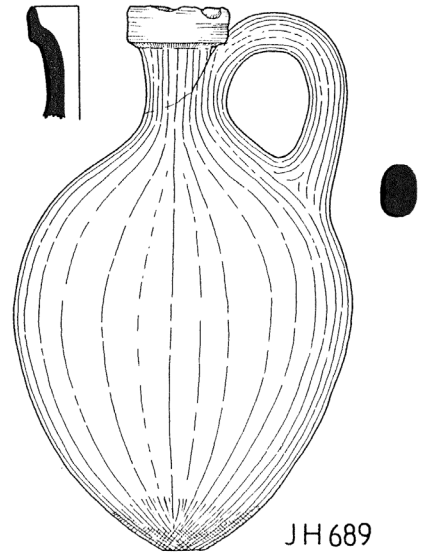
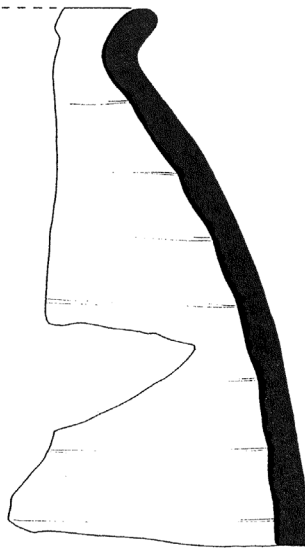
JH833
Tell el-Dab`a
4851
Black Polished Juglet
IV-6a?
FI l/21, gr. 35 (burial)
End of c; MB IIA
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

JH827 (not illustrated)
Tell el-Dab`a
5212A
Red Polished Juglet body sherds
IV-1c
FI k/22, gr. 27 (burial)
End of c; MB IIA
NAA Provenience: Egyptian Nile alluvium

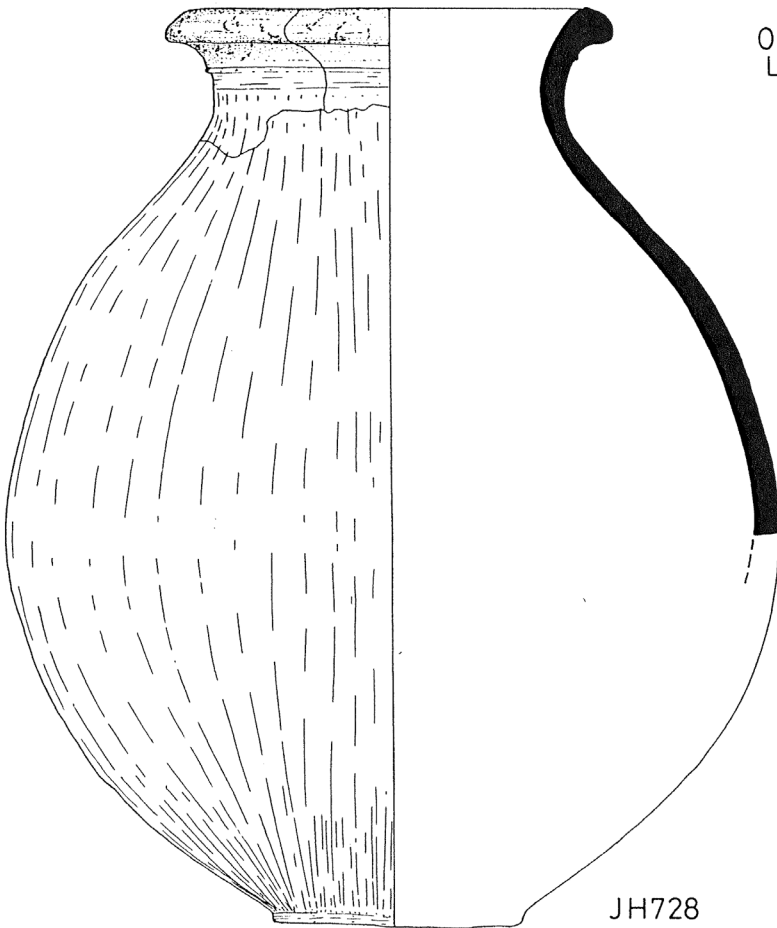
The Foreign Relations of the "Hyksos"



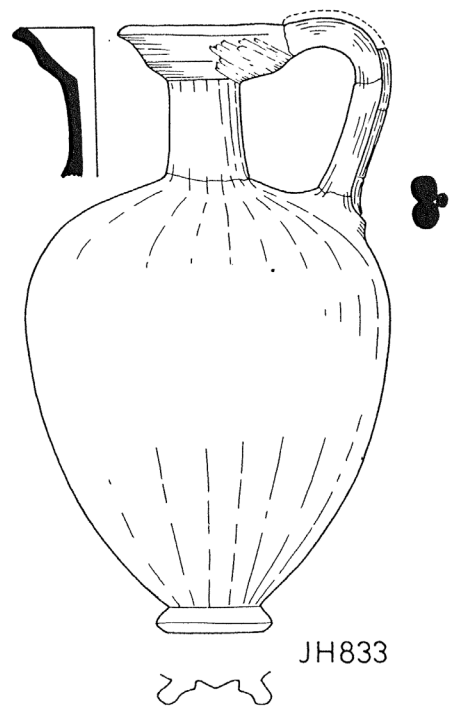
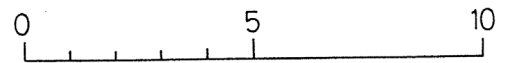
JH 726



JH 689



JH 728



JH 833

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Fig. 70: MB IIA Polished Jugs, Juglet, Bowl, and Jar

JH834
Tell el-Dab`a
4826
Jug, missing base, polished (not shown on drawing)
IV-3a
FI l/20, pl. 3-4 (residence)
d2; MB IIA
NAA Provenience: most similar to Tell Ibn Hani JH966, of local origin (mean Euclidean distance 0.072)

JH836
Tell el-Dab`a
4465G
Red Polished Jug, body sherd with handle stub
IV-2b
FI k/20, pl. 2-3 (residence)
c2; MB IIA
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.9%) and Abydos JHOX24, probable import from Southern Palestine (mean Euclidean distance 0.094)

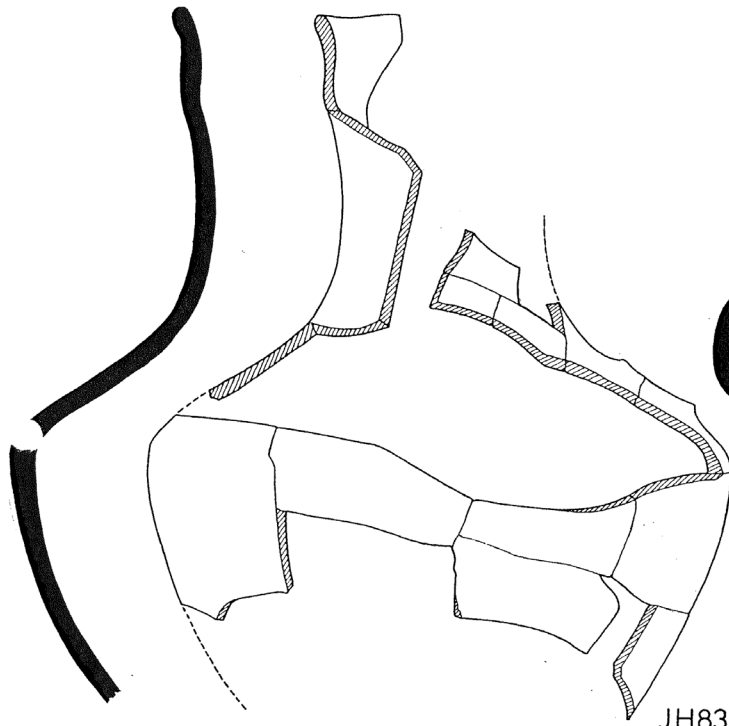
JH840
Tell el-Dab`a
5250
Jar, some polish
VII?
FI k/20, beneath gr. 28a (palace)
d1; MB IIA
NAA Provenience: ?; most similar to Sparta MASP04, of uncertain origin (mean Euclidean distance 0.081)

JH858 (Pl. 8b)
Tell el-Dab`a
4958
Red Polished Dipper Juglet
IV-1c
FI m/20, gr. 23 (burial)
d2; MB IIA
NAA Provenience: Southern Palestine

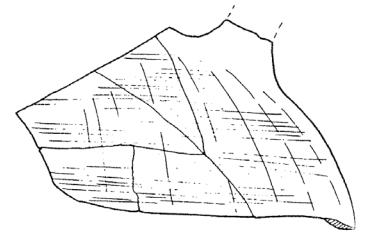
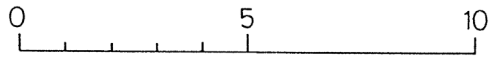
JH879
Tell el-Dab`a
4825
Red Polished Globular Bowl
I-d
FI l/20, pl. 2-3, pit 40 (residence)
d1; MB IIA
NAA Provenience: Egyptian Nile alluvium

JH880
Tell el-Dab`a
4859B
Amphora Jug, upper body, some polish
IV-5-c
FI l/21, pl. 1 (residence)
c; MB IIA
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

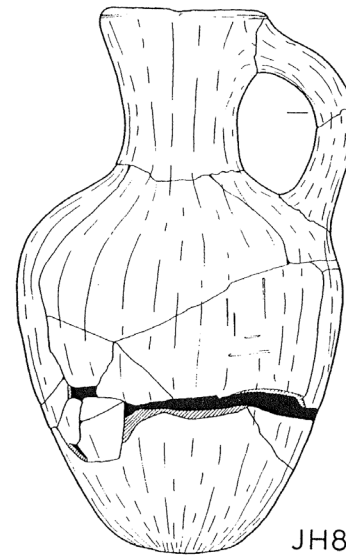
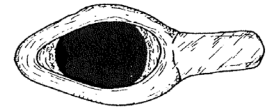
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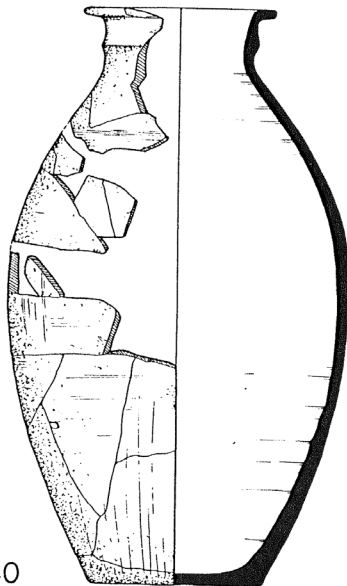
JH834



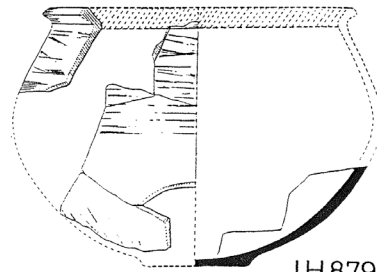
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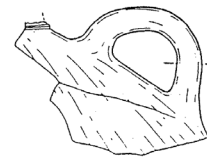
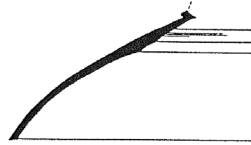
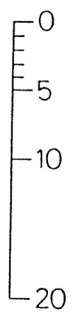
JH858



JH840



JH879



JH880

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Fig. 71: MB IIA and IIA-B Polished Juglets

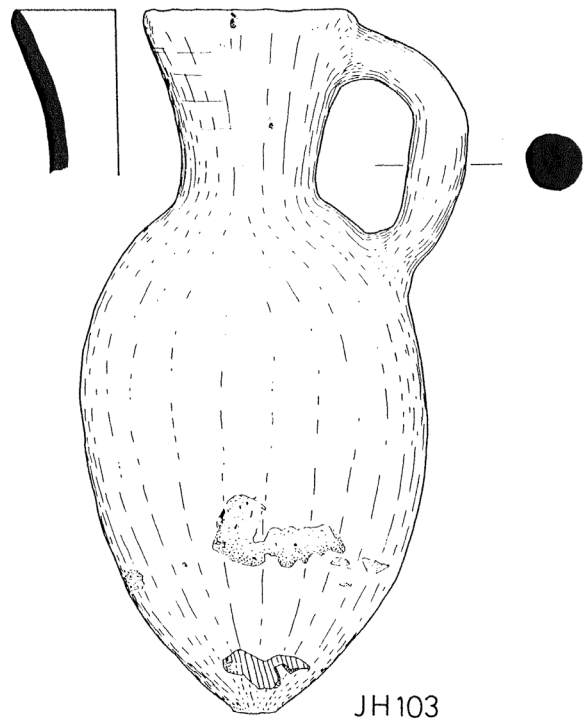
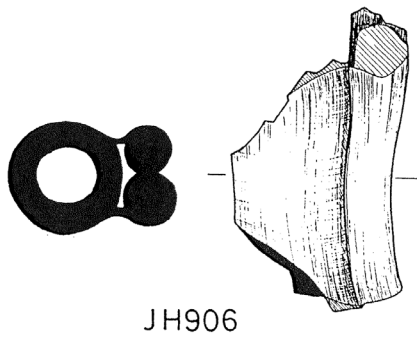
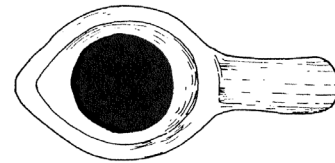
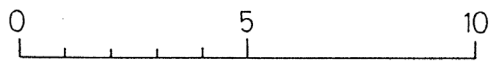
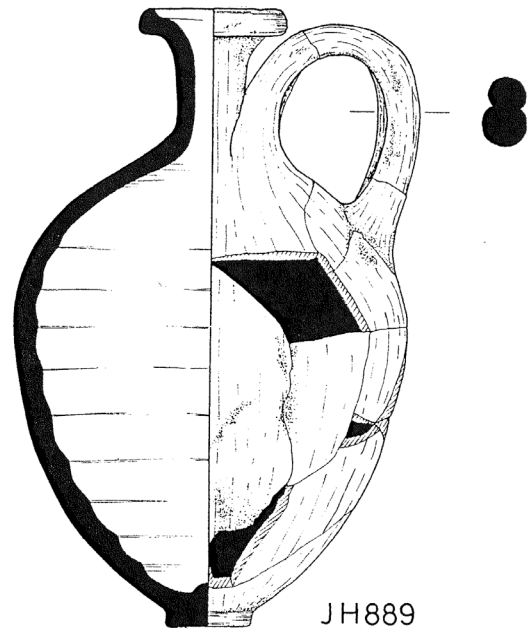
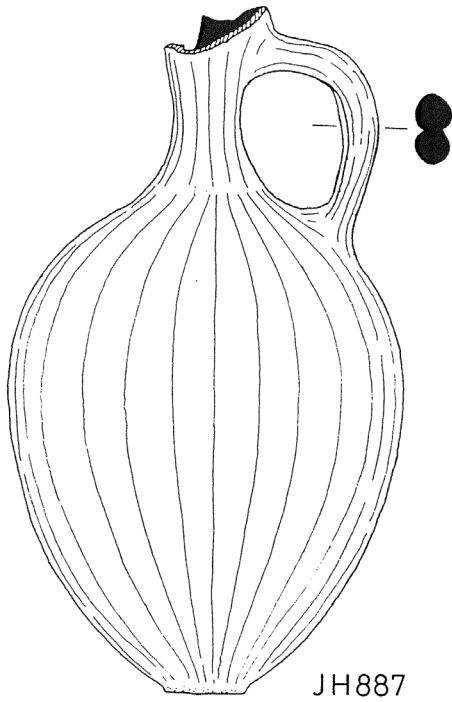
JH887
Tell el-Dab`a
4930
Red Polished Juglet, missing rim
IV-2b
FI k/24, pit 8, probably gr. 49 (burial?)
c1; MB IIA
NAA Provenience: Southern Palestine

JH889
Tell el-Dab`a
4901
Red Polished Juglet
IV-2b
FI k/24, pit 8, probably gr. 49 (burial?)
c; MB IIA
NAA Provenience: Southern Palestine

JH906 (Pl. 9a)
Tell el-Dab`a
4060E
Red Polished Juglet handle and neck fragment
IV-2a
FI i/23, pl. 3-4 (residence?)
c; MB IIA
NAA Provenience: Southern Palestine

JH103 (Pl. 8c)
Tell el-Dab`a
4626
Red Polished Dipper Juglet
IV-2b
FI l/20, gr. 10 (burial)
b3; MB IIA-B
NAA Provenience: most similar to Megiddo JHMG14, of local origin (mean Euclidean distance 0.078)

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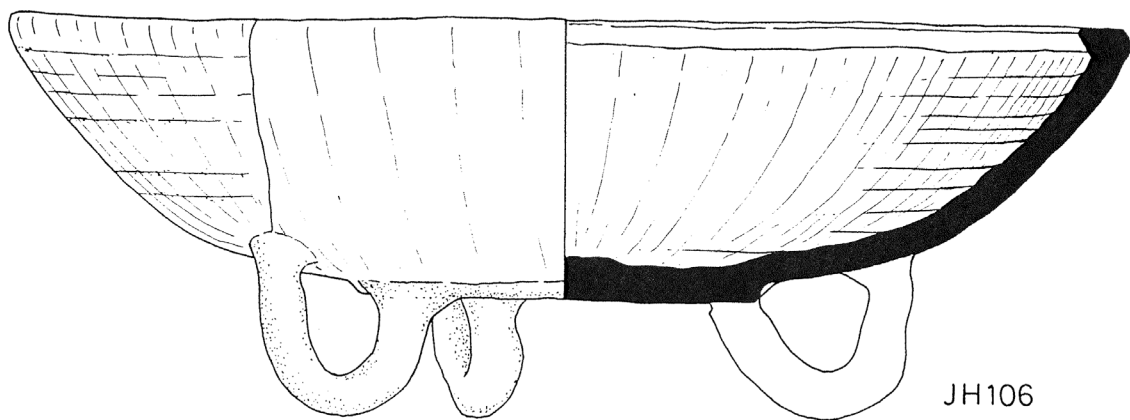
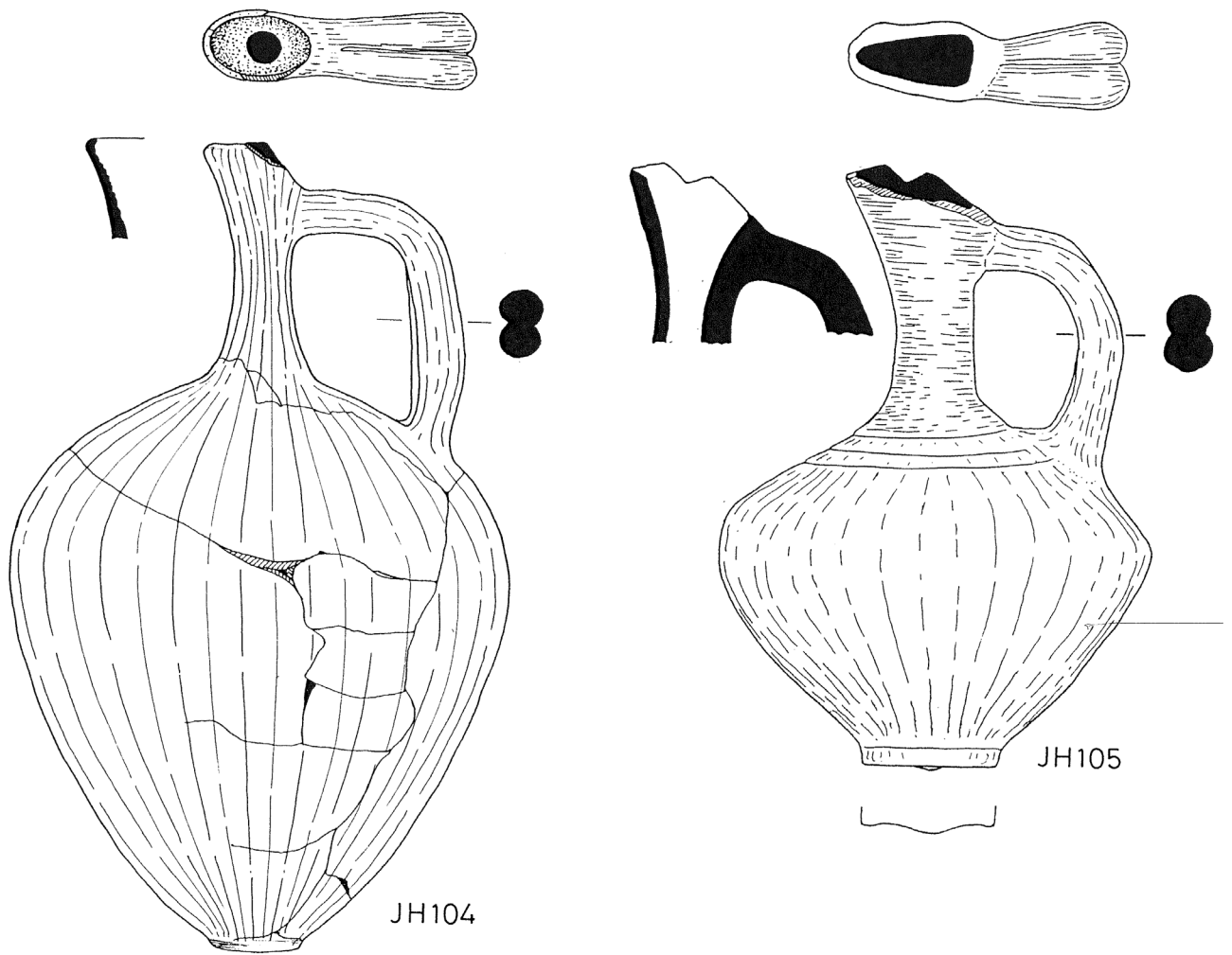
Fig. 72: MB IIA-B Polished Juglets and Bowl

JH104
Tell el-Dab`a
4625
Black Polished Juglet, with cut-away spout
IV-a
FI k/23, gr. 33 (burial)
b2-3; MB IIA-B
NAA Provenience: Southern Palestine

JH105
Tell el-Dab`a
4627
Brown Polished Juglet, missing rim
IV-2b
FI k/24, gr. 48 (burial)
b3; MB IIA-B
NAA Provenience: Southern Palestine

#JH106 (Pl. 9c)
Tell el-Dab`a
4629
Red Polished Platter Bowl, with triple loop-handled base
I-e3
FI k/23, gr. 36A (burial)
b2-3; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

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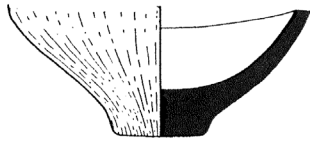


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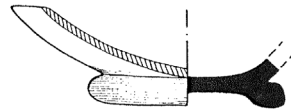
Fig. 73: MB IIA-B Polished Juglets

<p>JH278 Tell el-Dab`a (<i>Tell el-Dab`a V</i>: fig. 19.11) 587/WA2410 Red Polished Juglet, lower body Probably IV AII l/11, pl. 4, gr. 2 (burial) F; MB IIA-B NAA Provenience: ?; most similar to Tell el-Dab`a JH026, import from Southern Palestine (mean Euclidean distance 0.092)</p>	<p>JH308 Tell el-Dab`a (<i>Tell el-Dab`a V</i>: fig. 34.11) 1774/WA3196 Red Polished Juglet, upper body I-d AII m/10, gr. 8 (burial) F; MB IIA-B NAA Provenience: Egyptian Nile alluvium</p>
<p>JH279 Tell el-Dab`a (<i>Tell el-Dab`a V</i>: fig. 19.6) 589/WA2412 Black Polished Juglet, base IV-2c AII l/11, pl. 4, gr. 2 (burial) F; MB IIA-B NAA Provenience: most similar to Southern Palestine (ADCORR 2.3%; mean Euclidean distance 0.070)</p>	<p>JH309 Tell el-Dab`a (<i>Tell el-Dab`a V</i>: fig. 35.25) 1775/WA3197 Red Polished Juglet, missing rim and base I-d AII m/10, gr. 8 (burial) F; MB IIA-B NAA Provenience: Egyptian Nile alluvium</p>
<p>JH280 Tell el-Dab`a (<i>Tell el-Dab`a V</i>: fig. 19.10) 593/WA2420 Red Polished Juglet, upper body I-d? AII l/11, pl. 4, gr. 2 (burial) F; MB IIA-B NAA Provenience: ?; no matches at mean Euclidean distance 0.1</p>	<p>JH310 Tell el-Dab`a (<i>Tell el-Dab`a V</i>: fig. 35.23) 1776/WA3198 Red Polished Juglet, missing rim I-d or IV-1c? AII m/10, gr. 8 (burial) F; MB IIA-B NAA Provenience: Egyptian Nile alluvium</p>
<p>JH283 Tell el-Dab`a 773/WA2575 Red/Brown/Black Polished Juglet IV-2b AII m/10, pl. 4-5 (residence) F-G; MB IIA-B NAA Provenience: Fayyum-Maadi marl clay</p>	<p>JH315 Tell el-Dab`a (<i>Tell el-Dab`a V</i>: fig. 26.7A) 1897/WA3283 Red Polished Juglet, upper and lower bodiesjh3 I-d AII l/12, gr. 5 (burial) F; MB IIA-B NAA Provenience: Egyptian Nile alluvium</p>
<p>JH288 Tell el-Dab`a (<i>Tell el-Dab`a V</i>: fig. 21.2) 1217/WA2812 Red Polished Juglet, missing rim IV-2a AII l/11, gr. 3 (burial) F; MB IIA-B NAA Provenience: ?; most similar to JH286, from Tell Ibn Hani and of local origin (mean Euclidean distance 0.092)</p>	<p>JH277 (not illustrated) Tell el-Dab`a 586/WA2409 Black Polished Jug, base IV-b AII l/11, pl. 4, gr. 2 (burial) F; MB IIA-B NAA Provenience: Southern Palestine</p>

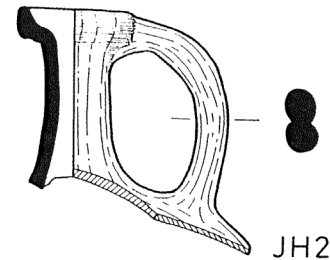
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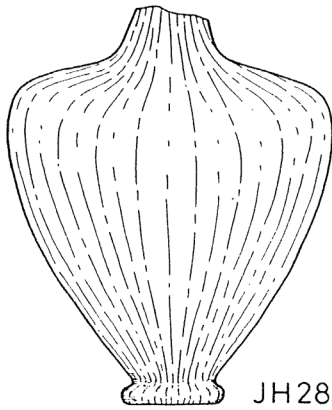
JH278



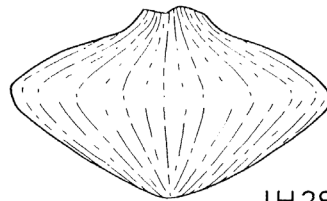
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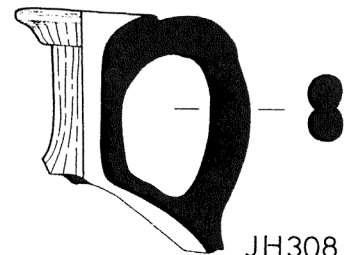
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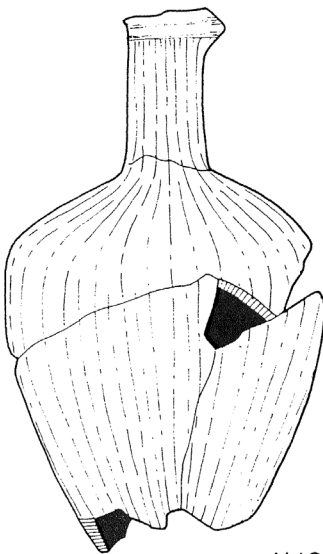
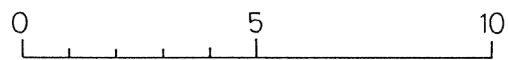
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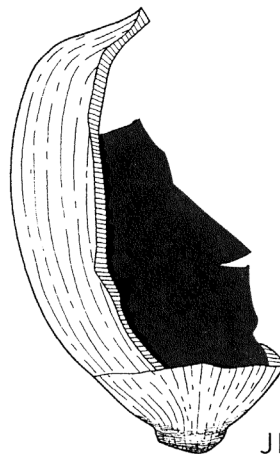
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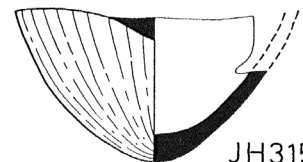
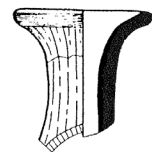
JH308



JH309



JH310



JH315

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Fig. 74: MB IIA-B Polished Juglets

JH316 (Pl. 5c)
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 13)
1916/WA3299
Red Polished Juglet, missing rim
IV-2b
AII k/12, pl. 6, gr. 1 (burial)
F-G; MB IIA-B
NAA Provenience: Southern Palestine

JH319
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 34.18)
1792/WA3211
Red Polished Juglet, missing base
I-d or IV-1c?
AII m/10, gr. 8 (burial)
F; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

JH321
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 37.7)
2264/WA3513
Red Polished Juglet
I-d
AII m/10, gr. 9 (burial)
F; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

JH323
Tell el-Dab`a
2280/WA3523
Black Polished Juglet
I-d?
AII k/14, gr. 1 (burial)
D3; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

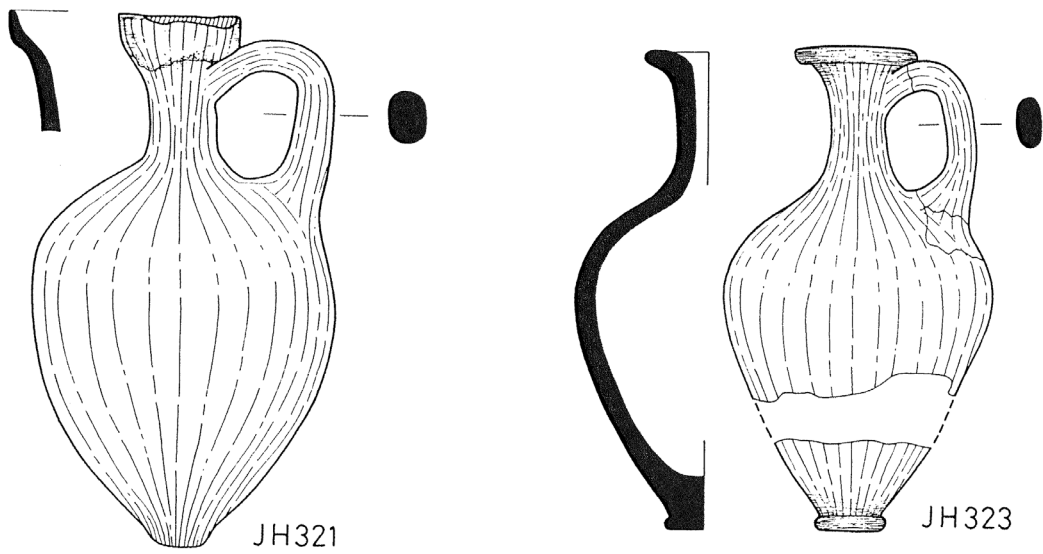
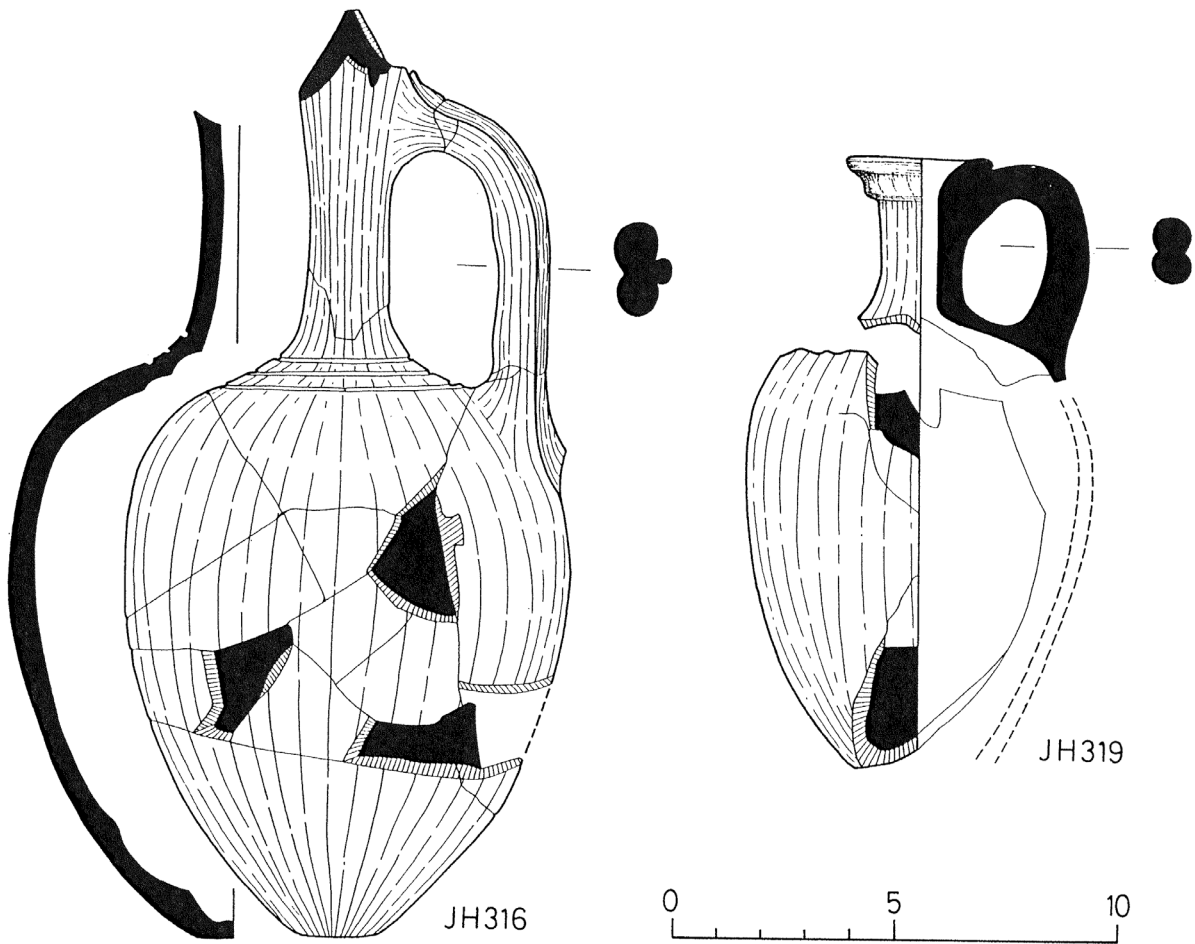


Fig. 75: MB IIA-B Polished Juglets

JH329 (Pl. 5g)

Tell el-Dab`a

2640

Brown Polished Juglet, complete to upper body

IV-b

AII m/16, gr. 3, bur. 3 (burial)

F; MB IIA-B

NAA Provenience: Southern Palestine

JH334 (Pl. 6a)

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 60.burial 2, 1)

2493

Brown Polished Juglet

IV-d

AII o/13, gr. 1, bur. 2 (burial)

E3-F; MB IIA-B

NAA Provenience: Egyptian Nile alluvium

JH336

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 60.burial 2, 4)

2492

Red Polished Juglet

I-d

AII o/13, gr. 1, bur. 2 (burial)

E3-F; MB IIA-B

NAA Provenience: Egyptian Nile alluvium

JH348

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 18.1)

499/WA2355

Red Polished Juglet, missing rim

IV-2b

AII l/11, gr. 1, bur. 2 (burial)

F; MB IIA-B

NAA Provenience: Southern Palestine

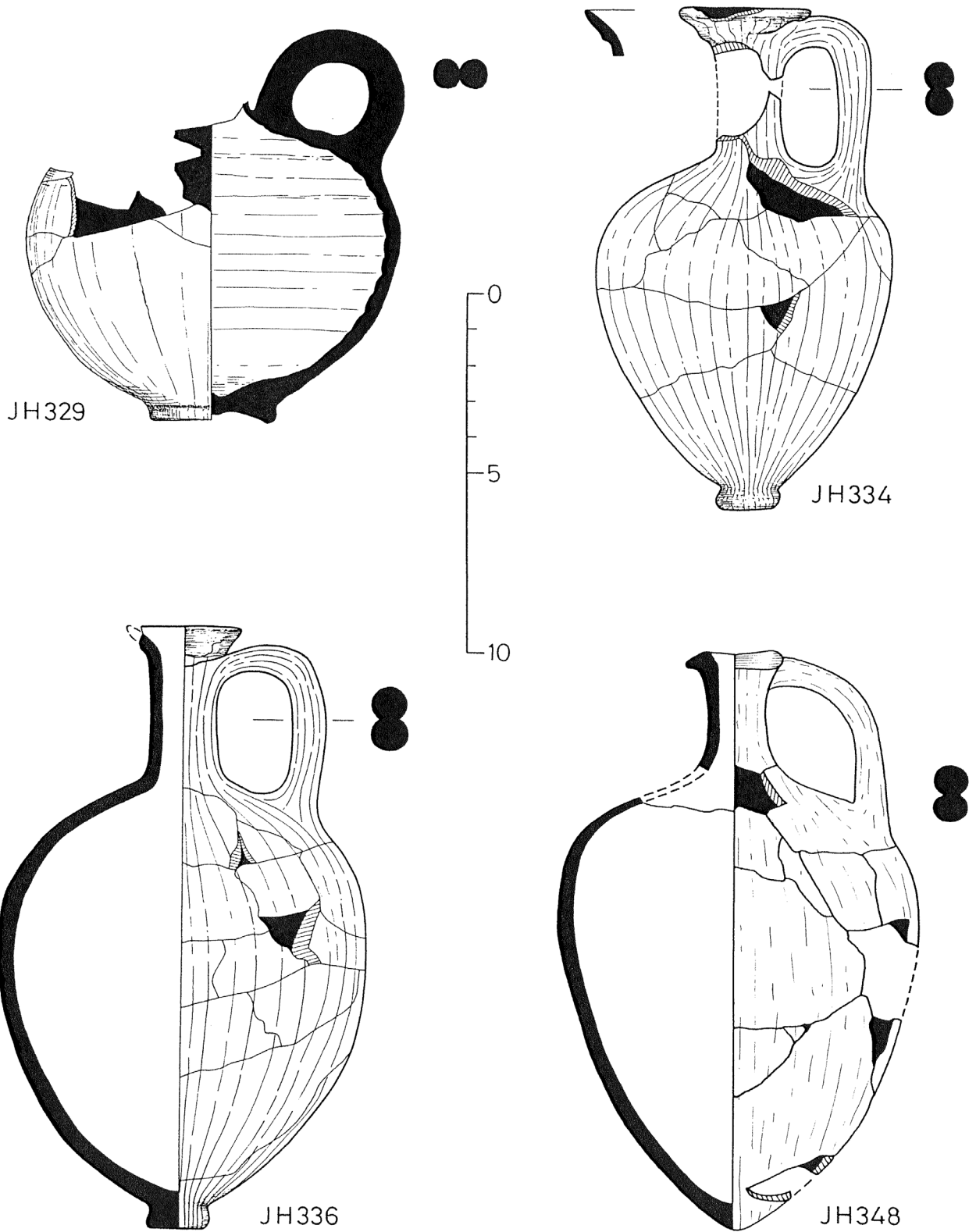


Fig. 76: MB IIA-B Polished Juglets

JH352

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 18.2)

501/WA2357

Red Polished Juglet, fragments

IV-2b

AII l/11, gr. 1 (burial)

F; MB IIA-B

NAA Provenience: Southern Palestine

JH354 (Pl. 5d)

Tell el-Dab`a

2512/WA3554

Red Polished Juglet

Macroscopic fabric assignment not available

AII m/15, pl. 6, gr. 8 (burial)

F; MB IIA-B

NAA Provenience: Southern Palestine

JH355 (Pl. 5e)

Tell el-Dab`a

2642

Brown Polished Juglet

IV-c

AII m/16, gr. 3, bur. 3 (burial)

F: MB IIA-B

NAA Provenience: ?; most similar to Southern Palestine (ADCORR 4.3%; mean Euclidean distance 0.086)

JH358 (Pl. 5f)

Tell el-Dab`a

2565

Red Polished Juglet

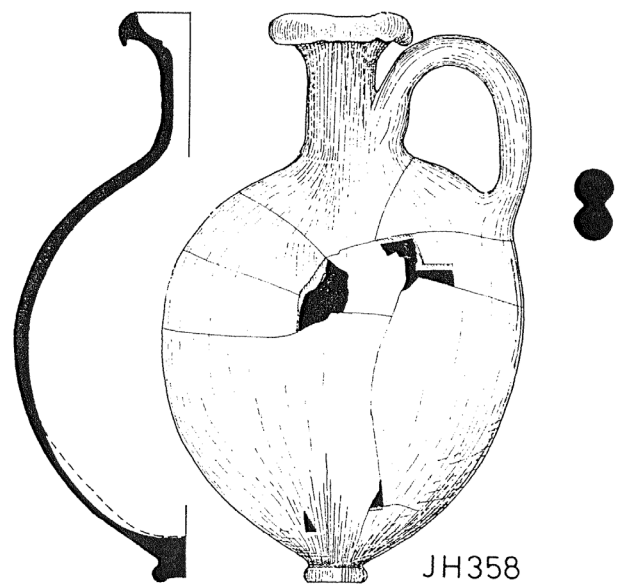
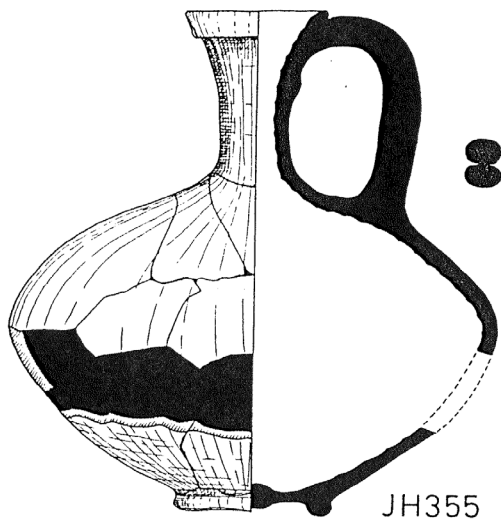
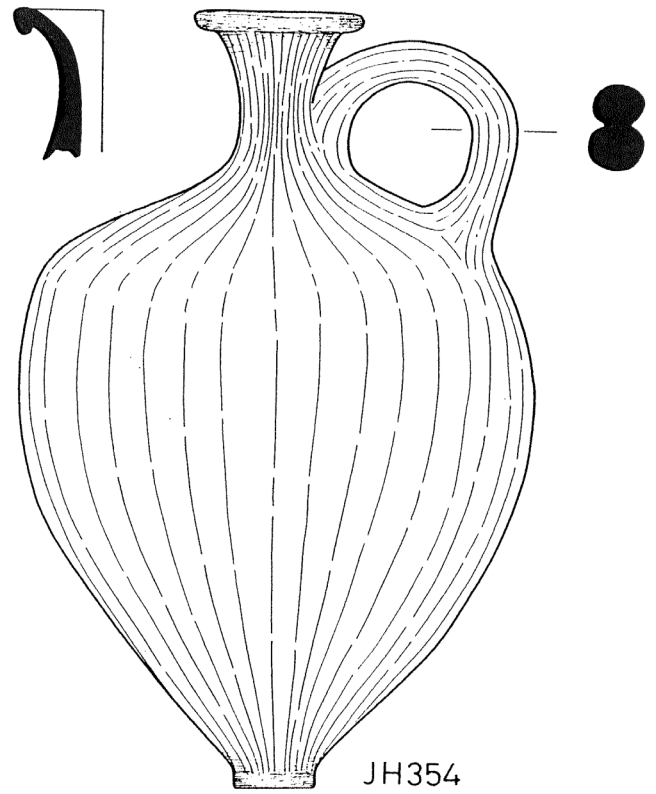
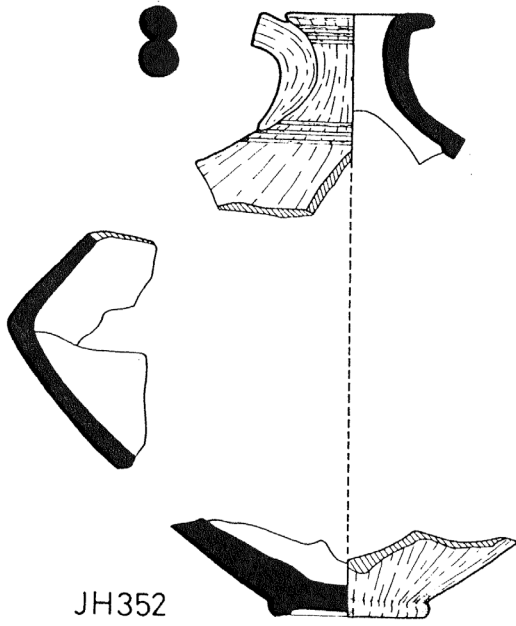
IV-b

AII m/16, gr. 3 (burial)

F; MB IIA-B

NAA Provenience: ?; most similar to Southern Palestine (ADCORR 3.5%) and Orontes Valley JH506, of uncertain provenience (mean Euclidean distance 0.086)

The Foreign Relations of the "Hyksos"



The Foreign Relations of the “Hyksos”

Fig. 77: MB IIA-B Polished Juglets

JH363 (Pl. 6d)

Tell el-Dab`a

2624

Red Polished Juglet, with cut-away spout

Macroscopic fabric assignment not available

AII m/16, gr. 3, bur. 2 (burial)

F; MB IIA-B

NAA Provenience: Southern Palestine

JH364 (not illustrated)

Tell el-Dab`a

2632

Brown Polished Juglet

Macroscopic fabric assignment not available

AII m/16, gr. 3, bur. 2 (burial)

F; MB IIA-B

NAA Provenience: Southern Palestine

JH365 (Pl. 6b)

Tell el-Dab`a

2517

Brown Polished Juglet

Macroscopic fabric assignment not available

AII m/16, gr. 8 (burial)

F; MB IIA-B

NAA Provenience: Egyptian Nile alluvium

JH366

Tell el-Dab`a

2520

Red Polished Juglet

Macroscopic fabric assignment not available

AII m/16, pl. 6-7, gr. 8 (burial)

F; MB IIA-B

NAA Provenience: ?; no matches at mean Euclidean distance 0.1

JH367 (not illustrated)

Tell el-Dab`a

1527/WA3045

Brown Polished Juglet, body sherd with handle stub

Macroscopic fabric assignment not available

AII n/14, pl. 3 (residence)

F; MB IIA-B

NAA Provenience: Southern Palestine

JH371 (Pl. 6c)

Tell el-Dab`a

2635

Black Polished Juglet, with cut-away spout

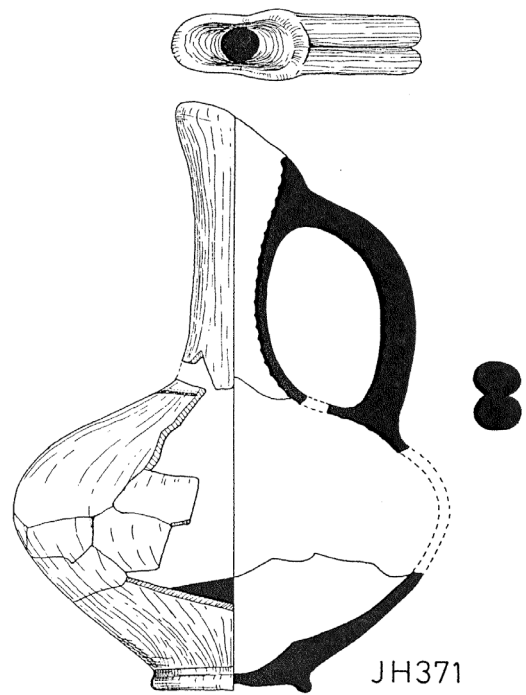
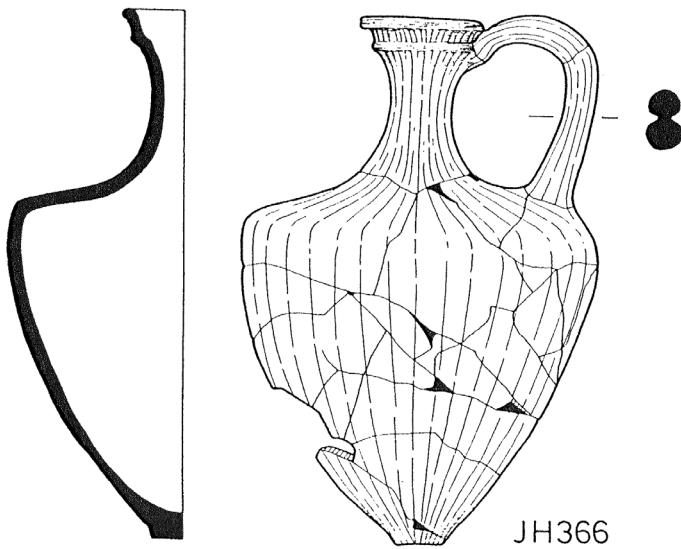
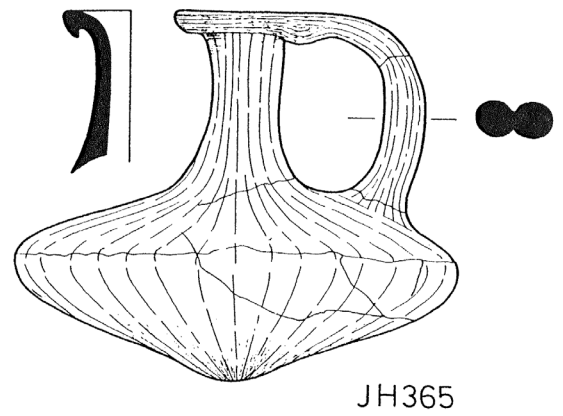
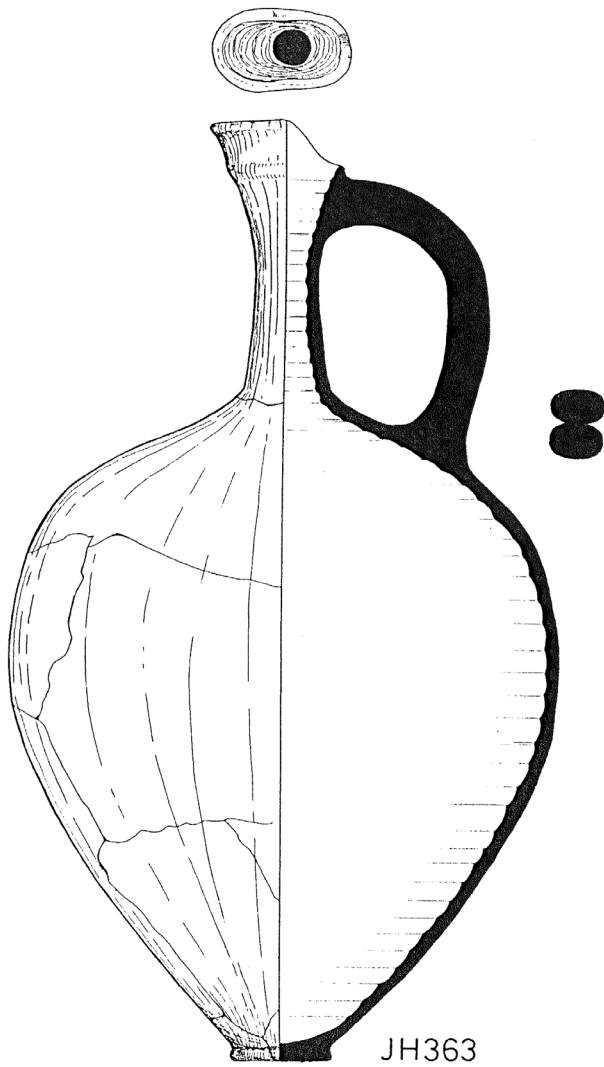
IV-b

AII m/16, gr. 3, bur. 3 (burial)

F; MB IIA-B

NAA Provenience: most similar to Southern Palestine (ADCORR 0.3%; mean Euclidean distance 0.080)

The Foreign Relations of the "Hyksos"



The Foreign Relations of the “Hyksos”

Fig. 78: MB IIA-B Polished Juglets, Jug, and Bowl

JH377
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 37.5)
2266/WA3517
Red Polished Juglet
IV-2b
AII m/10, gr. 9 (burial)
F; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

JH379
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 37.2)
2268/WA3519
Brown Polished Juglet
IV-2b
AII m/10, gr. 9 (burial)
F; MB IIA-B
NAA Provenience: Southern Palestine

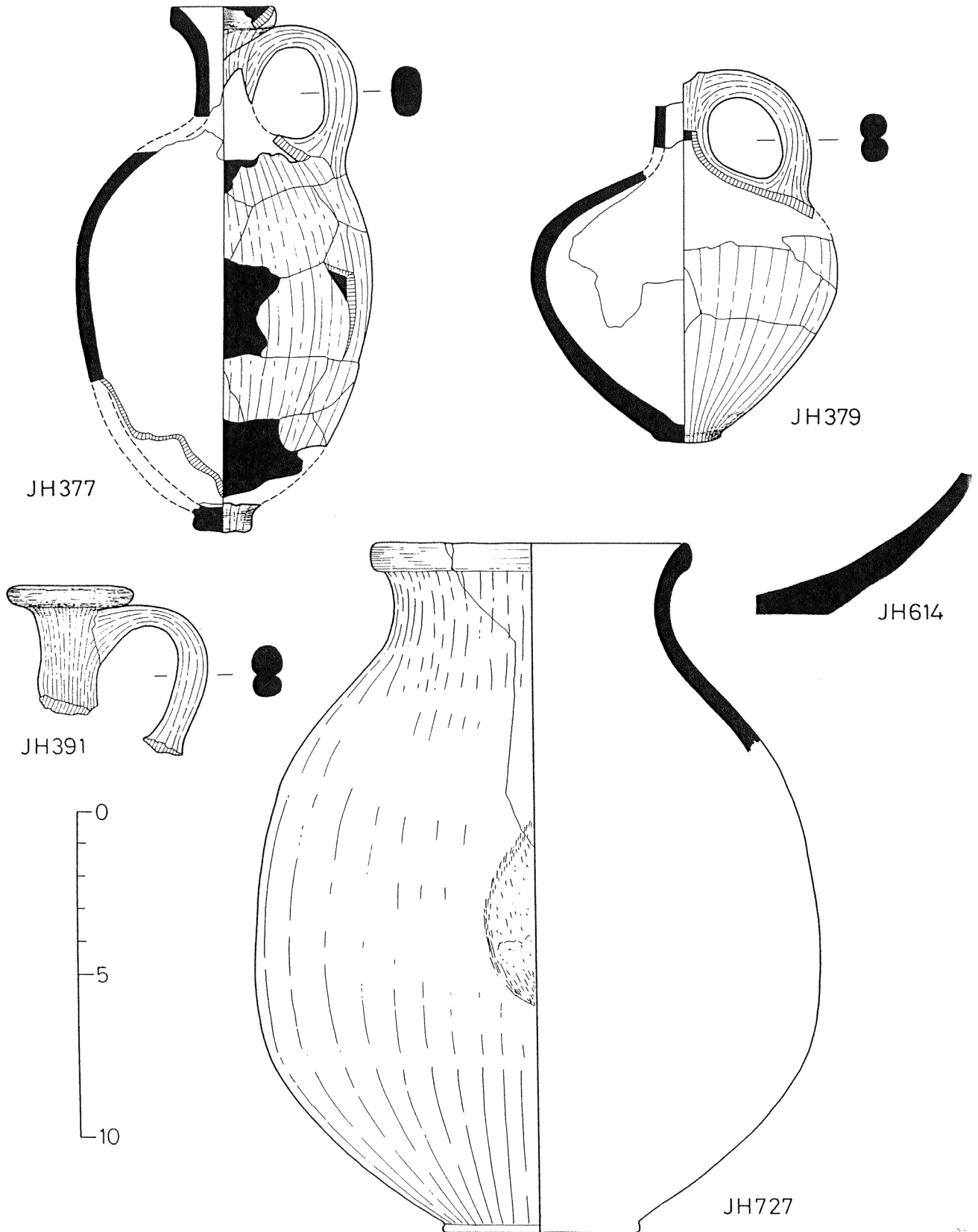
JH391
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 60.burial 1, 2)
2484
Red Polished Juglet, rim, neck, and handle
I-d
AII o/13, gr. 1, bur. 1 (burial)
E3-F; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

JH394 (not illustrated)
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 60.burial 2, 2)
2490
Red Polished Juglet
I-d
AII o/13, gr. 1, bur. 2 (burial)
E3-F; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

JH614
Tell el-Dab`a
K3665
Red Polished Jug base?
IV-b
F1 k/24 (residence)
b3; MB IIA-B
NAA Provenience: Southern Palestine

JH727
Tell el-Dab`a
4889
Brown Polished Deep Globular Bowl
I-d?
FI l/22, gr. 31 (burial)
b3; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

The Foreign Relations of the "Hyksos"



The Foreign Relations of the “Hyksos”

Fig. 79: MB IIA-B Polished Juglets and Bowl

JH823
Tell el-Dab`a
4806
Black Polished Juglet, missing base
IV-3b
FI l/20, gr. 23 (burial)
b3; MB IIA-B
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

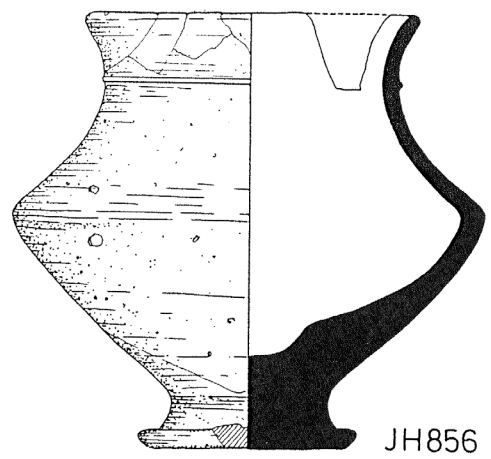
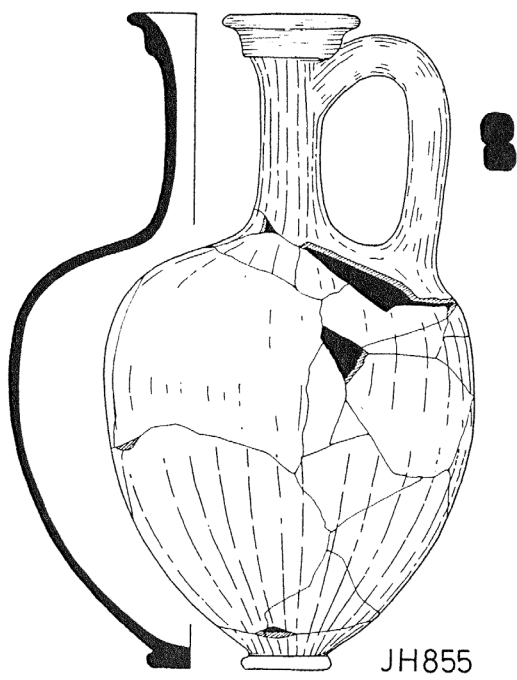
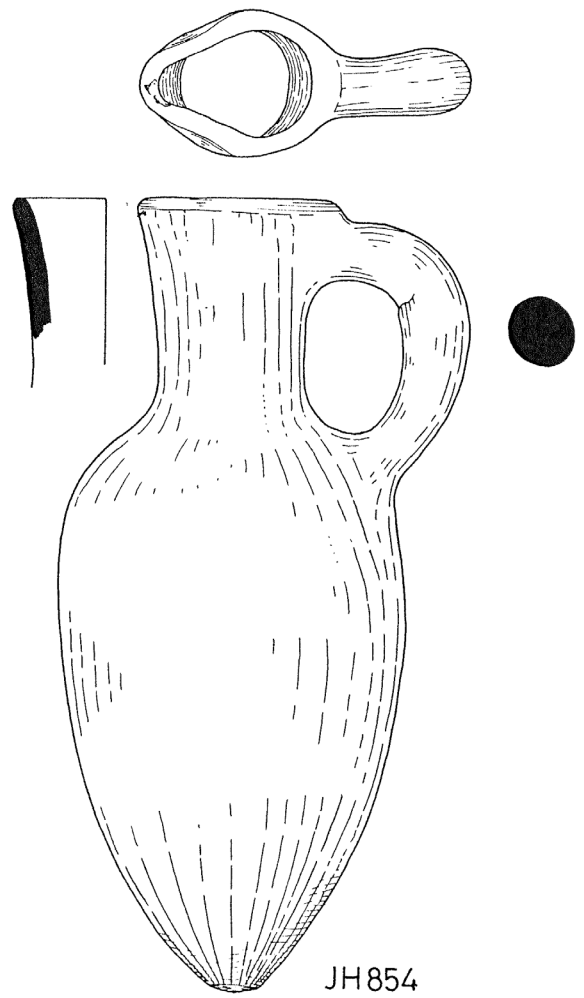
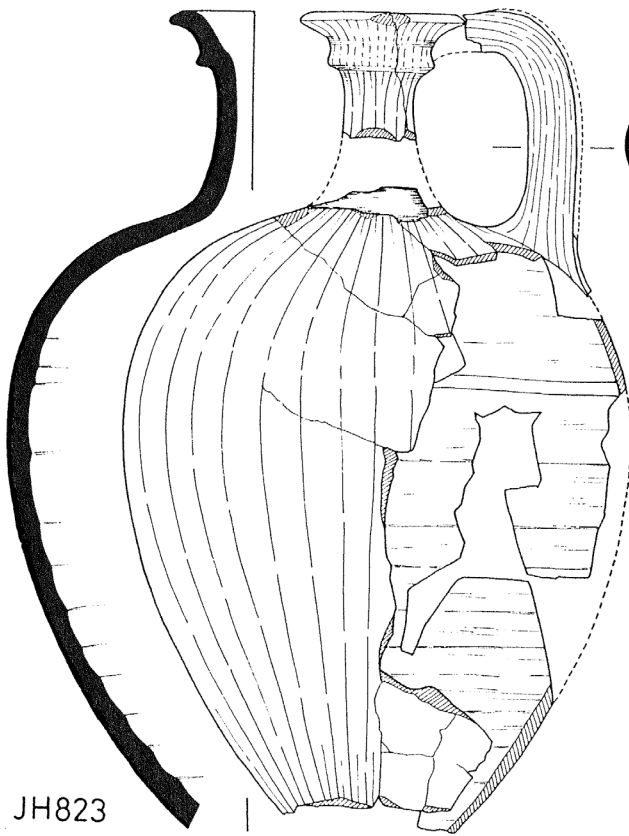
JH854 (Pl. 8d)
Tell el-Dab`a
4983
Red Polished Dipper Juglet
I-d
FI k/21s, gr. 30 (burial)
b3-c; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

JH855
Tell el-Dab`a
4979
Red Polished Juglet
IV-2b
FI k/21s, gr. 30 (burial)
b3-c; MB IIA-B
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

JH856
Tell el-Dab`a
4980
Red Polished Carinated Bowl
IV-2c
FI k/21s, gr. 30 (burial)
b3-c; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

JH859 (not illustrated)
Tell el-Dab`a
4942
Brown Polished Juglet
IV-3b
FI k/24, pl. 3-4, pit 52 (residence)
b3; MB IIA-B
NAA Provenience: most similar to Tell el-Hesi DBPA44, of local origin (mean Euclidean distance 0.075)

The Foreign Relations of the "Hyksos"



The Foreign Relations of the “Hyksos”

Fig. 80: MB IIA-B Polished Juglets

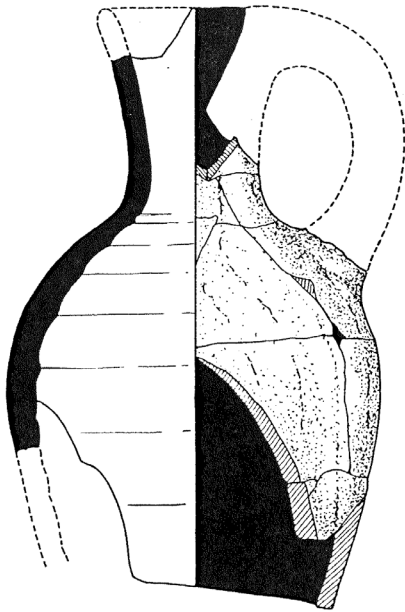
JH860
Tell el-Dab`a
4985B
Brown Polished Dipper Juglet, lower body
IV-2-3c
FI k/21s, pl. 1-2 (residence)
b2-3; MB IIA-B
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

JH863
Tell el-Dab`a
4846
Red Polished Juglet
I-e3?
FI l/21, gr. 24 (burial)
b3-c; MB IIA-B
NAA Provenience: ?; most similar to Egyptian Nile alluvium (ADCORR 0.1%; mean Euclidean distance 0.062)

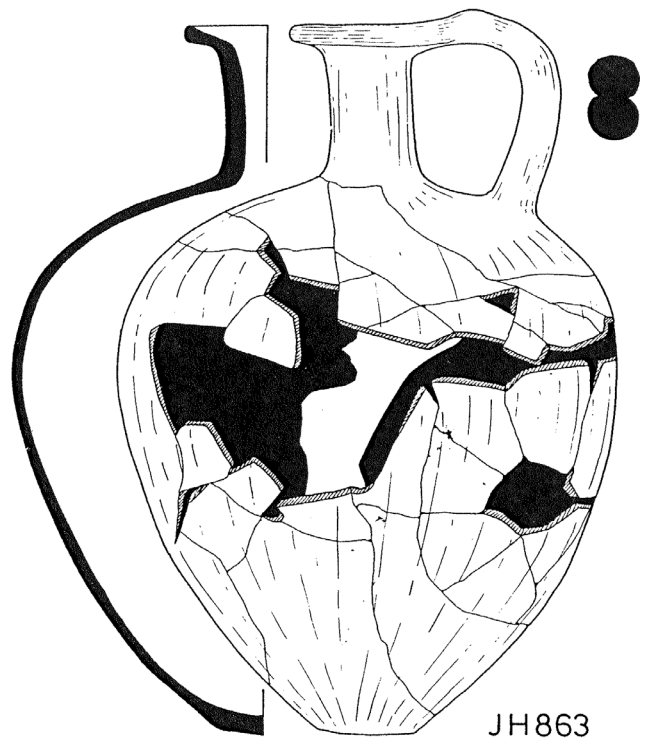
JH876
Tell el-Dab`a
4842
Red Polished Juglet
IV-2b
FI l/21, gr. 24 (burial)
b3-c; MB IIA-B
NAA Provenience: Southern Palestine

JH877
Tell el-Dab`a
4785
Red Polished Juglet
IV-2b
FI l/20, gr. 17 (burial)
b3; MB IIA-B
NAA Provenience: Southern Palestine

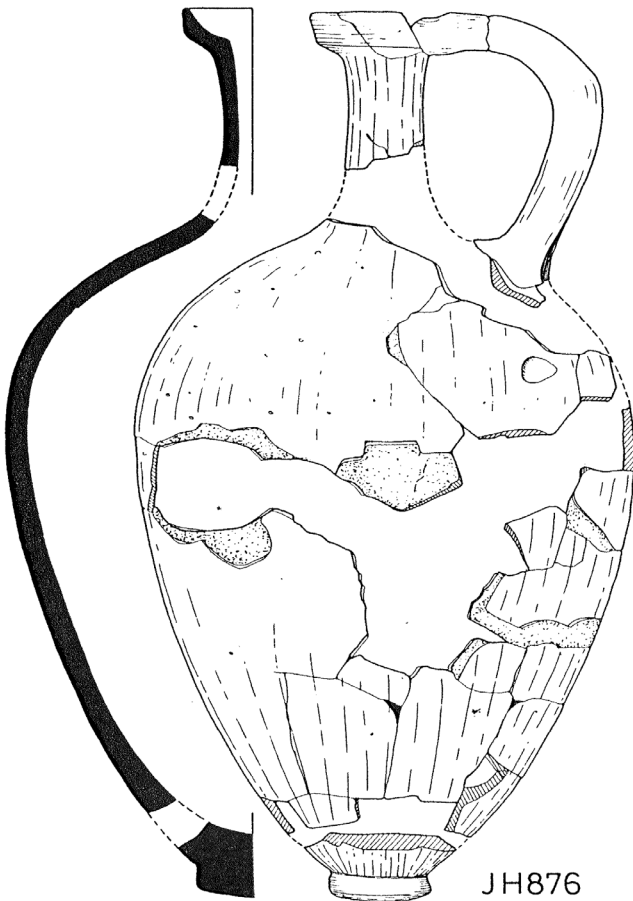
The Foreign Relations of the "Hyksos"



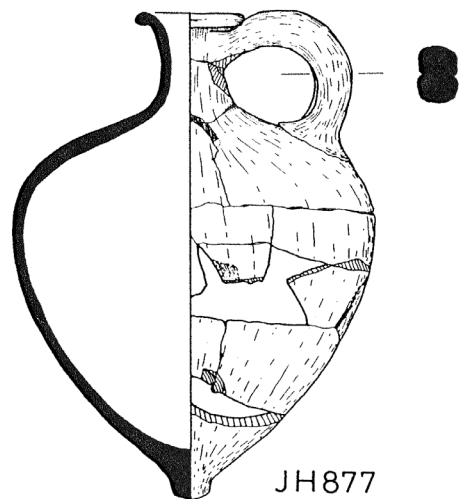
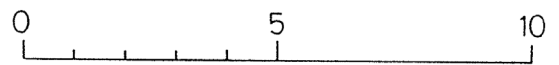
JH860



JH863



JH876



JH877

The Foreign Relations of the “Hyksos”

Fig. 81: MB IIA-B Polished Juglets and Jars

JH878
Tell el-Dab`a
4797
Brown Polished Juglet
IV-2b?
FI 1/20, gr. 20 (burial)
b3; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

JH882 (not illustrated)
Tell el-Dab`a
4836
Juglet, missing lower body, probably yellowish-white polished
IV-3c
FI 1/21, gr. 11 (burial)
b3-c; MB IIA-B
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.6%; mean Euclidean distance 0.084)

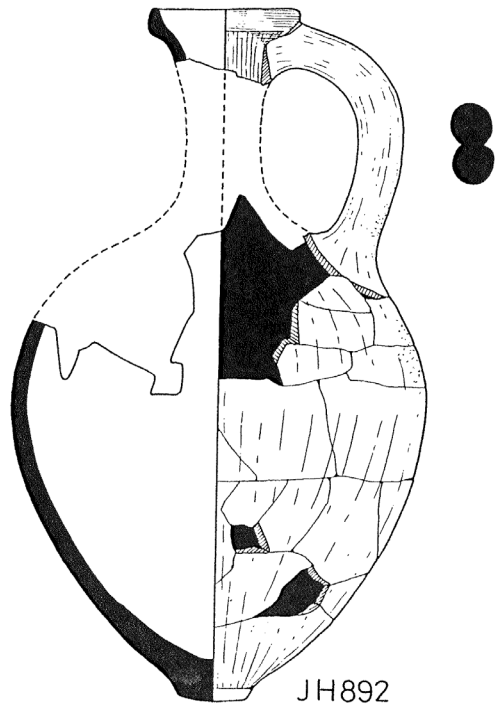
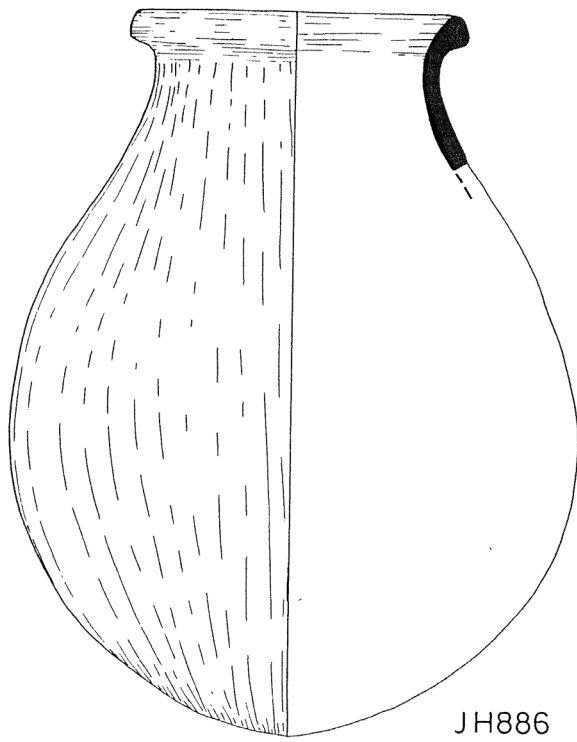
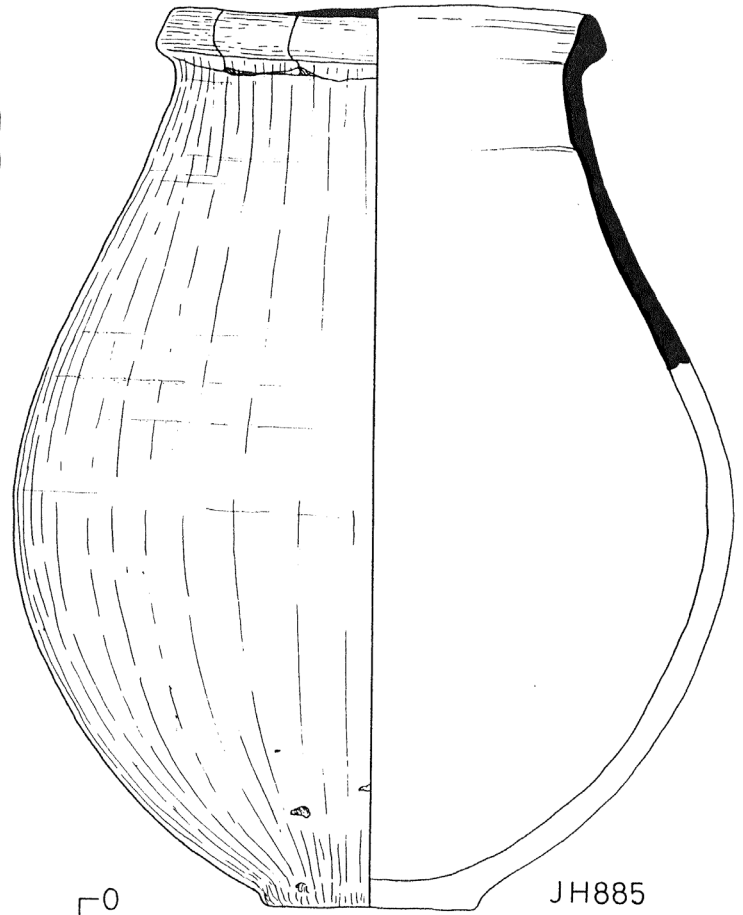
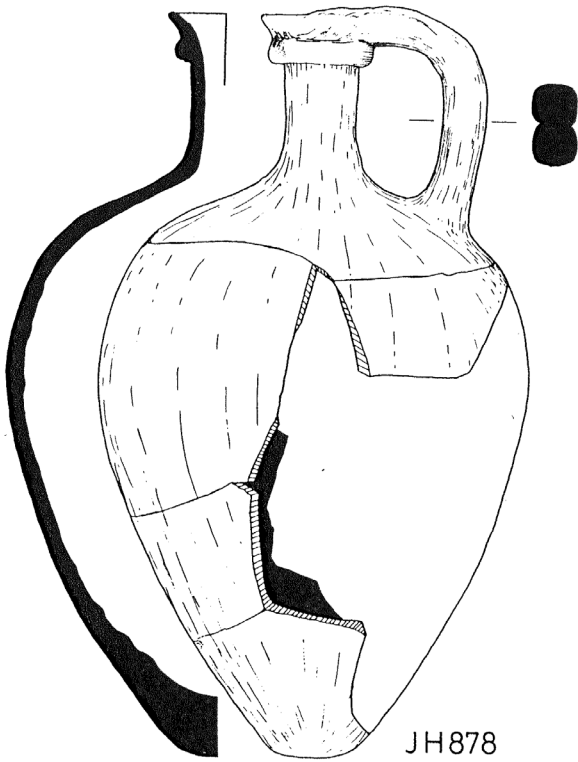
JH884 (not illustrated)
Tell el-Dab`a
4881
Red Polished Jar or Carinated Bowl, rim, neck, and lower body
Ic-d
FI 1/22, gr. 29 (burial)
b3; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

JH885 (Pl. 10a)
Tell el-Dab`a
4876
Red Polished Deep Globular Bowl
I-d
FI 1/22, gr. 27 (burial)
b3; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

JH886 (Pl. 10b)
Tell el-Dab`a
4891
Red Polished Deep Globular Bowl
I-d
FI 1/22, gr. 41 (burial)
b3; MB IIA-B
NAA Provenience: Egyptian Nile alluvium

JH892
Tell el-Dab`a
4884
Red Polished Juglet
IV-2b
FI 1/22, gr. 31 (burial)
b3; MB IIA-B
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 2.5%; mean Euclidean distance 0.064)

The Foreign Relations of the "Hyksos"



The Foreign Relations of the “Hyksos”

Fig. 82: MB IIB Polished Juglets

JH098
Tell el-Dab`a
4574
Juglet, polish worn off
IV-2b
FI j/22, gr. 2 (burial)
b1; MB IIB
NAA Provenience: most similar to Southern Palestine (ADCORR 0.7%; ADSTAT 0.076)

JH101 (not illustrated)
Tell el-Dab`a
4624
Brown Polished Juglet
IV-3a
FI l/22, gr. 1 (burial)
b1; MB IIB
NAA Provenience: Egyptian Nile alluvium

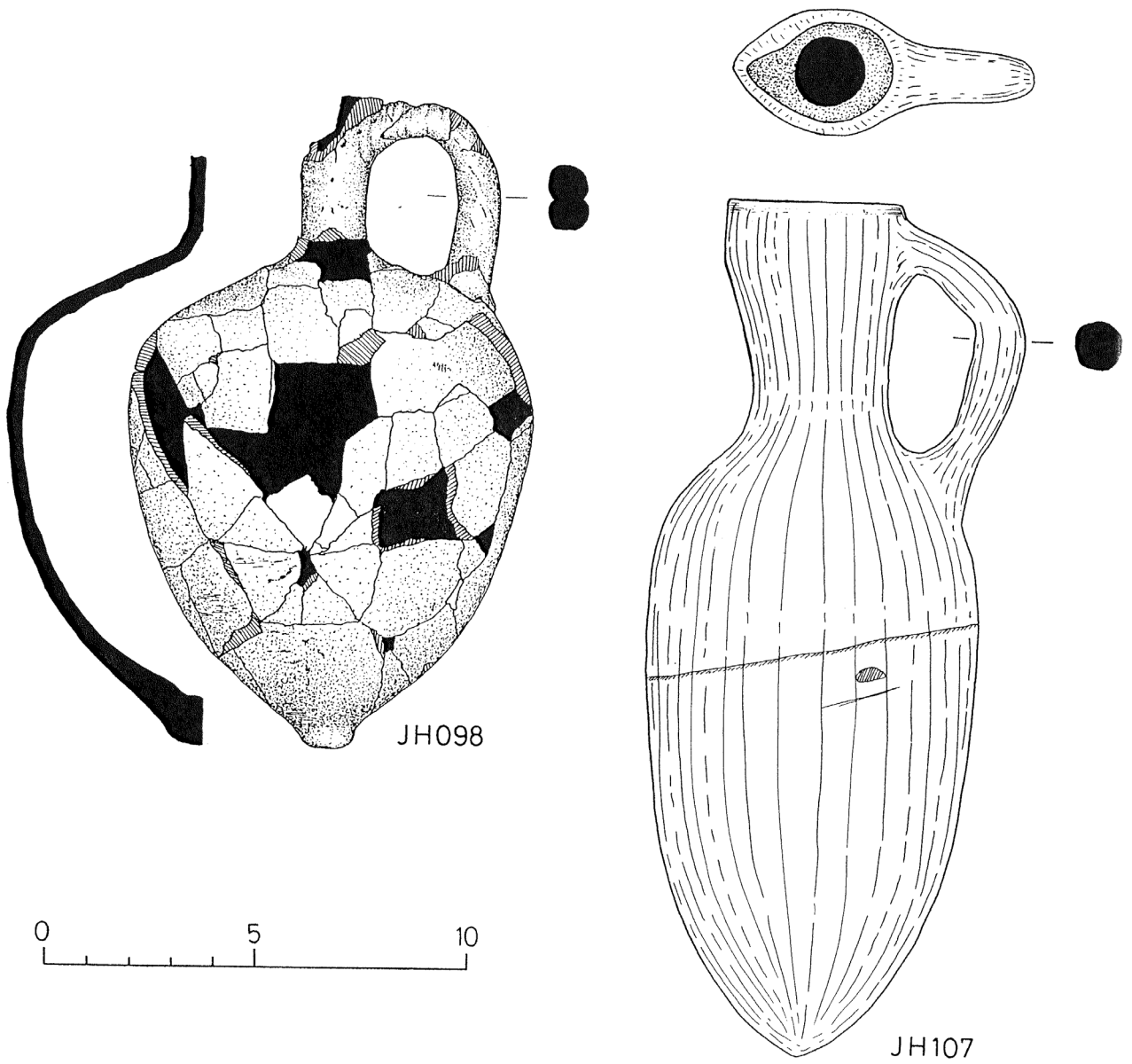
JH107
Tell el-Dab`a
4630
Red Polished Dipper Juglet
I-d?
FI k/24, feature 1 (residence)
b1-2; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH270 (Pl. 6e)
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 44.4)
301/WA1400
Brown Polished Juglet
IV-2c
AII l/12, gr. 3 (burial)
E3; MB IIB
NAA Provenience: Southern Palestine

JH271 (Pl. 6f)
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 44.6)
302/WA2268
Brown Polished Juglet
IV-b
AII l/12, gr. 3 (burial)
E3; MB IIB
NAA Provenience: Southern Palestine

JH272 (Pl. 6g)
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 44.8)
303/WA1638
Brown Polished Juglet
IV-2c
AII l/12, gr. 3 (burial)
E3; MB IIB
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

The Foreign Relations of the "Hyksos"

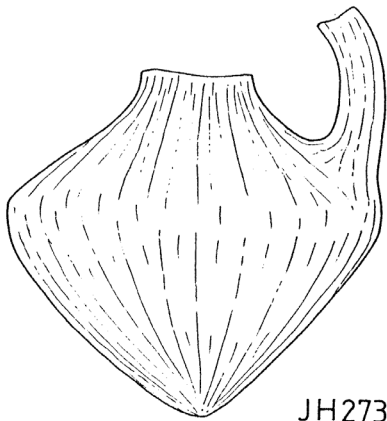


The Foreign Relations of the “Hyksos”

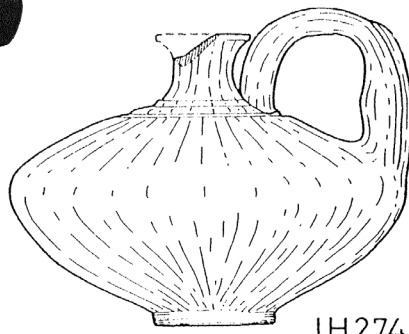
Fig. 83: MB IIB Polished Juglets

JH273 Tell el-Dab`a (<i>Tell el-Dab`a V</i> : fig. 44.7) 302/WA2270 Red Polished Juglet IV-2b AII l/12, gr. 3 (burial) E3; MB IIB NAA Provenience: Southern Palestine	IV-2c AII m/10, pl. 3-4 (residence) E2; MB IIB NAA Provenience: Southern Palestine
JH274 (Pl. 6h) Tell el-Dab`a (<i>Tell el-Dab`a V</i> : fig. 44.3) 314/WA2278 Brown Polished Juglet IV-2b? AII l/12, gr. 3 (burial) E3; MB IIB NAA Provenience: Southern Palestine	JH284 Tell el-Dab`a (<i>Tell el-Dab`a V</i> : fig. 88.6) 797/WA2590 Gray Polished Juglet, missing rim IV-3a AII m/13, gr. 6 (burial) E2; MB IIB NAA Provenience: ?; no matches at mean Euclidean distance 0.1
JH275 Tell el-Dab`a (<i>Tell el-Dab`a V</i> : fig. 44.5) 315/WA2279 Brown Polished Juglet, missing rim I-d or IV? AII l/12, gr. 3 (burial) E3; MB IIB NAA Provenience: ?; most similar to Southern Palestine (ADCORR 1.6%) and Tell el-Dab`a JH335, of uncertain provenience (mean Euclidean distance 0.096)	JH289 Tell el-Dab`a (<i>Tell el-Dab`a V</i> : fig. 202.35) 1293/WA2812 Red Polished Juglet, handle IV-2c AII n/11, pl. 2, gr. 3 (burial) E1; MB IIB NAA Provenience: Southern Palestine
JH276 Tell el-Dab`a (<i>Tell el-Dab`a V</i> : fig. 44.12) 308/WA2272 Red Polished Dipper Juglet IV-2c AII l/12, gr. 3 (burial) E3; MB IIB NAA Provenience: Southern Palestine	JH290 Tell el-Dab`a 1294/1/WA2880 Red Polished Juglet, handle IV-2b AII n/11, pl. 2, gr. 3 (burial) E1; MB IIB NAA Provenience: Egyptian Nile alluvium
JH281 Tell el-Dab`a 768/WA2570 Juglet, missing rim, polish worn off	JH291 Tell el-Dab`a 1294/2/WA2881 Black Polished Juglet, handle IV-2b AII n/17, pl. 2, gr. 3 (burial) E1; MB IIB NAA Provenience: ?; most similar to Southern Palestine (ADCORR 3.7%; mean Euclidean distance 0.081)

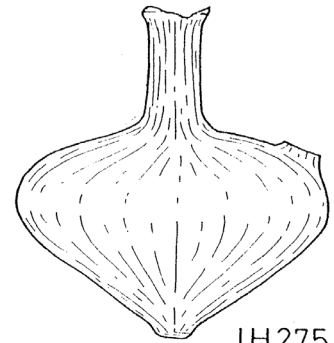
The Foreign Relations of the "Hyksos"



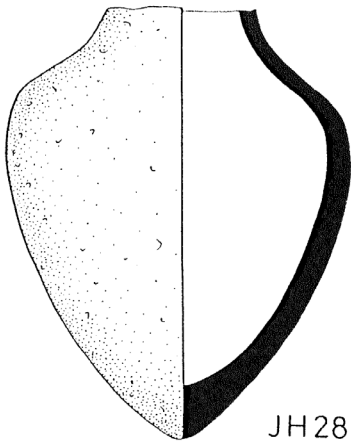
JH273



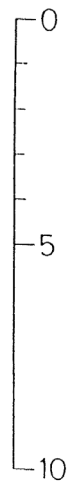
JH274



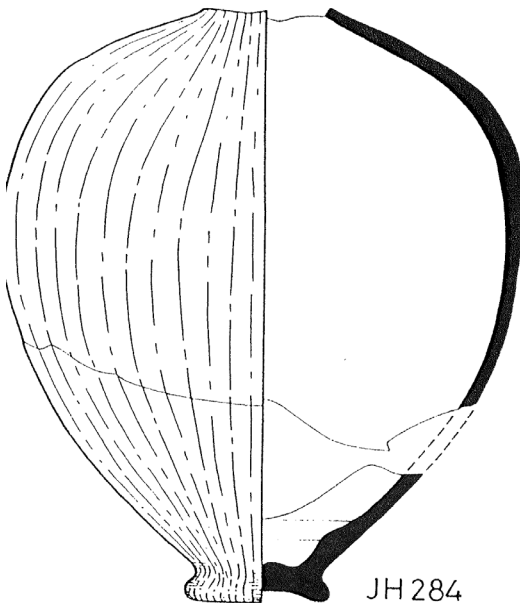
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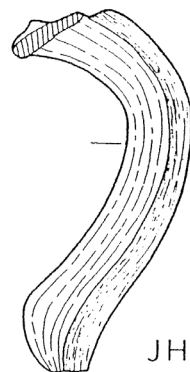
JH281



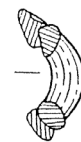
JH276



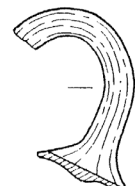
JH284



JH289



JH290



JH291

The Foreign Relations of the “Hyksos”

Fig. 84: MB IIB Polished Juglets

JH293
Tell el-Dab`a
1351/WA2922
Red Polished Juglet, missing rim
IV-2c
AII l/14, gr. 5 (burial)
E1; MB IIB
NAA Provenience: Southern Palestine

JH294 (not illustrated)
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 257.4)
1448/WA2992
Red Polished Juglet, handle
I-a
AII n/12, pl. 3 (residence)
E1; MB IIB
NAA Provenience: most similar to Egyptian Nile alluvium (ADCORR 1.9%; mean Euclidean distance 0.061)

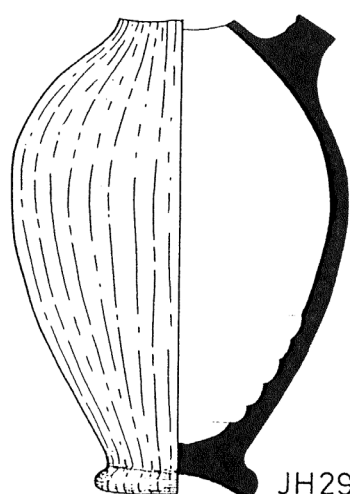
JH296
Tell el-Dab`a
1619/WA3105
Red Polished Juglet, missing base
I-d
AII m/12, gr. 9 (burial)
E2; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH297
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 81.34)
1629/WA3112
Red Polished Dipper Juglet
I-d?
AII m/12, gr. 9 (burial)
E2; MB IIB
NAA Provenience: Egyptian Nile alluvium

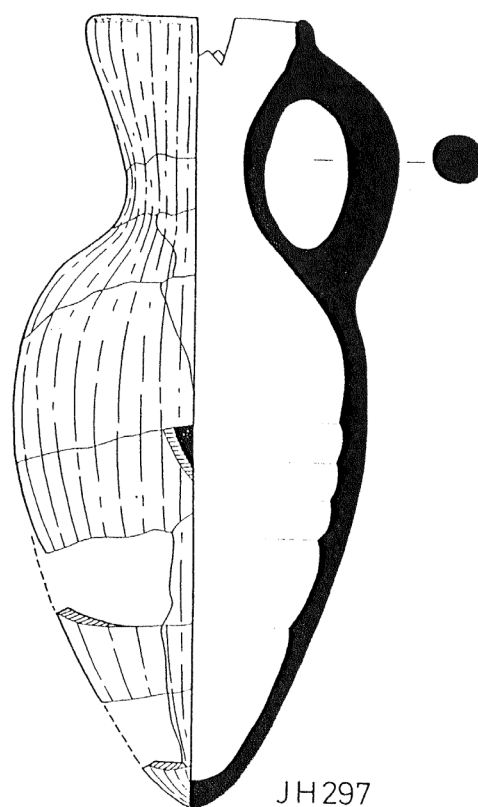
JH298
Tell el-Dab`a (*Tell el-Dab`a V*: fig. 81.25)
1636/WA3117
Red Polished Juglet, missing rim
I-d
AII m/12, gr. 9 (burial)
E2; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH299
Tell el-Dab`a
1639/WA3120
Juglet, some polish
I-d
AII m/12, gr. 9 (burial)
E2; MB IIB
NAA Provenience: Egyptian Nile alluvium

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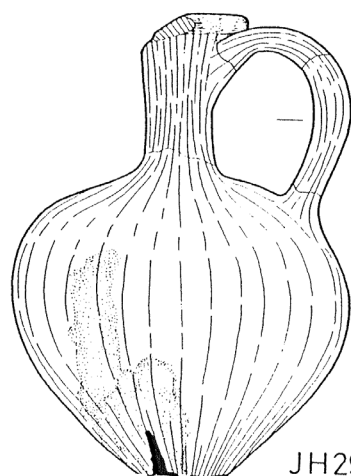


JH293

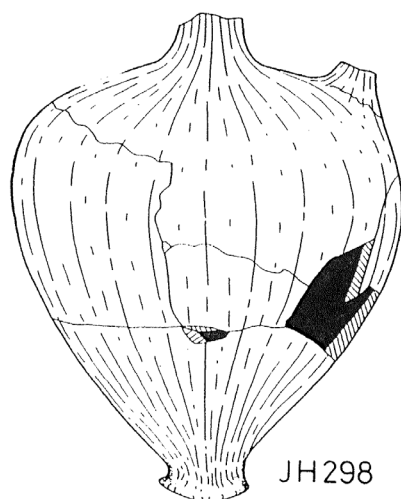


JH297

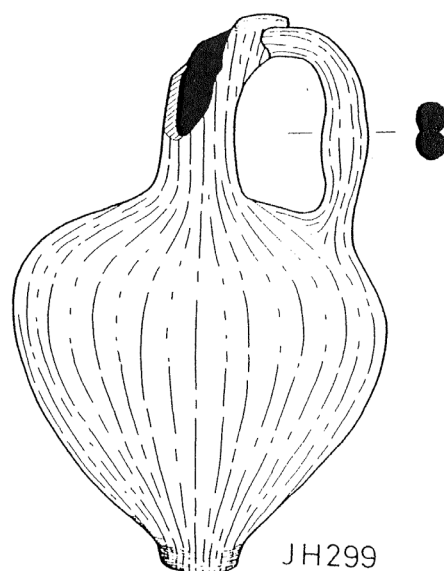
0
5
10



JH296



JH298



JH299

The Foreign Relations of the “Hyksos”

Fig. 85: MB IIB Polished Juglets and Jar

JH300

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 81.29)

1640/WA3121

Red Polished Juglet, lower body

I-d

AII m/12, gr. 9 (burial)

E2; MB IIB

NAA Provenience: Egyptian Nile alluvium

JH301

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 81.31)

1642/WA3122

Red Polished Juglet

I-d

AII m/12, gr. 9 (burial)

E2; MB IIB

NAA Provenience: Egyptian Nile alluvium

JH302

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 81.27)

1647/1/WA3125a

Red Polished Juglet, handle

I-d

AII m/12, gr. 9 (burial)

E2; MB IIB

NAA Provenience: Egyptian Nile alluvium

JH303

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 81.26)

1647,3/WA3125,c

Red Polished Juglet handle

Ia,d or IV-3a?

AII m/12, gr. 9 (burial)

E2; MB IIB

NAA Provenience: Egyptian Nile alluvium

JH304

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 73.3)

1650/WA3127

Red Polished Jar, missing rim and handles

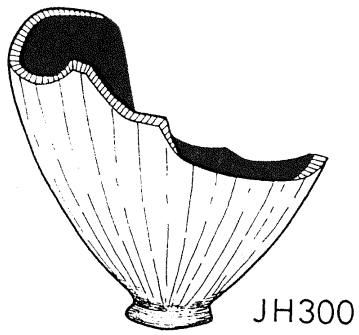
IV-2b

AII m/11, gr. 12 (burial)

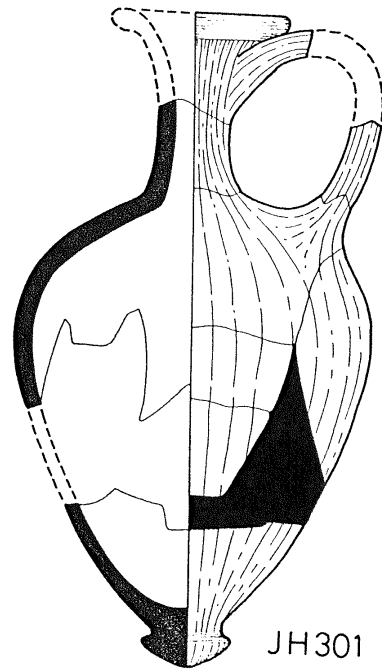
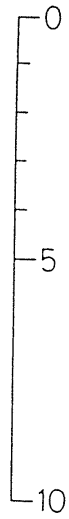
E1-2; MB IIB

NAA Provenience: most similar to Southern Palestine (ADCORR 2.0%; mean Euclidean distance 0.079)

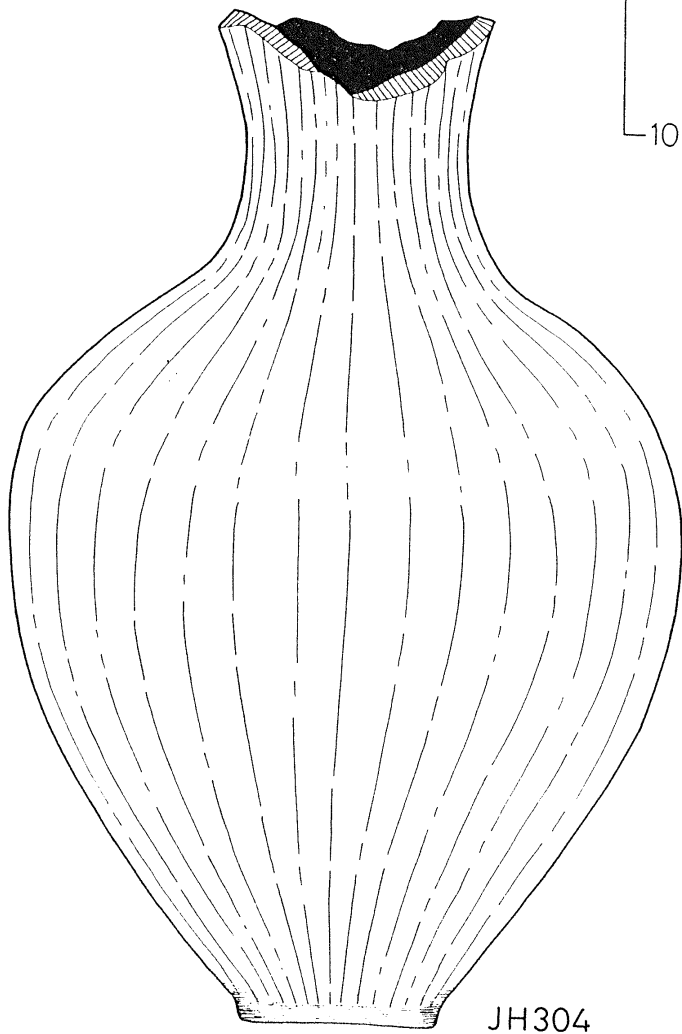
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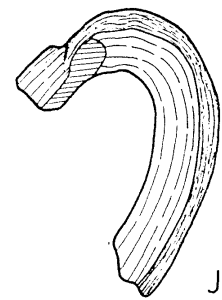
JH300



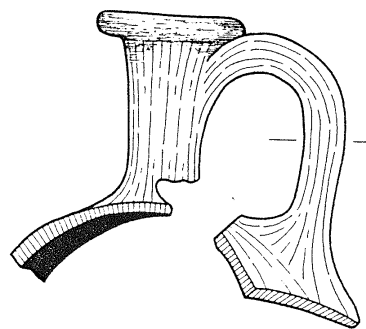
JH301



JH304



JH302



JH303



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Fig. 86: MB IIB Polished Juglets

JH311

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 48.other contexts, 5)

1837/WA3244

Red Polished Juglet

I-d

AII n/13, gr. 8 (burial)

E3; MB IIB

NAA Provenience: Egyptian Nile alluvium

JH314

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 46.1)

1875/WA3266

Red Polished Juglet, missing rim

I-d?

AII m/13, gr. 13 (burial)

E3; MB IIB

NAA Provenience: ?; most similar to Egyptian Nile alluvium (ADCORR 0.1%; mean Euclidean distance 0.086)

JH320 (Pl. 6i)

Tell el-Dab`a (*Tell el-Dab`a V*: fig. 82.deposit 3)

1544/WA1674

Red Polished Juglet

I-d

AII m/12, gr. 9 (deposit in burial chamber entrance)

E2; MB IIB

NAA Provenience: Egyptian Nile alluvium

JH332

Tell el-Dab`a

2434

Juglet, yellow polished (not shown on drawing)

Macroscopic fabric assignment not available

AII l/15, gr. 4 (burial)

E2; MB IIB

NAA Provenience: Egyptian Nile alluvium

JH337

Tell el-Dab`a

3384

Brown Polished Juglet

I-d

AII m/15, gr. 12 (burial)

E2-3; MB IIB

NAA Provenience: Egyptian Nile alluvium

JH341

Tell el-Dab`a

1354/WA2924

Red Polished Juglet, missing rim

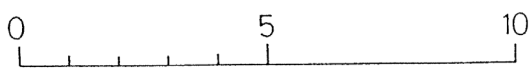
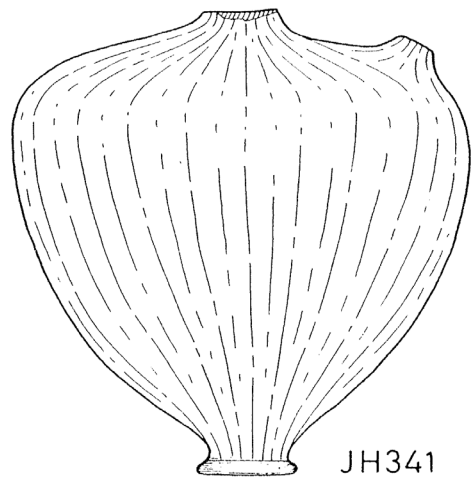
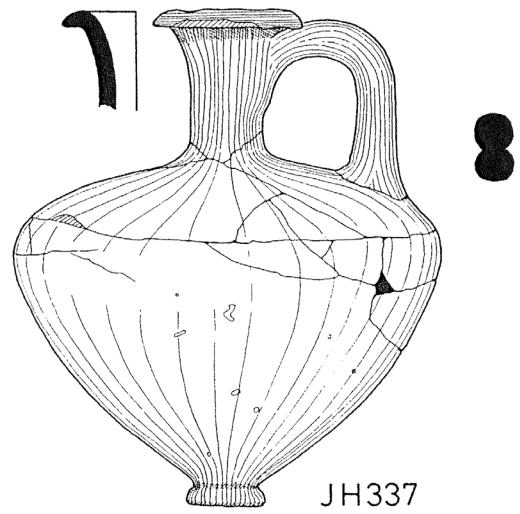
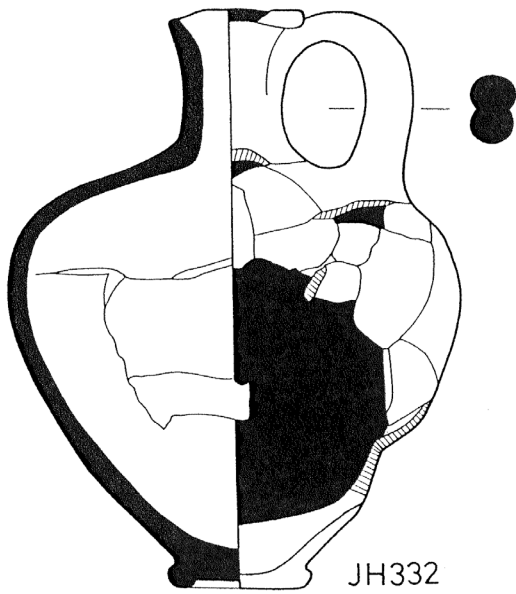
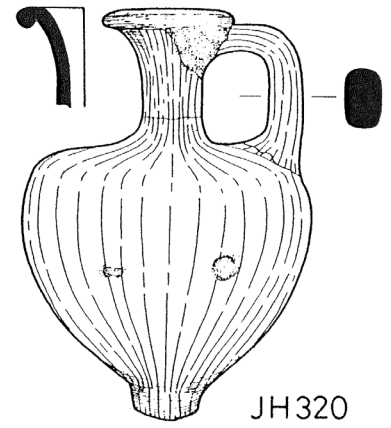
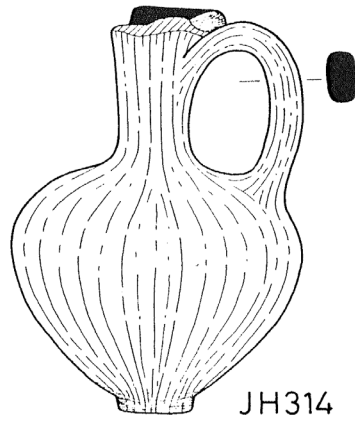
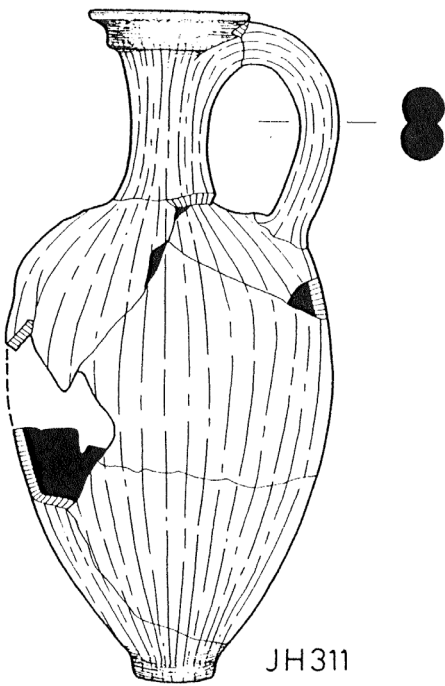
Macroscopic fabric assignment not available

AII l/14, gr. 5 (burial)

E1; MB IIB

NAA Provenience: ?; most similar to Tell Far`ah South JH232, of local Southern Palestinian origin (mean Euclidean distance 0.089)

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Fig. 87: MB IIB Polished Bowl and Juglets

JH343 (Pl. 9b)
Tell el-Dab`a
239/WA2230
Red Polished Carinated Bowl
Macroscopic fabric assignment not available
AII I/13, gr. 3 (burial)
E3; MB IIB
NAA Provenience: Egyptian Nile alluvium

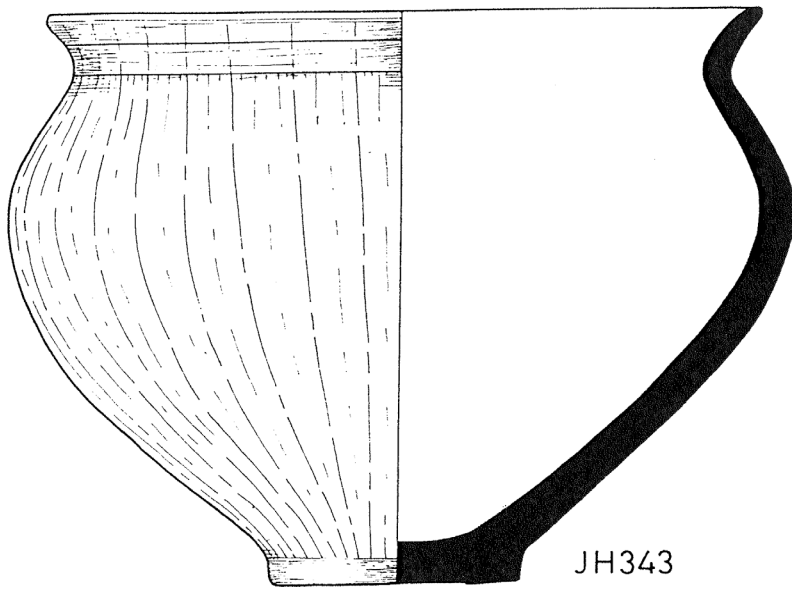
JH347 (Pl. 7a)
Tell el-Dab`a
241/WA1625
Red Polished Juglet
Macroscopic fabric assignment not available
AII I/13, gr. 3 (burial)
E3; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH349
Tell el-Dab`a
243/WA1608
Juglet, polished (not shown on drawing)
I-d, dung?
AII I/13, gr. 3 (burial)
E3; MB IIB
NAA Provenience: Egyptian Nile alluvium

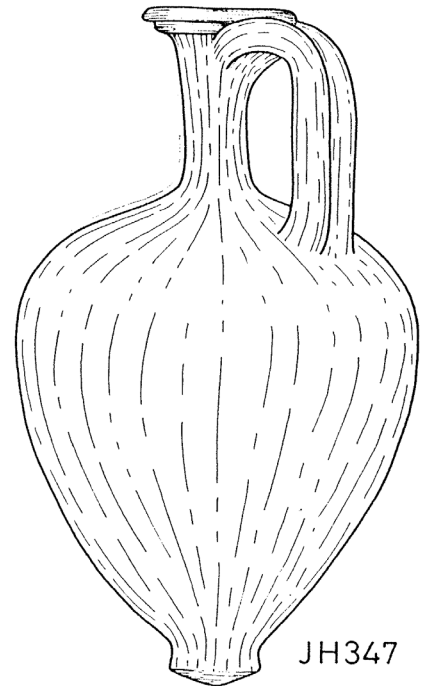
JH351 (not illustrated)
Tell el-Dab`a
1397/WA1397
Red Polished Juglet
I-d
AII I/14, gr. 5 (burial)
E1; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH356 (Pl. 7b)
Tell el-Dab`a
1678/WA1684
Red Polished Juglet
Macroscopic fabric assignment not available
AII I/14, gr. 7 (burial)
E3; MB IIB
NAA Provenience: ?; most similar to Tell el-Dab`a JH375, of uncertain provenience (mean Euclidean distance 0.065)

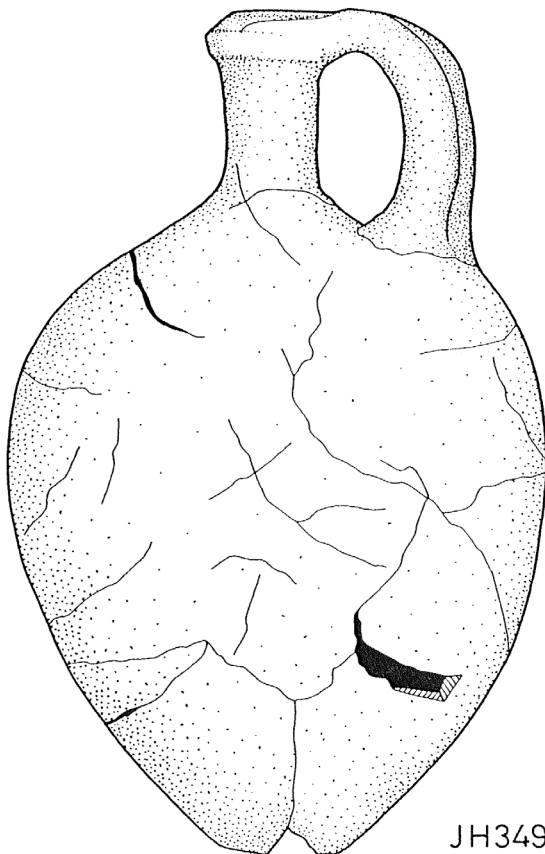
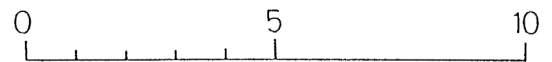
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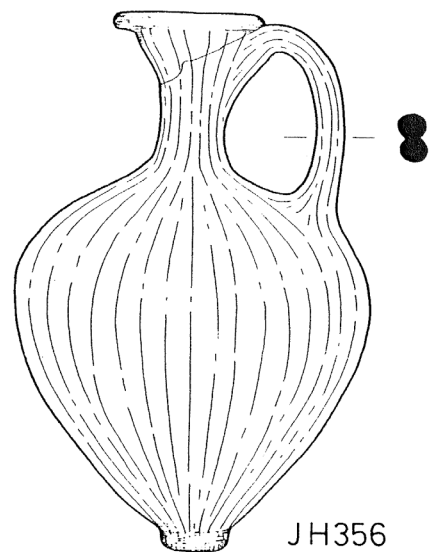
JH343



JH347



JH349



JH356

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Fig. 88: MB IIB Polished Juglets and Bowl

JH357
Tell el-Dab`a
1687/WA3147
Red Polished Juglet
Macroscopic fabric assignment not available
AII l/14, gr. 7 (burial)
E3; MB IIB
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.1%) and Tell el-Dab`a JH808, of local origin (mean Euclidean distance 0.096)

JH360 (not illustrated)
Tell el-Dab`a
1517/WA3040
Black Polished Juglet, rim and neck
Macroscopic fabric assignment not available
AII n/14, pl. 2 (residence?)
E1; MB IIB
NAA Provenience: Egyptian Nile alluvium

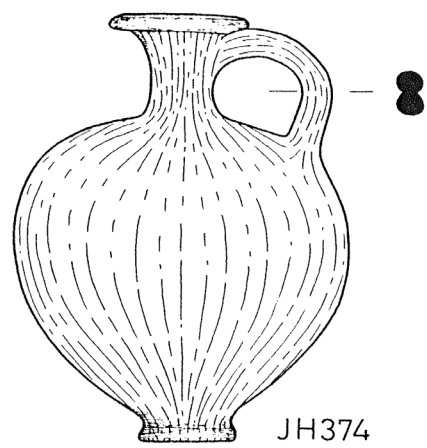
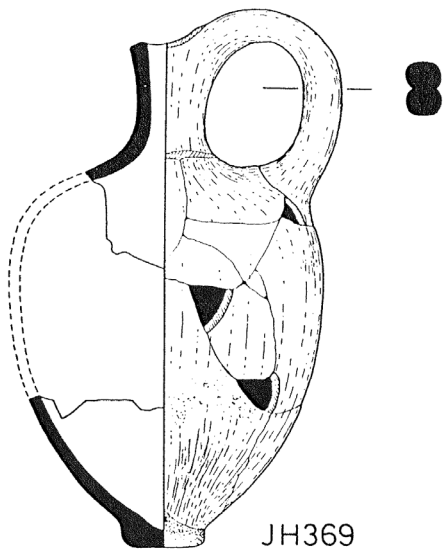
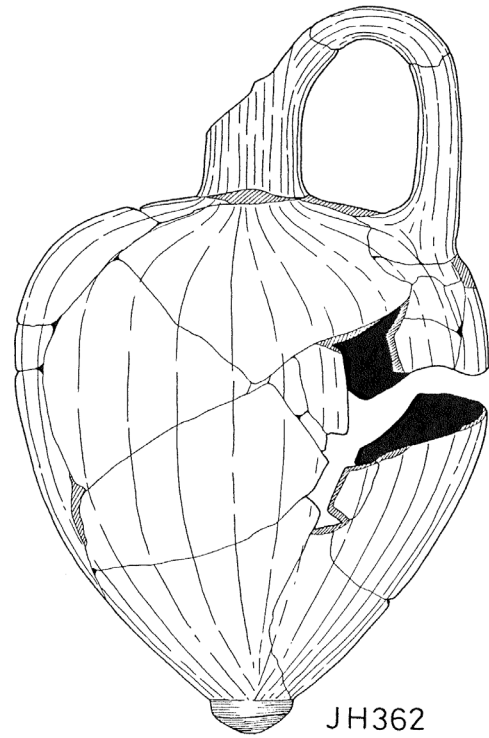
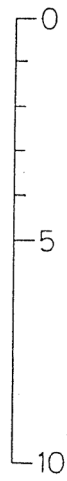
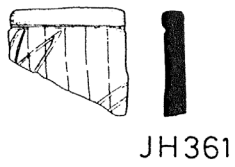
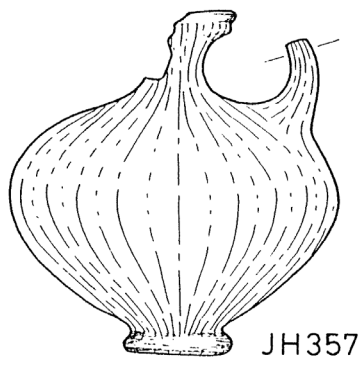
JH361
Tell el-Dab`a
1511/WA3034
Black Polished Bowl rim, with incised design
Macroscopic fabric assignment not available
AII n/14, pl. 1-2 (residence)
E1; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH362
Tell el-Dab`a
3435
Red Polished Jug, missing rim
IV-2b
AII o/21 (residence)
D3-E1; MB IIB
NAA Provenience: most similar to Southern Palestine (ADCORR 3.9%; mean Euclidean distance 0.078)

JH369
Tell el-Dab`a
3444
Red Polished Juglet, missing rim
I-d
FI i/22, gr. 1 (burial)
b1; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH374 (Pl. 7c)
Tell el-Dab`a
1665/WA1681
Black Polished Juglet
I-d
AII l/14, gr. 7 (burial)
E3; MB IIB
NAA Provenience: Egyptian Nile alluvium

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Fig. 89: MB IIB Polished Juglets

JH375 (Pl. 7d)

Tell el-Dab`a

1677/WA3142

Black Polished Juglet

Macroscopic fabric assignment not available

AII l/14, gr. 7 (burial)

E3; MB IIB

NAA Provenience: ?; most similar to Tell el-Dab`a JH356, of uncertain provenience (mean Euclidean distance 0.067)

JH383

Tell el-Dab`a

2110/WA3415

Red/Black Polished Juglet, missing rim

Macroscopic fabric assignment not available

AII l/16, gr. 1 (burial)

D3-E1; MB IIB

NAA Provenience: Egyptian Nile alluvium

JH388

Tell el-Dab`a

2122/WA3425

Red Polished Juglet, missing rim

Macroscopic fabric assignment not available

AII l/16, gr. 1 (burial)

D3-E1; MB IIB

NAA Provenience: Egyptian Nile alluvium

JH395

Tell el-Dab`a

2180/WA3461

Red Polished Dipper Juglet

Macroscopic fabric assignment not available

AII n/15, pl. 2, gr. 1 (burial)

D3-E1; MB IIB

NAA Provenience: ?; most similar to Egyptian Nile alluvium (ADCORR 0.2%; mean Euclidean distance 0.057)

JH717

Tell el-Dab`a

4972

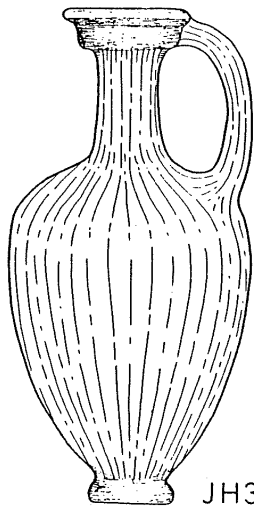
Red Polished Juglet, missing base

IV-2

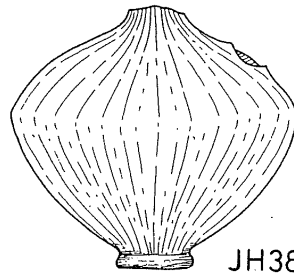
FI k/21s, gr. 24 (burial)

b2 or older; MB IIB

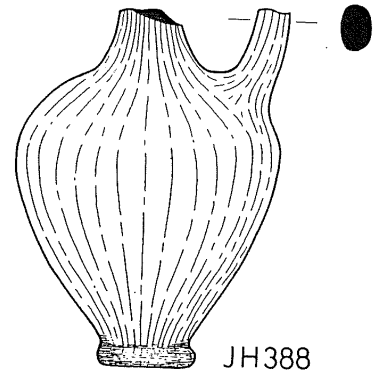
NAA Provenience: ?; most similar to Tell el-Dab`a JH073, import from Southern Palestine (mean Euclidean distance 0.087)



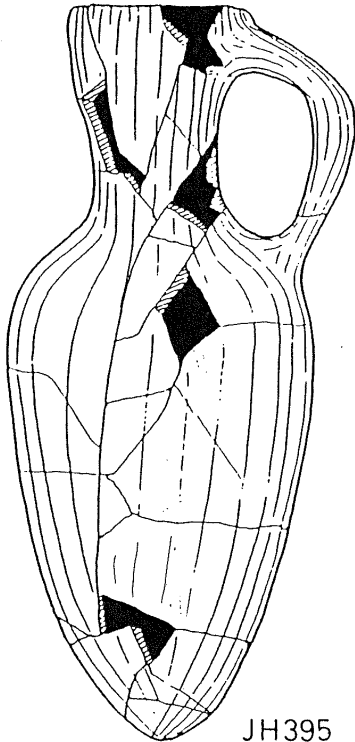
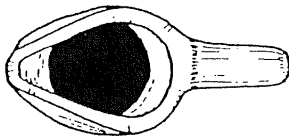
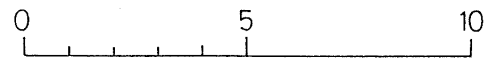
JH375



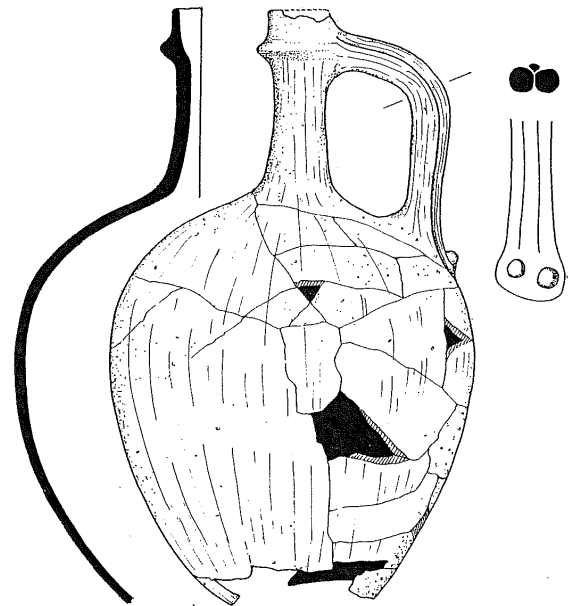
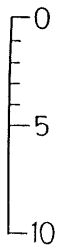
JH383



JH388



JH395



JH717

Fig. 90: MB IIB Polished Juglets

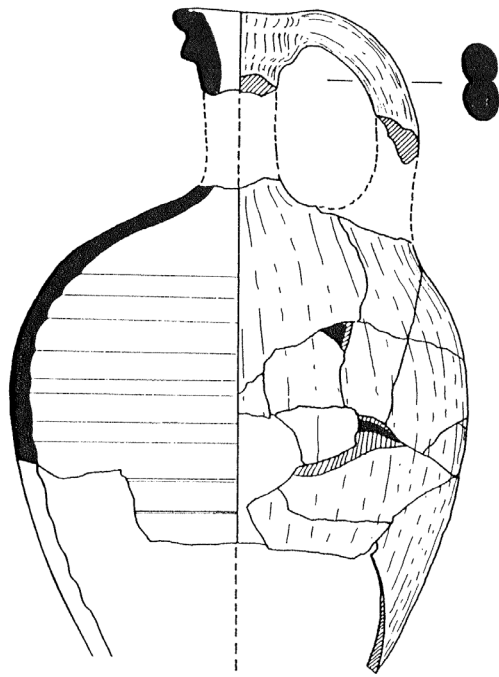
JH720
Tell el-Dab`a
4967
Red Polished Juglet, missing base
I-d
FI k/21s, gr. 24 (burial)
b2; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH721
Tell el-Dab`a
4970
Red Polished Juglet
I-d?
FI k/21s, gr. 24 (burial)
b2; MB IIB
NAA Provenience: Egyptian Nile alluvium

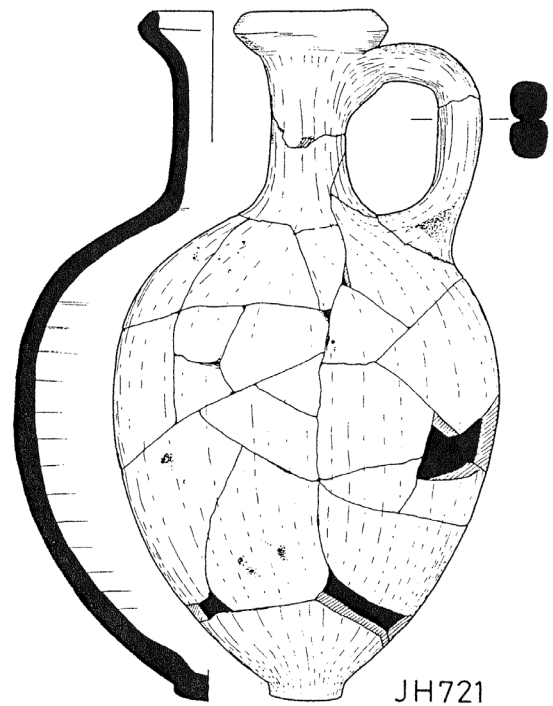
JH722
Tell el-Dab`a
4968
Red Polished Juglet
I-d?
FI k/21s, gr. 24 (burial)
b2; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH723
Tell el-Dab`a
4971
Red Polished Juglet
I-d
FI k/21s, gr. 24 (burial)
b2; MB IIB
NAA Provenience: ?; most similar to Egyptian Nile alluvium (ADCORR 0.1%; mean Euclidean distance 0.087)

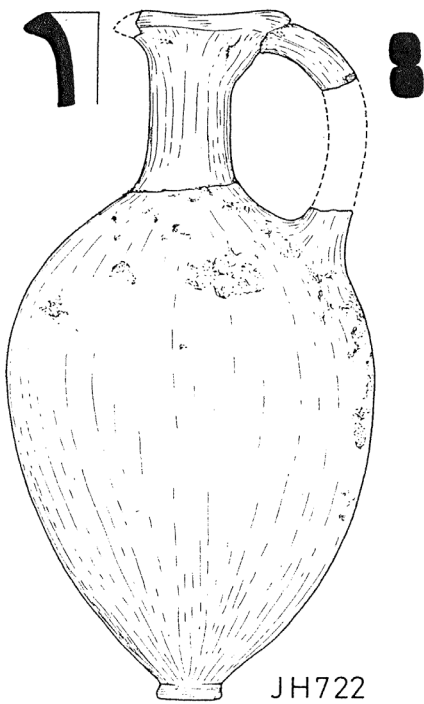
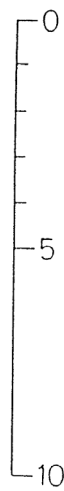
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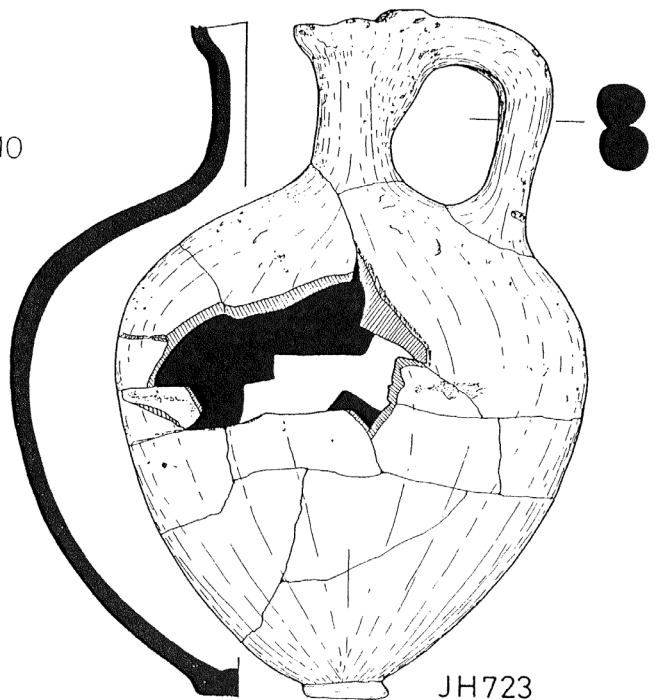
JH720



JH721



JH722



JH723

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Fig. 91: MB IIB Polished Juglets

JH724
Tell el-Dab`a
4976
Red Polished Juglet
IV-2b
FI k/21s, gr. 24 (burial)
b2; MB IIB
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

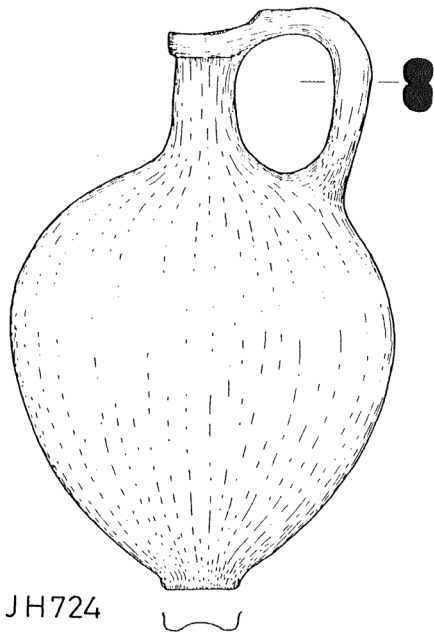
JH725
Tell el-Dab`a
4969
Red Polished Juglet
I-d?
FI k/21s, gr. 24 (burial)
b2; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH830 (Pl. 9d)
Tell el-Dab`a
4506F
Carinated Bowl rim, polished (not shown on drawing), with incised design
I-a
FI k/23 (residence)
b1; MB IIB
NAA Provenience: Egyptian Nile alluvium

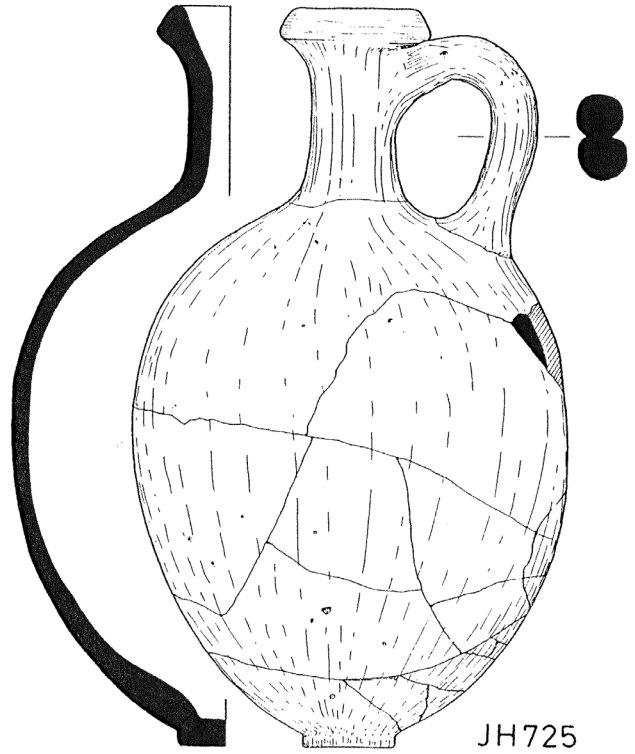
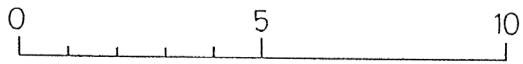
JH866
Tell el-Dab`a
4478
Brown Polished Juglet
IV-3b
FI k/23, gr. 3 (burial)
b1; MB IIB
NAA Provenience: Egyptian Nile alluvium

JH875
Tell el-Dab`a
4868
Brown Polished Juglet
IV-2b
FI l/22, gr. 1 (burial)
b1; MB IIB
NAA Provenience: ?; most similar to Tell el-Dab`a JH881, of uncertain provenience (mean Euclidean distance 0.049)

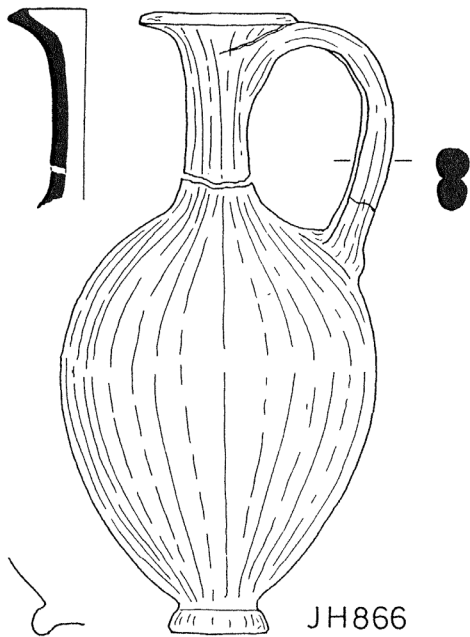
The Foreign Relations of the "Hyksos"



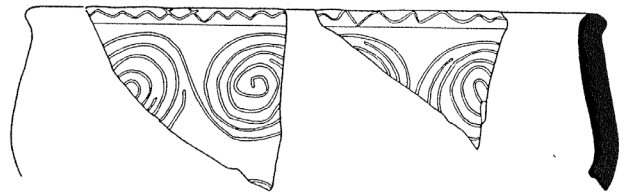
JH724



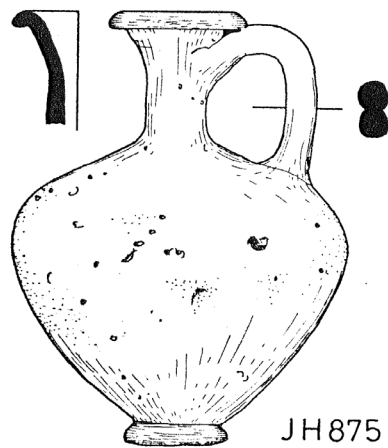
JH725



JH866



JH830



JH875

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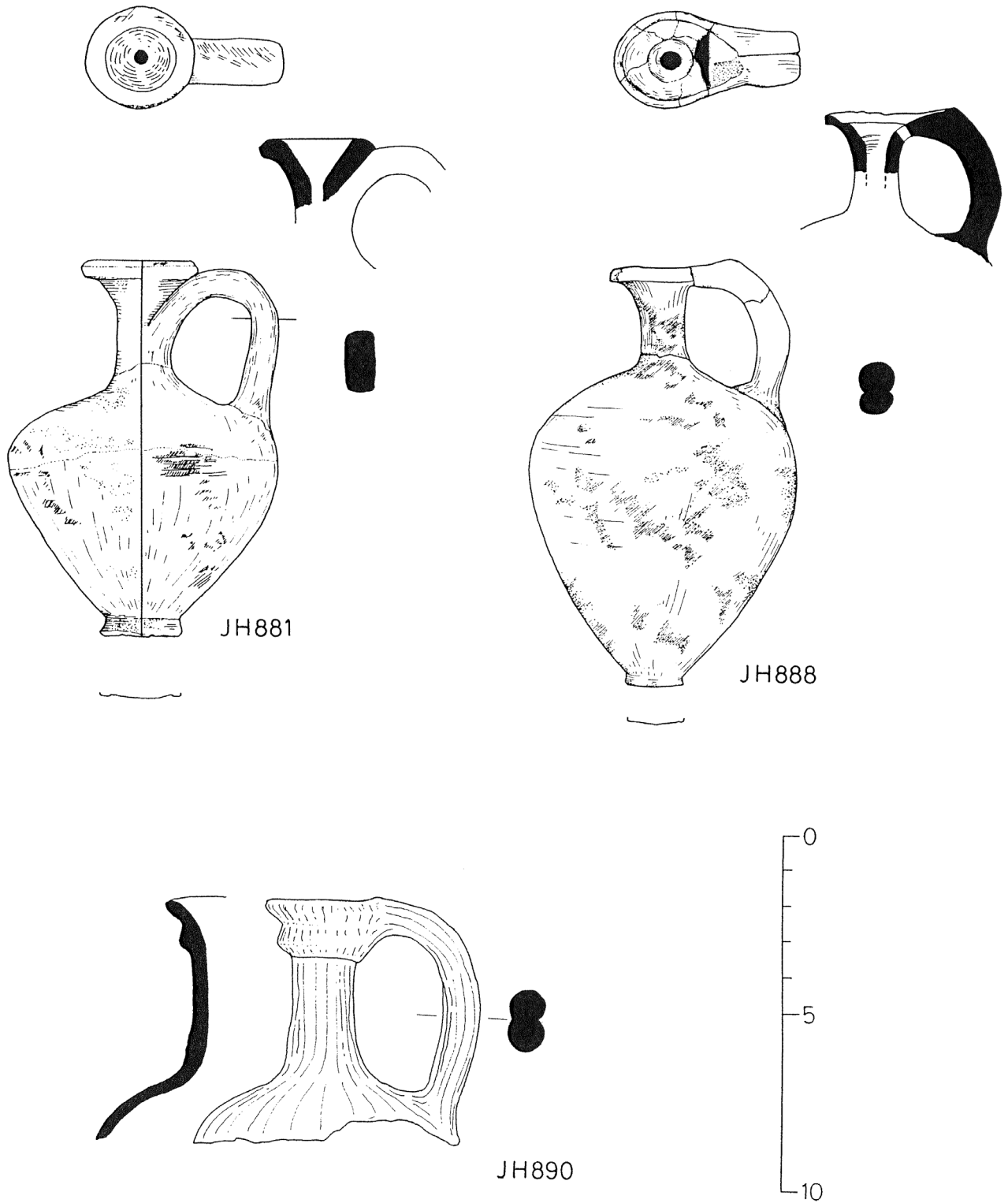
Fig. 92: MB IIB Polished Juglets

JH881
Tell el-Dab`a
4867
Red Polished Juglet
I-d
FI l/22, gr. 1 (burial)
b1; MB IIB
NAA Provenience: ?; most similar to Tell el-Dab`a JH875, of uncertain provenience (mean Euclidean distance 0.049)

JH888
Tell el-Dab`a
4925
Red Polished Juglet
IV-2c
FI k/24, gr. 43 (burial)
b2; MB IIB
NAA Provenience: Southern Palestine

JH890
Tell el-Dab`a
4927
Black Polished Juglet, upper body
I-d
FI k/24, gr. 43 (burial)
b2; MB IIB
NAA Provenience: Southern Palestine

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The Foreign Relations of the “Hyksos”

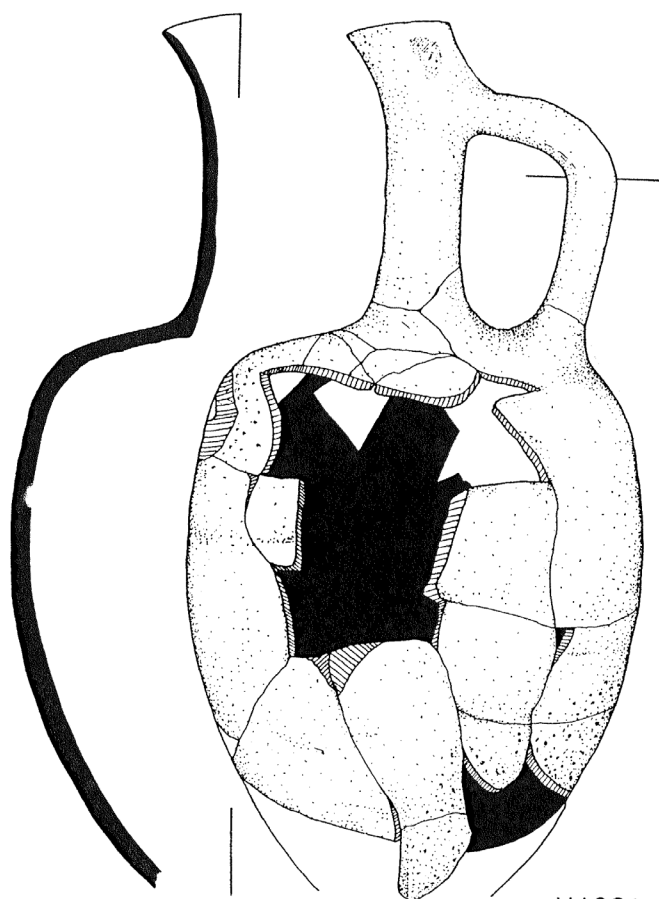
Fig. 93: MB IIB and IIB-C Polished Juglets and Bowl

JH891
Tell el-Dab`a
4926
Red Polished Juglet, with cut-away spout
IV-2b
FI k/24, gr. 43 (burial)
b2; MB IIB
NAA Provenience: Southern Palestine

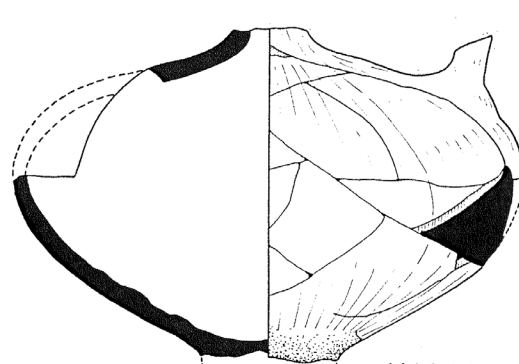
JH896
Tell el-Dab`a
3415B
Bowl, polished (not shown on drawing), with incised design
IV-2a
FI j/22, pl. 1 (residence)
b1; MB IIB
NAA Provenience: Southern Palestine

JH903
Tell el-Dab`a
4107A
Red Polished Juglet, missing rim and base
I-d
FI j/22, pl. 1, deposit 1 (residence)
b1; MB IIB
NAA Provenience: ?; most similar to Southern Palestine (ADCORR 1.8%) and Tell el-Dab`a JH892, of uncertain provenience (mean Euclidean distance 0.072)

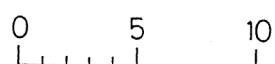
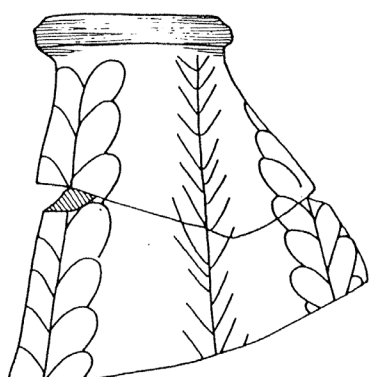
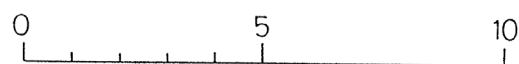
JH333
Tell el-Dab`a
2858
Red Polished Juglet
I-d
AII p/20, gr. 1 (burial)
D3; MB IIB-C
NAA Provenience: Egyptian Nile alluvium



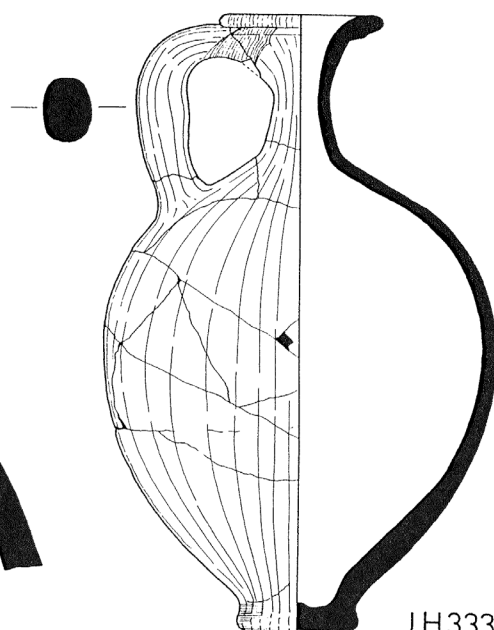
JH891



JH903



JH896



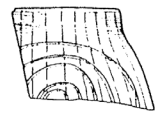
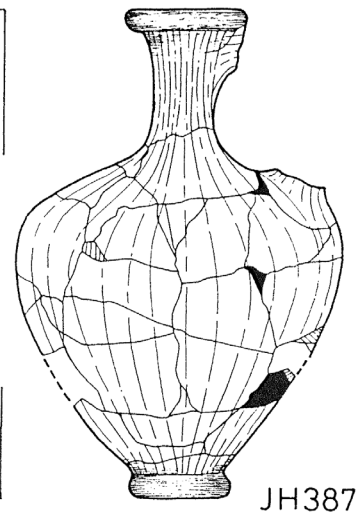
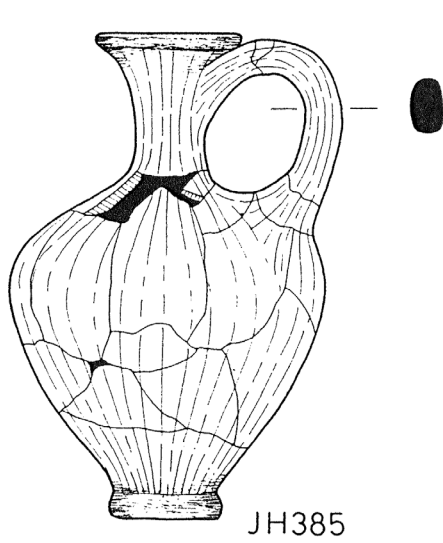
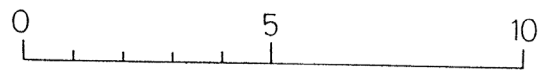
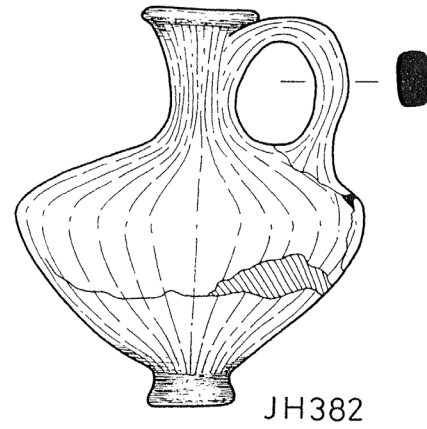
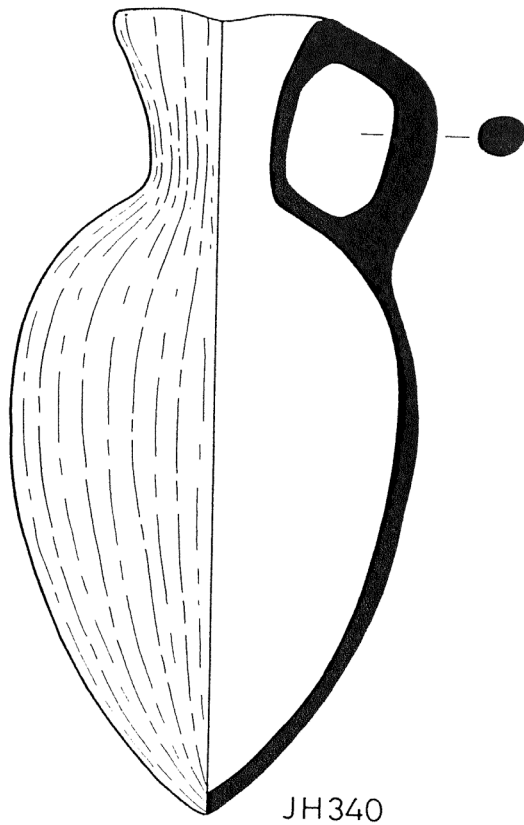
JH333

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Fig. 94: MB IIB-C Polished Juglets

JH340 (Pl. 8e) Tell el-Dab`a 324/WA1639 Red Polished Dipper Juglet I-d AI g/5 (uncertain context) D2-3; MB IIB-C NAA Provenience: Egyptian Nile alluvium	Macroscopic fabric assignment not available AII k/14, gr. 1 (burial) D3; MB IIB-C NAA Provenience: Egyptian Nile alluvium
JH382 Tell el-Dab`a 2281/WA3524 Black Polished Juglet Macroscopic fabric assignment not available AII k/14, gr. 1 (burial) D3; MB IIB-C NAA Provenience: Egyptian Nile alluvium	JH287 (not illustrated) Tell el-Dab`a 1006/WA2697 Red Polished Juglet I-d AII m/11, pl. 1 (residence?) D2; MB IIC NAA Provenience: Egyptian Nile alluvium
JH385 Tell el-Dab`a 2283/WA3525 Red Polished Juglet Macroscopic fabric assignment not available AII k/14, gr. 1 (burial) D3; MB IIB-C NAA Provenience: Egyptian Nile alluvium	JH368 (not illustrated) Tell el-Dab`a 1590/WA3085 Black Polished horizontal curved bar-handle AII l/14, pl. 2-3, secondary fill in gr. 4 (residence) D2 or earlier; MB IIC NAA Provenience: Egyptian Nile alluvium
JH387 Tell el-Dab`a 2284/WA3526 Red Polished Juglet	JH373 Tell el-Dab`a 1596/WA3089 Black Polished Bowl rim, with incised design Macroscopic fabric assignment not available AII l/14, pl. 2-3, gr. 3 (burial) D2 or earlier; MB IIC NAA Provenience: Egyptian Nile alluvium

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JH373

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Fig. 95: Polished Juglets of MB IIC and Questionable Date

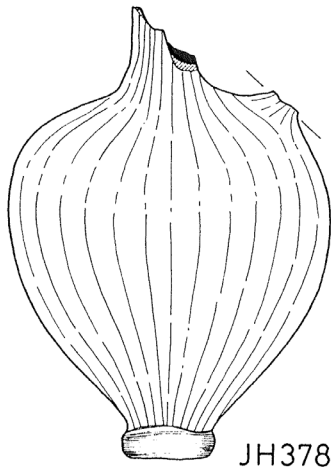
JH378
Tell el-Dab`a
3447
Red Polished Juglet, missing rim
I-d
All m/17, gr. 3 (burial)
D2; MB IIC
NAA Provenience: Fayyum-Maadi marl clay

JH100
Tell el-Dab`a
4566
Red Polished Juglet, missing rim and handle
IV-2b
All a/21 (uncertain context)
E3-F (typological dating); MB IIA-B?
NAA Provenience: most similar to Southern Palestine (ADCORR 0.4%; mean Euclidean distance 0.080)

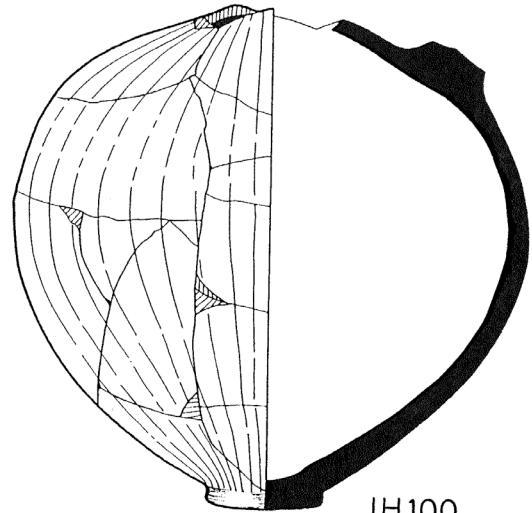
JH883
Tell el-Dab`a
4841
Black Polished Juglet
I-d
FI l/21, gr. 24 (burial)
b?; MB IIA-B?
NAA Provenience: Egyptian Nile alluvium

MB024
Tell el-Dab`a
5971E
Brown Polished Juglet, with incised design
Id or IV-b-c?
FI n/19, pl. 0-1 (residence)
d2?; MB IIA?
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

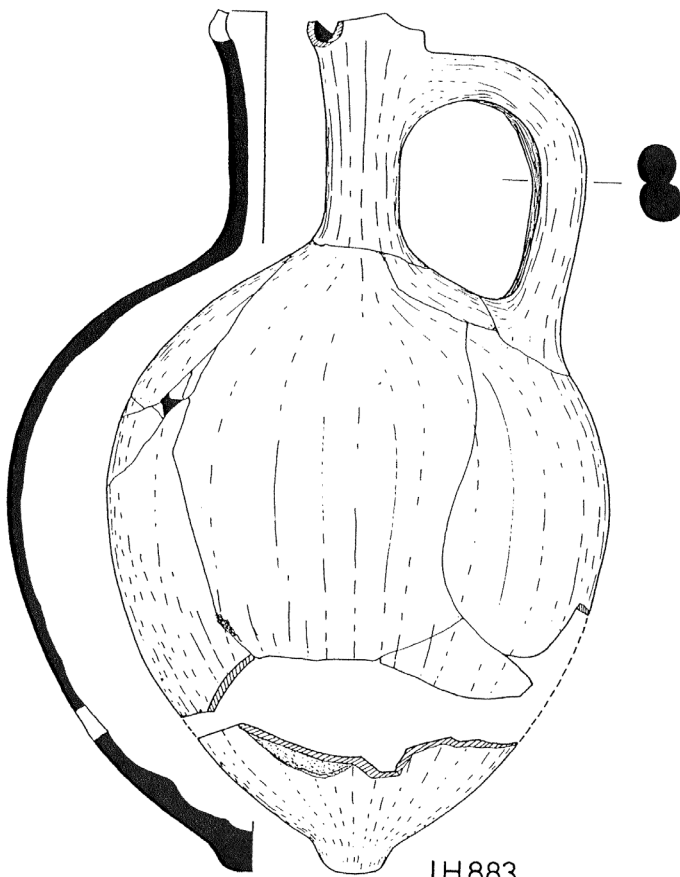
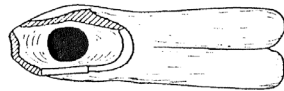
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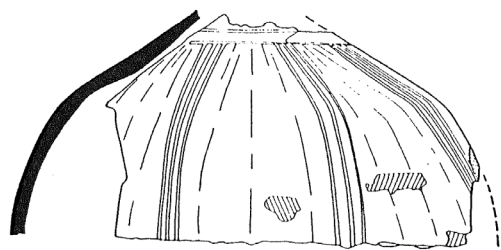
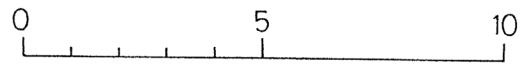
JH378



JH100



JH883



MB024

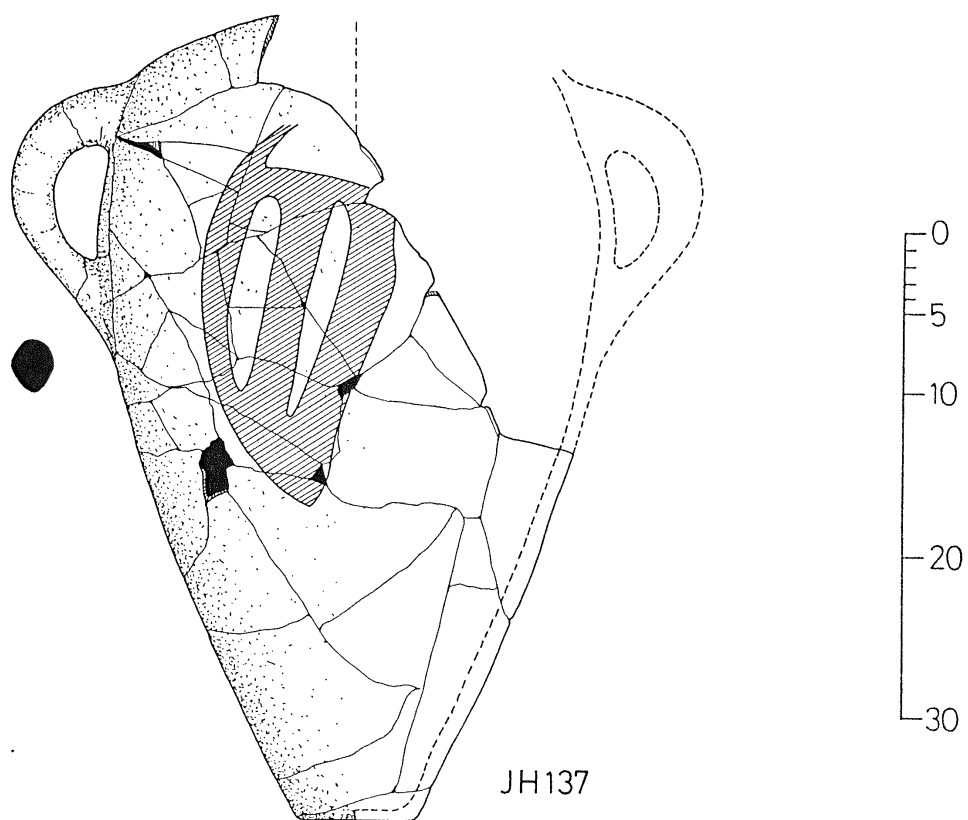
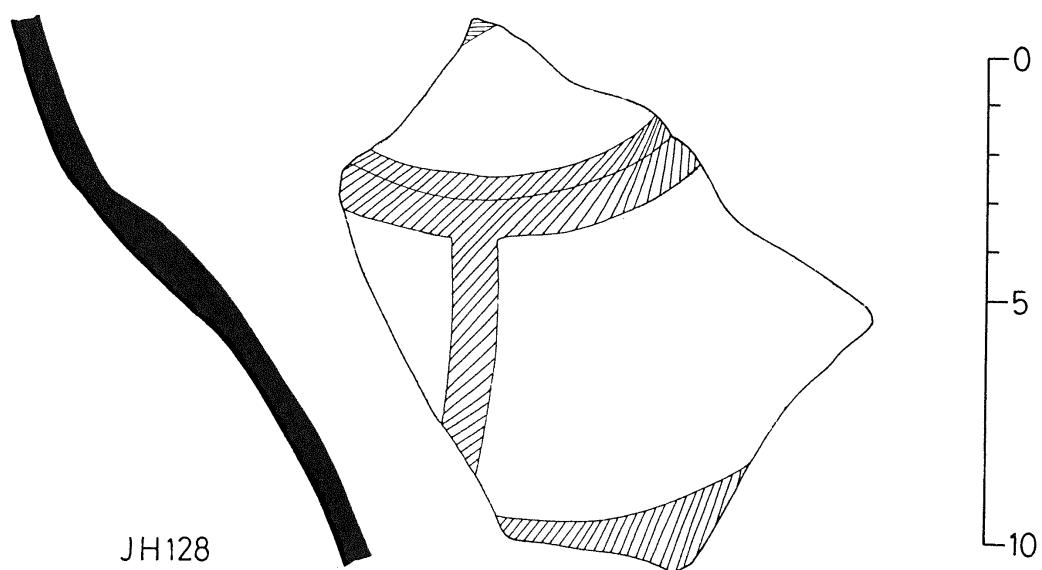
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Fig. 96: MB IIA Painted Canaanite Jar and Jar/Jug

JH128
Tell el-Dab`a
4599A
Jar or Jug shoulder sherd, red painted design
IV-2c
FI k/20 (residence?)
c-d1; MB IIA
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

JH137
Tell el-Dab`a
4637B
Canaanite Jar, complete up to upper body, red painted design
IV-2c
FI l/20, gr. 14 (burial)
c; MB IIA
NAA Provenience: ?; most similar to Ruweise JH480, of local origin (ADSTAT 0.081)

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Fig. 97: MB IIA Painted Jar

JH831 (Pl. 11a)

Tell el-Dab`a

4284 (+6114J, 3319A, 3252B, 3241B)

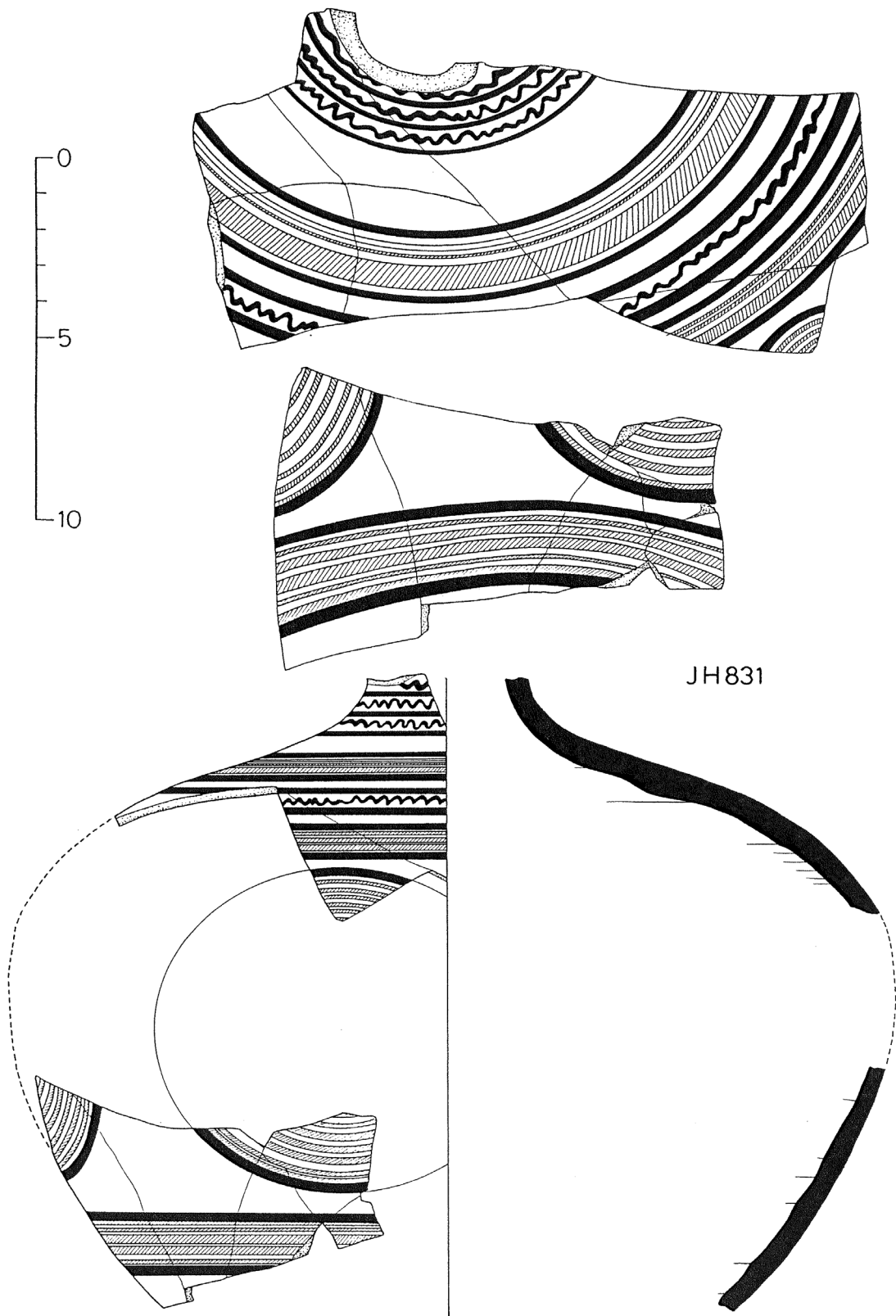
Jar body sherds, burnished (not shown on drawing), red and black painted design

IV-3b

FI j/22, pl. 5-6 (residence)

d2; MB IIA

NAA Provenience: ?; most similar to Southern Palestine (ADCORR 2.2%) and Tell el-Dab`a JH077, of uncertain provenience (ADSTAT 0.075)



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Fig. 98: MB IIA Painted Jars and Jugs

JH837 (Pl. 11c)

Tell el-Dab`a

5226A

Jar, rim and upper body, burnished, black painted design

IV-1b

FI l/20, pl. 3-4, pit 53 (residence)

d2; MB IIA

NAA Provenience: Southern Palestine

JH838

Tell el-Dab`a

5226B

Jug, missing rim, neck and body sherds, burnished, red painted design

IV-2b

FI l/20, pl. 3-4, pit 53 (residence)

d2; MB IIA

NAA Provenience: ?; most similar to Tell el-Dab`a MB027, of uncertain provenience (ADSTAT 0.075)

JH839

Tell el-Dab`a

5226H

Jar or Jug body sherd, burnished, red and black painted design

IV-1b

FI l/20, pl. 3-4, pit 53 (residence)

d2; MB IIA

NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.5%) and Tell el-Dab`a MB033, of uncertain provenience (ADSTAT 0.070)

JH893

Tell el-Dab`a

5229D

Jar or Jug body sherd, red and dark brown painted design

IV-2c

FI k/22, pl. 5 (palace)

d2; MB IIA

NAA Provenience: ?; most similar to Tell el-Dab`a JH977, of uncertain provenience (ADSTAT 0.099)

JH901 (Pl. 11b)

Tell el-Dab`a

4046J

Jar or Jug, rim and midbody, red painted design, with handle stub

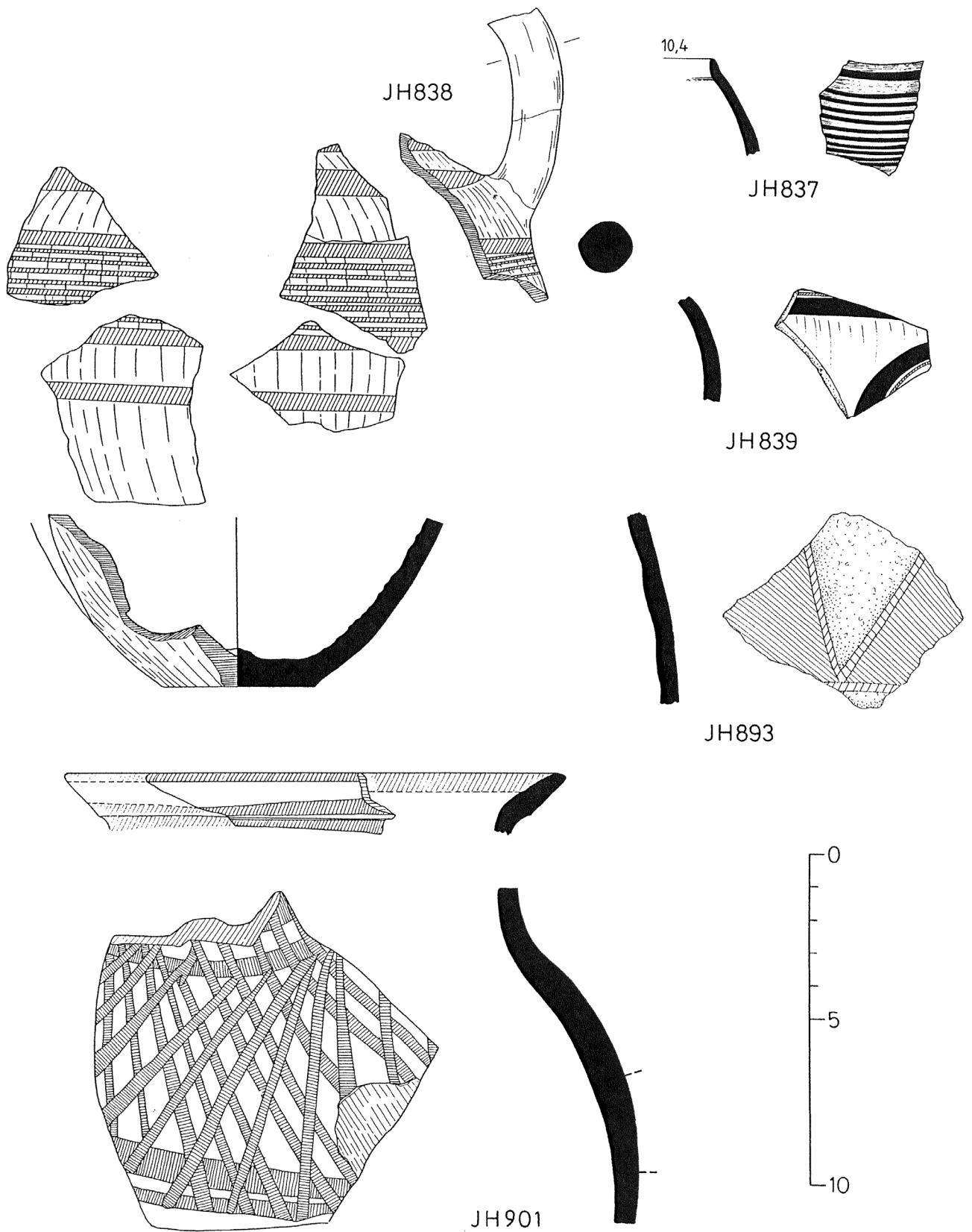
IV-2b

FI j/21, pl. 7 (residence)

d2; MB IIA

NAA Provenience: ?; no matches at mean Euclidean distance 0.1

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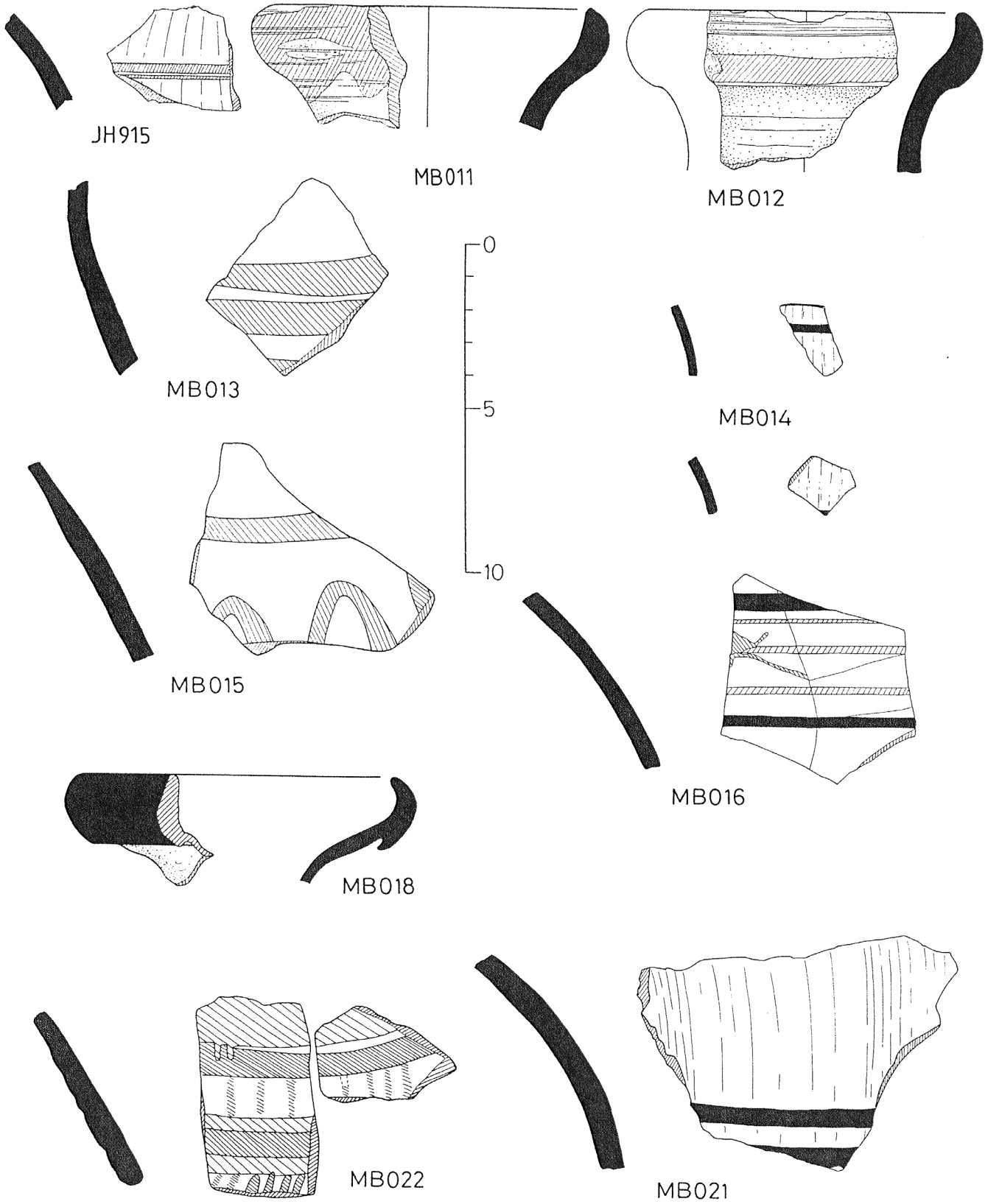


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Fig. 99: MB IIA Painted Jars/Jugs

<p>JH915 Tell el-Dab`a 2879G Jar or Jug body sherd, burnished, red and dark brown painted design IV-2b AII r/18 (residence) G; MB IIA NAA Provenience: most similar to Tell el-Dab`a JH130, import from Southern Palestine (ADSTAT 0.066)</p>	<p>MB015 Tell el-Dab`a 6115G Jar or Jug shoulder sherd, burnished (not shown on drawing), red painted design IV-2c FI j/23s, pl. 4-5 (residence) c2; MB IIA NAA Provenience: ?; most similar to Tell el-Dab`a JH781, of uncertain provenience (ADSTAT 0.082)</p>
<p>MB011 Tell el-Dab`a 6116B Jar or Jug rim, red painted design IV-2b FI l/21, pl. 3 (palace) d2; MB IIA NAA Provenience: Southern Palestine</p>	<p>MB016 (Pl. 11d) Tell el-Dab`a 4223B Jar or Jug shoulder sherd, burnished (not shown on drawing), very fugitive red and black painted design IV-3b FI i/22, pl. 6-7 (residence) d2; MB IIA NAA Provenience: ?; most similar to Southern Palestine (ADCORR 1.4%; ADSTAT 0.079)</p>
<p>MB012 Tell el-Dab`a 6115F Jug rim, burnished (not shown on drawing), red painted design IV-2b FI k/22, pl. 5 (palace) d2; MB IIA NAA Provenience: Southern Palestine</p>	<p>MB018 (Pl. 11f) Tell el-Dab`a 6115Y Jar or Jug rim, burnished (not shown on drawing), black painted design IV-2a-b FI l/19, pit 40 (palace) d1-(d2); MB IIA NAA Provenience: Southern Palestine</p>
<p>MB013 (Pl. 11d) Tell el-Dab`a 6115S Jar or Jug shoulder sherd, burnished (not shown on drawing), red painted design I-e3 FI i-j/22, gr. 29, deposit 1 (deposit in burial chamber entrance) c or earlier; MB IIA NAA Provenience: Egyptian Nile alluvium</p>	<p>MB021 Tell el-Dab`a 3336H Jar or Jug body sherds, burnished red slip, black painted design IV-b FI i/21, pl. 3 (residence) c-d; MB IIA NAA Provenience: Southern Palestine</p>
<p>MB014 Tell el-Dab`a 6115Z Juglet body sherds, burnished, black painted design IV-2b FI k/20, pl. 3 (palace) d1; MB IIA NAA Provenience: Southern Palestine</p>	<p>MB022 (Pl. 11g) Tell el-Dab`a 4937D Jar or Jug, shoulder sherds, burnished (not shown on drawing), red and dark brown painted design IV-2 or I-e3 FI k/24, pl. 4 (residence) c; MB IIA NAA Provenience: Southern Palestine</p>

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Fig. 100: MB IIA Painted Jars/Jugs

MB023

Tell el-Dab`a

6115T

Jar or Jug, body sherd, burnished, red painted design

I-e3

FI i/23, pl. 2-3 (residence)

c; MB IIA

NAA Provenience: Egyptian Nile alluvium

MB025

Tell el-Dab`a

3336A

Jar or Jug, shoulder sherd with handle stub, burnished, red and black painted design

IV-2b

FI j/20 (residence)

d2; MB IIA

NAA Provenience: Southern Palestine

MB027 (Pl. 11h)

Tell el-Dab`a

4226

Jar or Jug midbody, burnished, red and black painted design

IV-2b

FI i/22, pl. 7-8 (residence)

d2; MB IIA

NAA Provenience: most similar to Tell el-Dab`a JH083, import from Southern Palestine (ADSTAT 0.058)

MB028 (Pl. 12a)

Tell el-Dab`a

6114M

Jar or Jug, shoulder sherd with handle stub, burnished, red and black painted design

IV-2c

AII p/16, pl. 2-3 (residence)

G; MB IIA

NAA Provenience: ?; most similar to Tell el-Dab`a MB031, of uncertain provenience (ADSTAT 0.065)

MB029 (Pl. 12b)

Tell el-Dab`a

6114E

Jar or Jug, rim and upper body, burnished, red and black painted design

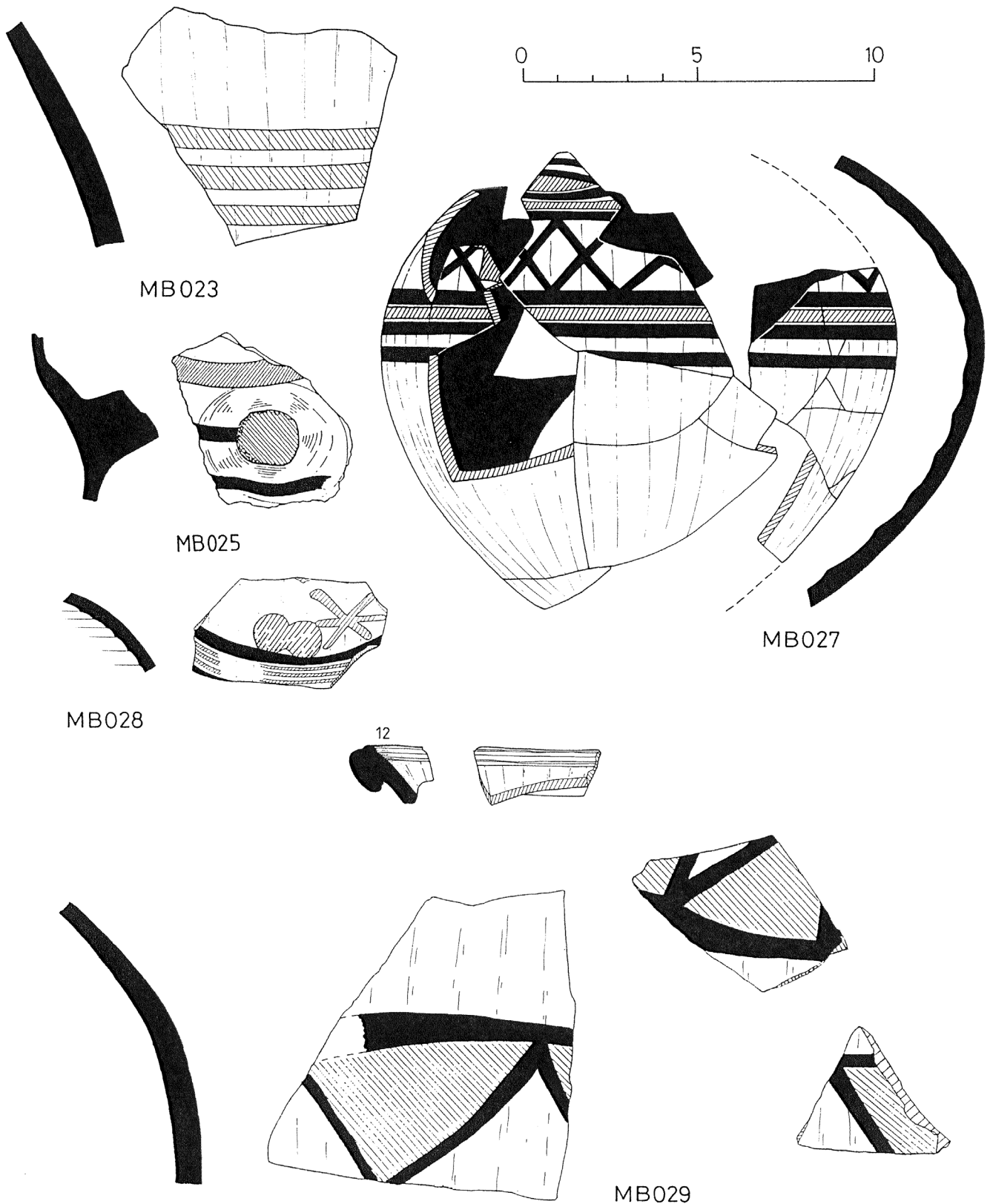
IV-1c

FI l/20, pl. 1-2 (residence)

d1-d2; MB IIA

NAA Provenience: Southern Palestine

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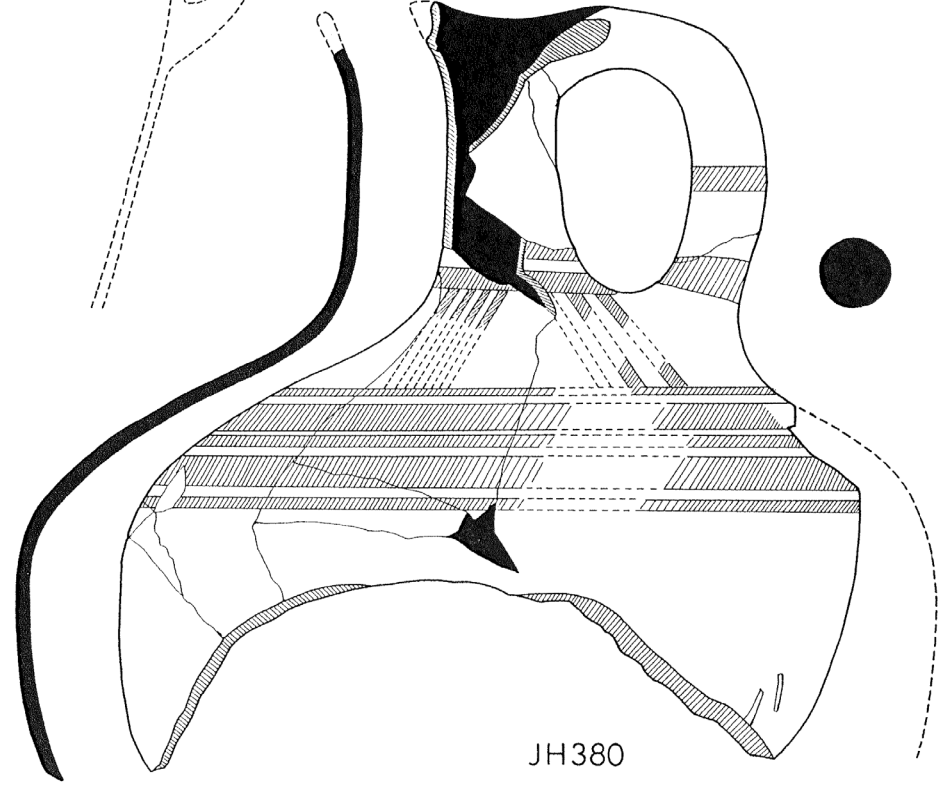
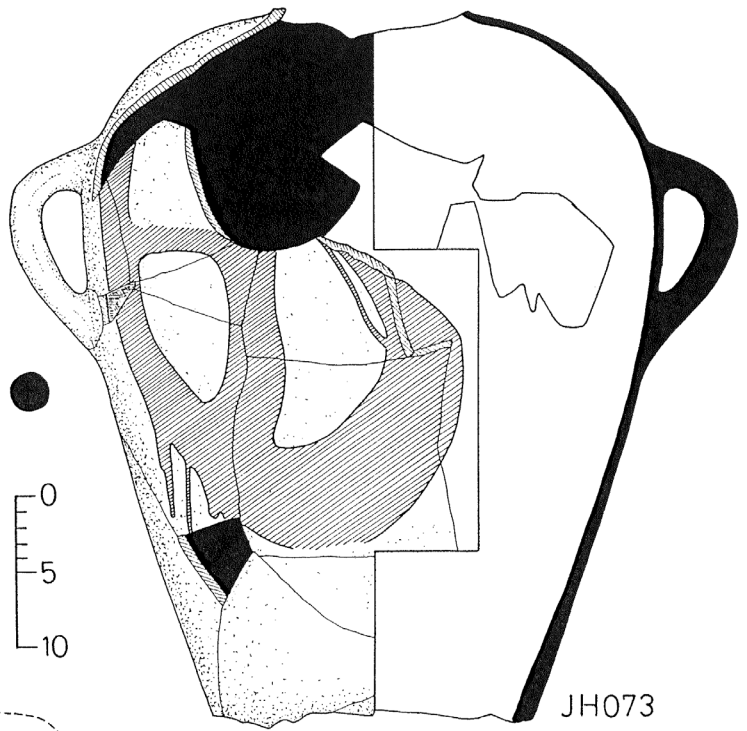
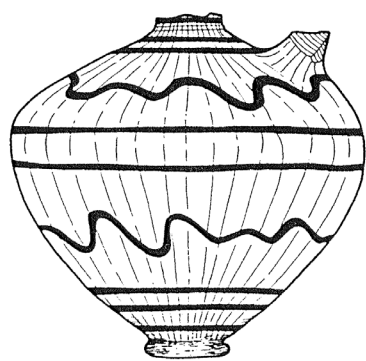
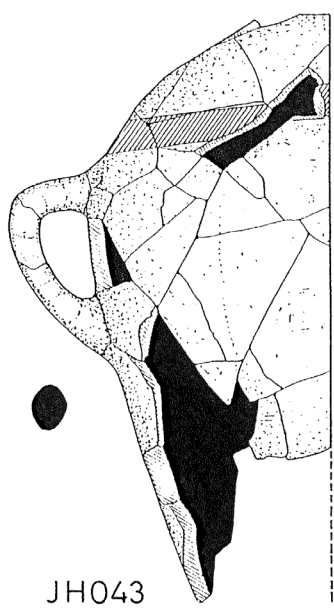
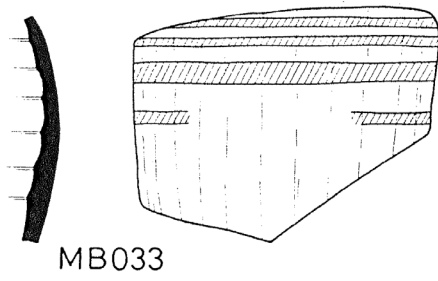
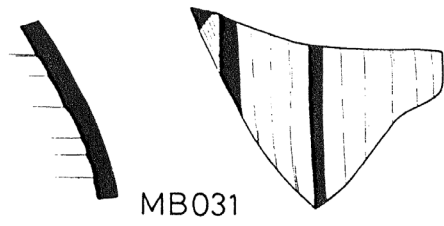


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Fig. 101: MB IIA Painted Jars/Jugs, IIA-B Canaanite Jars and Juglet, and IIB Jug

- MB031
Tell el-Dab`a
6114I
Jar or Jug shoulder sherd, burnished, red and black painted design
IV-2a
FI i/22, pl. 6-7 (residence)
d2; MB IIA
NAA Provenience: ?; most similar to Tell el-Dab`a MB033, of uncertain provenience (ADSTAT 0.061); also similar to Tell el-Dab`a MB022, import from Southern Palestine (ADSTAT 0.076)
- MB033
Tell el-Dab`a
6114O
Jar or Jug body sherd, burnished, red painted design
IV-2c?
FI m/18, pl. 3 (palace)
d1; MB IIA
NAA Provenience: ?; most similar to Tell el-Dab`a MB031, of uncertain provenience (ADSTAT 0.061); also similar to Tell el-Dab`a JH372, import from Southern Palestine (ADSTAT 0.078)
- JH043
Tell el-Dab`a
4551L
Canaanite Jar midbody, red painted design
IV-2c
FI k/23, pl. 3 (residence)
b3; MB IIA-B
NAA Provenience: Southern Palestine
- JH073
Tell el-Dab`a
2497E
Canaanite Jar midbody, red painted design
IV-1c
AII m/10 (residence)
E3-F; MB IIA-B
NAA Provenience: Southern Palestine
- JH318 (Pl. 13a)
Tell el-Dab`a
2395/WA3595
Juglet, missing rim and neck, burnished, black painted design
I-d
AII n/10, pl. 5, probably foundation offering
F or earlier; MB IIA-B
NAA Provenience: Egyptian Nile alluvium
- JH380
Tell el-Dab`a
3479
Jug, missing rim and lower body, red painted design
IV-3b
AII n/19, offering pit 1, near gr. 4 (burial)
E3; MB IIB
NAA Provenience: ?; no matches at mean Euclidean distance 0.1

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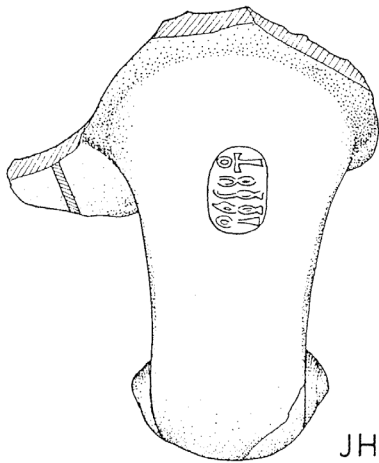
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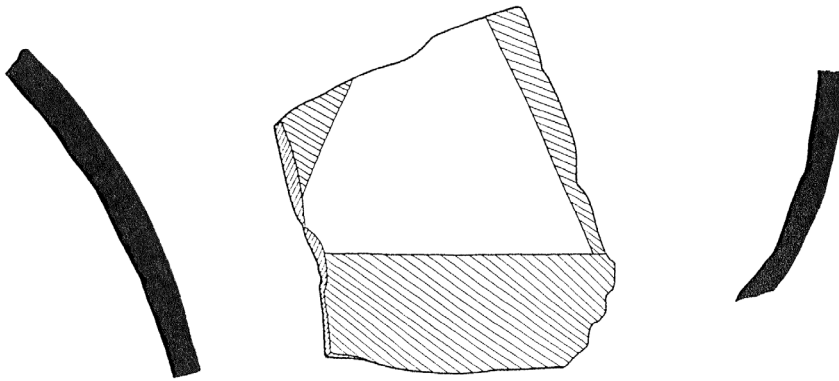
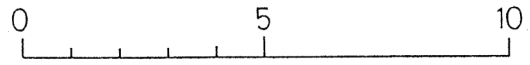
Fig. 102: MB IIA-B Painted Jug and Canaanite Jar Handle, and IIB Jars/Jugs and Juglets

JH873 (Pl. 4b)	AII n/12, pl. 3 (residence)
Tell el-Dab`a	E1; MB IIB
4947	NAA Provenience: Egyptian Nile alluvium
Canaanite Jar handle, red painted design, with scarab impression	JH317 (Pl. 13b)
IV-2c	Tell el-Dab`a (Tell el-Dab`a V: fig. 114.1)
FI k/24, pit 52 (residence)	2069/WA3392
b3; MB IIA-B	Juglet, missing rim and base, burnished, red painted design
NAA Provenience: Southern Palestine	IV-3b
	AII o/12, pl. 4-5, gr. 8 (burial)
MB020	E2; MB IIB
Tell el-Dab`a	NAA Provenience: Egyptian Nile alluvium
6115I	
Jar or Jug shoulder sherd, red painted design	JH346
IV-2b	Tell el-Dab`a (Bietak 1968: fig. 8.398)
FI j/23S, below gr. 24 (residence?)	398/WA2312
b2-3; MB IIA-B	Juglet, missing rim, burnished, black painted design
NAA Provenience: Southern Palestine	AI g/3, gr. 1 (burial)
	D3-E1: MB IIB
JH285 (not illustrated)	NAA Provenience: ?; no matches at mean Euclidean distance 0.1
Tell el-Dab`a	
906/WA2653	JH826
Body sherd, black painted design	Tell el-Dab`a
I-e3	4192E
AII m/12, pl. 4 (residence)	Jar or Jug body sherds, burnished (not shown on drawing), black painted design
E3; MB IIB	IV-3b or VI
NAA Provenience: Egyptian Nile alluvium	FI i/22 (residence)
	b2; MB IIB
JH295 (Pl. 12c)	NAA Provenience: ?; no matches at mean Euclidean distance 0.1
Tell el-Dab`a (Tell el-Dab`a V: fig. 238.8)	
1450/WA2994	
Jar or Jug body sherd, burnished, red painted design	
I-d	

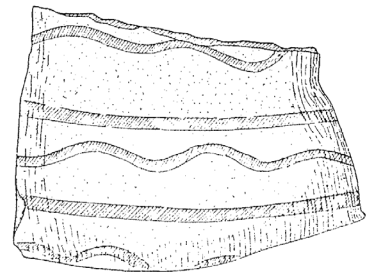
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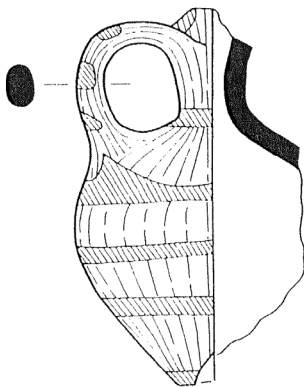
JH873



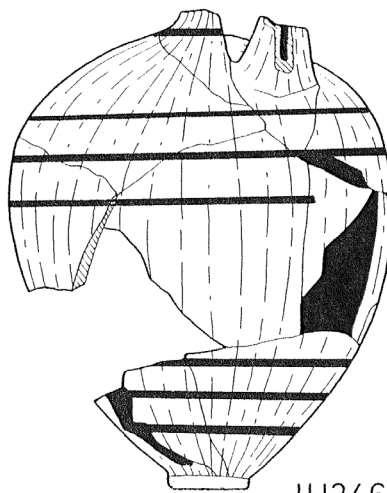
MB020



JH295



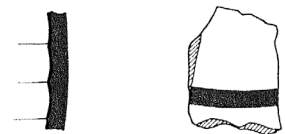
JH317



JH346



JH826

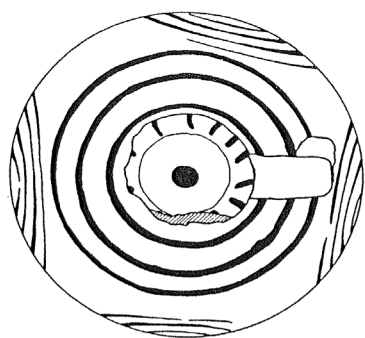


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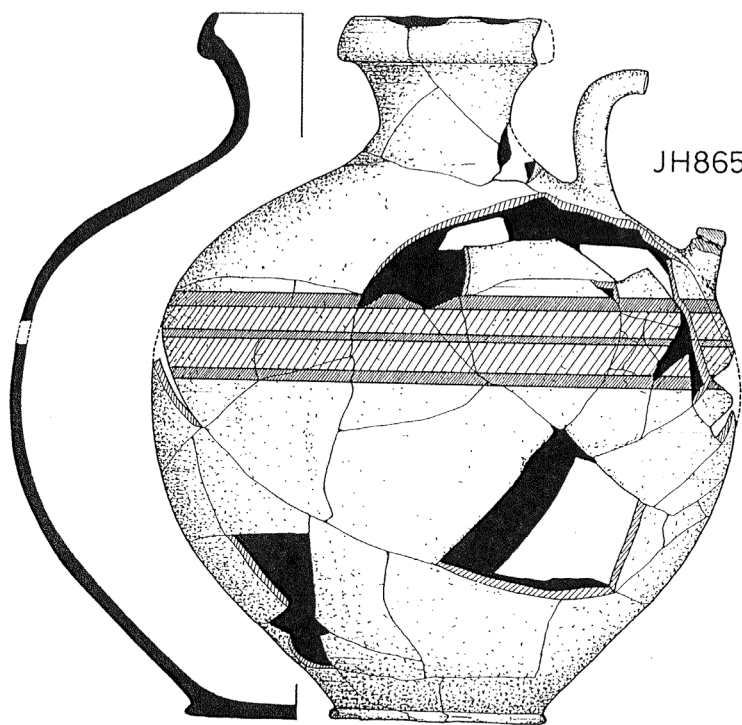
Fig. 103: MB IIB Painted Jars/Jugs and Juglets

JH864 (Pl. 13c) Tell el-Dab`a 4481 Juglet, burnished, black painted design IV-d FI k/23, gr. 16 (burial) a2-b1; MB IIB NAA Provenience: Egyptian Nile alluvium	IV-3b AII l/17, gr. 6 (burial) E1; MB IIB NAA Provenience: Egyptian Nile alluvium
JH865 Tell el-Dab`a 4406 Jug, burnished (not shown on drawing), red and brown painted design IV-2b-c FI j/23, gr. 24 (burial) b2; MB IIB NAA Provenience: Southern Palestine	JH916 Tell el-Dab`a 3423C Jar or Jug body sherd, red painted design IV-2b or VI AII, p/20, gr. 3 (burial) E1; MB IIB NAA Provenience: ?; no matches at mean Euclidean distance 0.1
JH899 (Pl. 7e) Tell el-Dab`a 4128F Jar or Jug body sherd, burnished (not shown on drawing), red painted design VI AII n/19 (residence) E1; MB IIB NAA Provenience: ?; no matches at mean Euclidean distance 0.1	MB010 Tell el-Dab`a 4128E Jar or Jug, shoulder body sherd, burnished, black painted design IV-1b AII n/19, pl. 2-3 (residence) E1-2; MB IIB NAA Provenience: ?; no matches at mean Euclidean distance 0.1
JH907 Tell el-Dab`a 4108F Jar or Jug body sherd, burnished (not shown on drawing), red painted design	MB017 (Pl. 12d) Tell el-Dab`a 3453C/K1997 Jar, shoulder and neck, burnished, black painted design I-d? AII m/18, pl. 2 (residence) E1; MB IIB NAA Provenience: Egyptian Nile alluvium

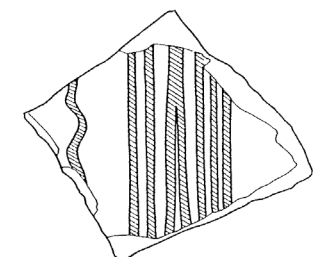
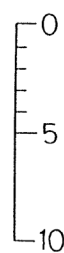
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JH864



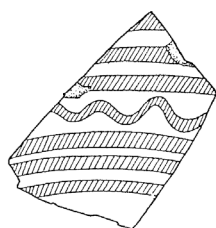
JH865



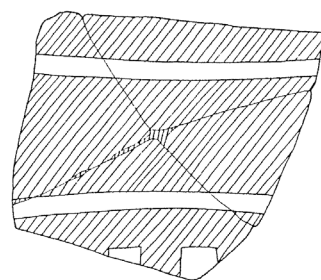
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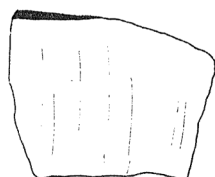
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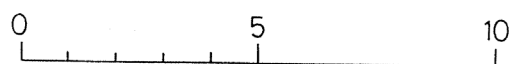
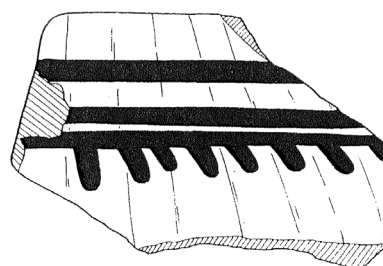
JH916



MB010



MB017



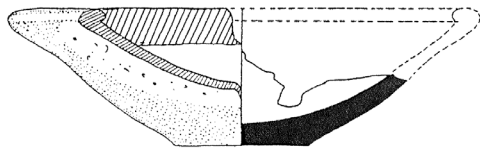
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Fig. 104: MB IIB-C Painted Platter Bowl, Jars/Jugs, and Juglets

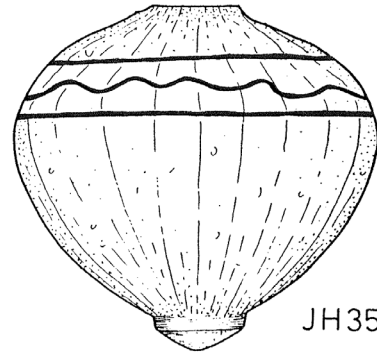
JH328 Tell el-Dab`a 2339/WA3561 Platter Bowl, red painted design II-b AII m/15, gr. 3 (burial) D3; MB IIB-C NAA Provenience: Egyptian Nile alluvium	FI j/21, pl. 1, pit 1 (residence?) a2-b1; MB IIB-C NAA Provenience: Egyptian Nile alluvium
JH353 Tell el-Dab`a 299/WA2262 Juglet, missing rim and neck, burnished, black painted design AI g/3, pl. 3 (residence) D3-E1; MB IIB-C NAA Provenience: Egyptian Nile alluvium	MB026 Tell el-Dab`a 3392A Juglet, burnished (not shown on drawing), red painted design IV-2b FI i/20, pl. 1, gr. 2 (burial) a2; MB IIB-C NAA Provenience: Egyptian Nile alluvium
JH822 (Pl. 13d) Tell el-Dab`a 5202 Juglet, burnished (not shown on drawing), red painted design IV-3b FI k/23s, gr. 4 (burial) a2; MB IIB-C NAA Provenience: ?; no matches at mean Euclidean distance 0.1	MB030 Tell el-Dab`a 6114K Jar or Jug, shoulder, burnished (not shown on drawing), red and black painted design IV-2a or VI AII l/17, pl. 2 (residence) D3; MB IIB-C NAA Provenience: Cyprus
JH897 Tell el-Dab`a 3301A Juglet, missing rim, burnished (not shown on drawing), red painted design IV-2b	MB032 (Pl. 12e) Tell el-Dab`a 6114L Jar or Jug, body sherd, burnished, red painted design IV-2a AII l/17, above and near gr. 12 (burial?) D3; MB IIB-C NAA Provenience: Egyptian Nile alluvium

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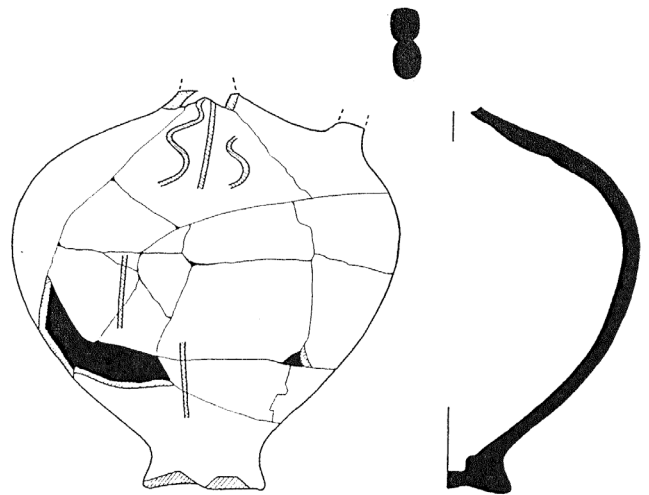
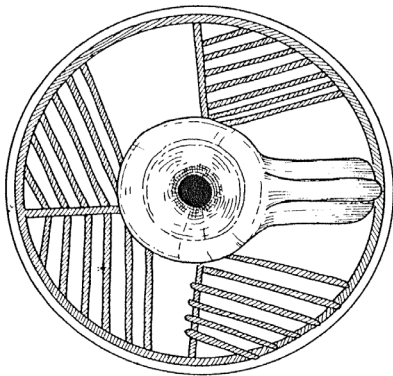
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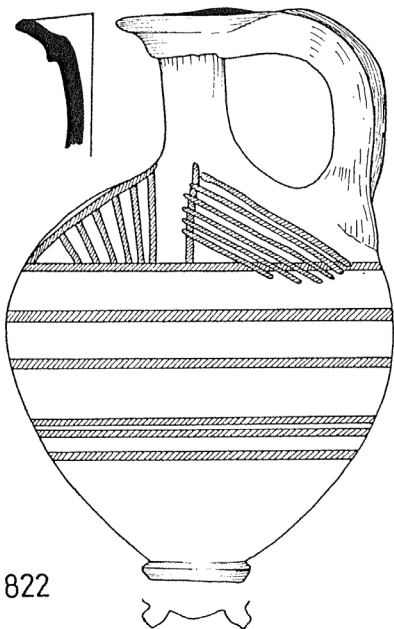
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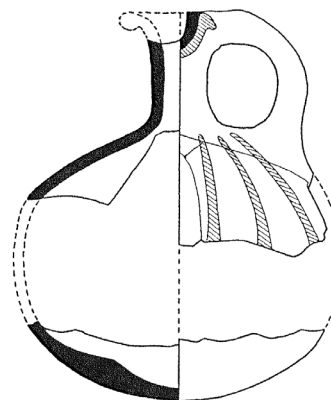
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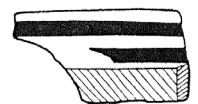
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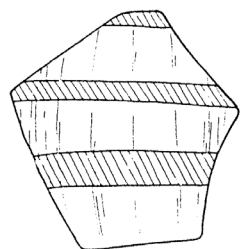
JH822



MB 026



MB 030



MB 032

0 5 10

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Fig. 105: Painted Jars/Jugs, Jug, and Juglet of Questionable Date

JH331 (Pl. 12e)

Tell el-Dab`a

2657

Tell el-`Ajjul Bichrome Jug body sherd, burnished (not shown on drawing), red and black painted design

VI

AI e/24, pl. 1-2 (residence)

D2?; MB IIC?

NAA Provenience: Egyptian Nile alluvium

JH905

Tell el-Dab`a

4138E

Bowl or Jar/Jug, rim and body sherd, burnished, incised and red painted design

I-d

AII l/17, pl. 6 (residence)

G?; MB IIA?

NAA Provenience: Southern Palestine

MB019

Tell el-Dab`a

2680E

Juglet, shoulder sherd with handle stub, burnished white slip, black painted design

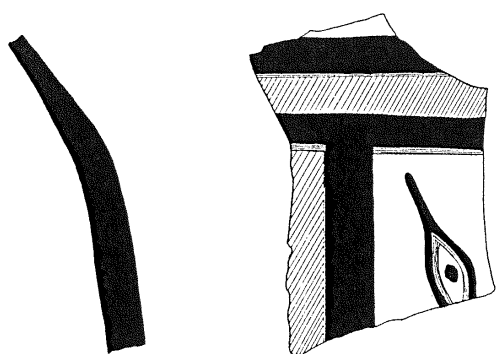
IV-2b or VI

AII o/16, modern sebak pit (Bietak 1979: 247, n. 4) (residence)

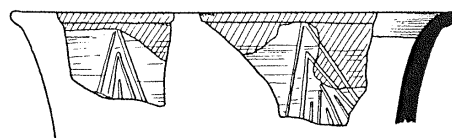
Undated

NAA Provenience: ?; no matches at mean Euclidean distance 0.1

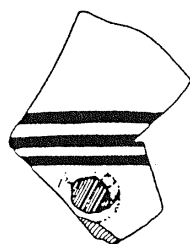
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JH331



JH905



MB019

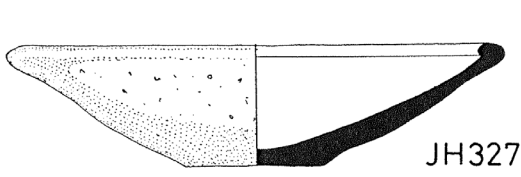


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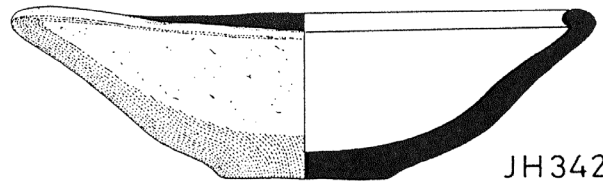
Fig. 106: MBA Miscellaneous Platter Bowls, Deep Bowls, and Cups

JH327	No context
Tell el-Dab`a	E1; MB IIB
2337/WA3559	NAA Provenience: Egyptian Nile alluvium
Platter Bowl, red slip	
I-b2	JH292
AII m/15, gr. 3 (burial)	Tell el-Dab`a (Tell el-Dab`a V: fig. 257.4)
D3; MB IIC	1314/WA2898
NAA Provenience: Egyptian Nile alluvium	Deep Bowl, upper body
	IV-3c
JH342 (Pl. 14a)	AII n/11, gr. 4 (burial)
Tell el-Dab`a	D3; MB IIC
839/WA2609	NAA Provenience: ?; most similar to Tell el-Dab`a JH354,
Platter Bowl, red slip	import from Southern Palestine (ADSTAT 0.093)
Macroscopic fabric assignment not available	
AIII, pl. 2-3, undefined tomb	JH718 (Pl. 14c)
D3-E1; MB IIB-C	Tell el-Dab`a
NAA Provenience: Egyptian Nile alluvium	4974
	Cup
JH861 (Pl. 14b)	II-b
Tell el-Dab`a	FI k/21s, gr. 24 (burial)
4879	b2; MB IIB
Platter Bowl	NAA Provenience: Egyptian Nile alluvium
I-e3	
FI l/22, gr. 28 (burial)	JH719
b3-c; MB IIA-B	Tell el-Dab`a
NAA Provenience: Egyptian Nile alluvium	4975
	Cup
JH677	I-b2
Tell el-Dab`a	FI k/21s, gr. 24 (burial)
3355	b2; MB IIB
Platter Bowl rim	NAA Provenience: Egyptian Nile alluvium
I-d	

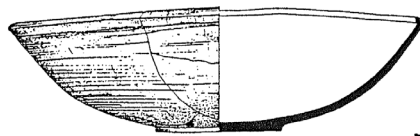
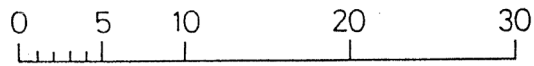
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JH327



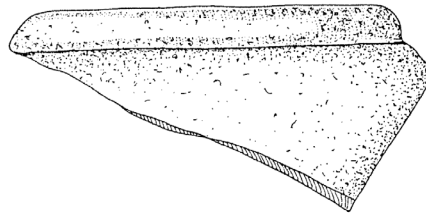
JH342



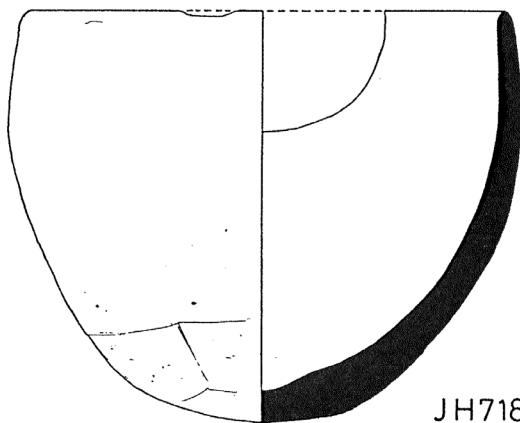
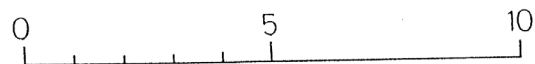
JH861



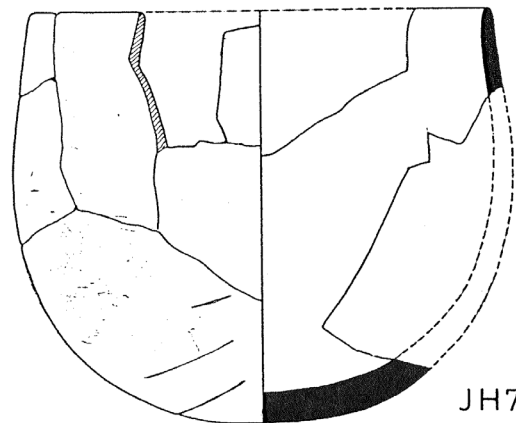
JH677



JH292



JH718



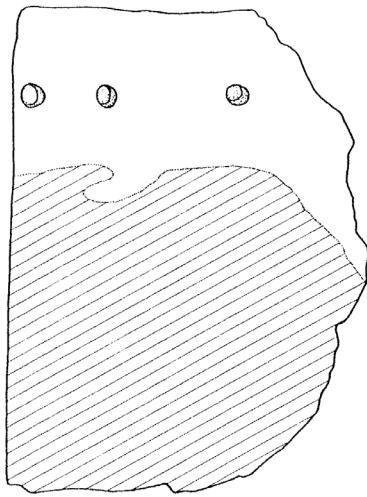
JH719

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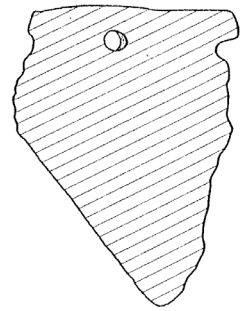
Fig. 107: MBA Miscellaneous Cooking Pots

JH126 Tell el-Dab`a K2817 Flat-bottomed Cooking Pot rim, with holes punched partly through sidewall below exterior rim, exfoliated surface I-3e FI I/20, pl. 2-3, filling in pit 40, west balk (palace) d1; MB IIA NAA Provenience: ?; no matches at mean Euclidean distance 0.1	FI i/22, pl. 0-1 (residence) b1; MB IIB NAA Provenience: most similar to Egyptian Nile alluvium (ADCORR 0.3%; ADSTAT 0.068)
JH127 Tell el-Dab`a K2817 Flat-bottomed Cooking Pot rim, with holes punched through sidewall below rim, exfoliated surface I-3e FI I/20, pl. 2-3, filling in pit 40, west balk (palace) d1; MB IIA NAA Provenience: Egyptian Nile alluvium	JH793 Tell el-Dab`a K995(1) Flat-bottomed Cooking Pot rim I-c AII p/18, pl. 2-3 (residence) G-H; MB IIA NAA Provenience: Egyptian Nile alluvium
JH155 Tell el-Dab`a K598 Flat-bottomed Cooking Pot rim, with holes punched partly through sidewall below exterior rim I-3e AII o/15, pl. 4 (residence) G; MB IIA NAA Provenience: Egyptian Nile alluvium	JH668 Tell el-Dab`a Hole-mouth Cooking Pot or Deep Bowl rim I-d No context d1-2; MB IIA NAA Provenience: Egyptian Nile alluvium
JH282 Tell el-Dab`a 769/WA2571 Flat-bottomed Cooking Pot base I-3e AII m/10, pl. 4-5 (residence) F-G; MB IIA-B NAA Provenience: most similar to Tell el-Dab`a JH303, of local Nile alluvial origin (ADSTAT 0.064)	JH670 Tell el-Dab`a Hole-mouth Cooking Pot or Deep Bowl rim I-d No context d1-2; MB IIA NAA Provenience: Egyptian Nile alluvium
JH735 Tell el-Dab`a K2122(2) Flat-bottomed Cooking Pot rim I-c	JH671 Tell el-Dab`a Hole-mouth Cooking Pot or Deep Bowl rim I-d No context d1-2; MB IIA NAA Provenience: Egyptian Nile alluvium
	JH675 Tell el-Dab`a Hole-mouth Cooking Pot or Deep Bowl rim I-d No context b3; MB IIA-B NAA Provenience: Egyptian Nile alluvium

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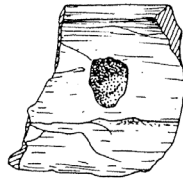
JH126



JH127



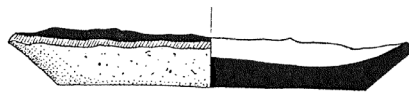
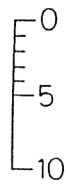
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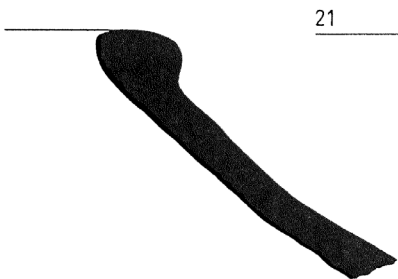
JH735



JH793



JH282



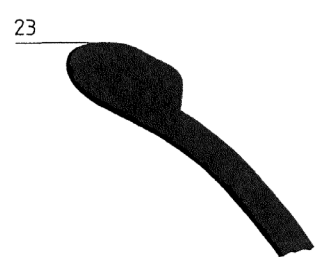
JH668



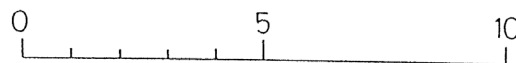
JH670



JH671



JH675

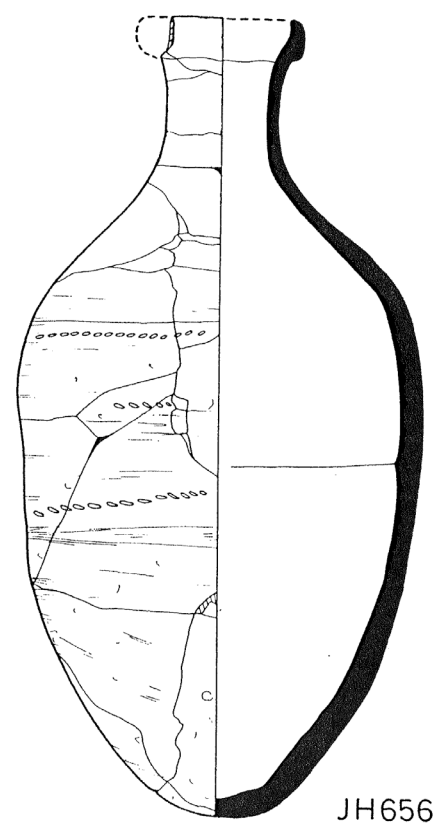
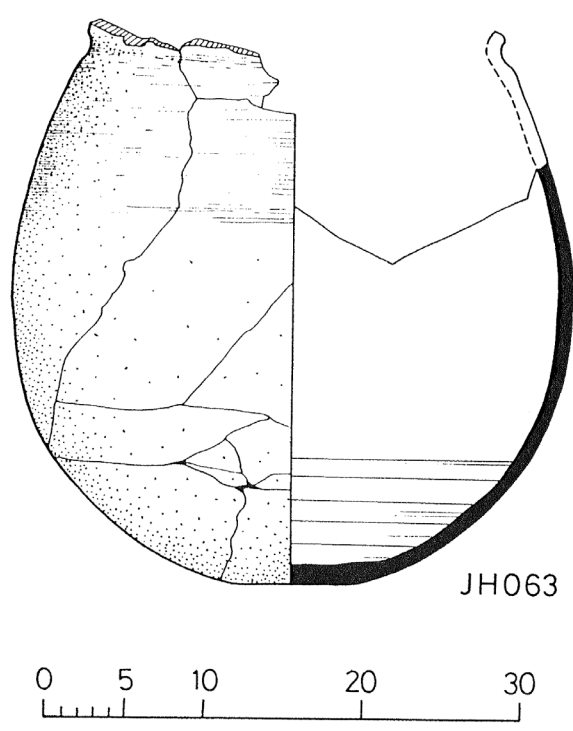
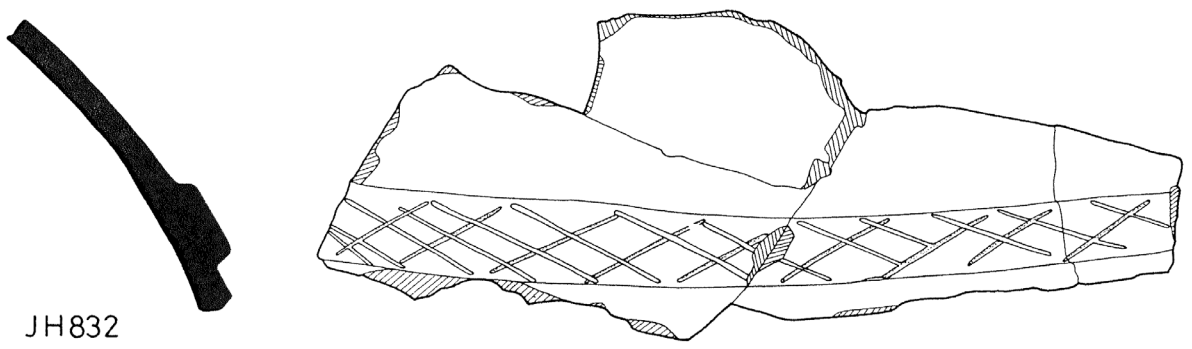
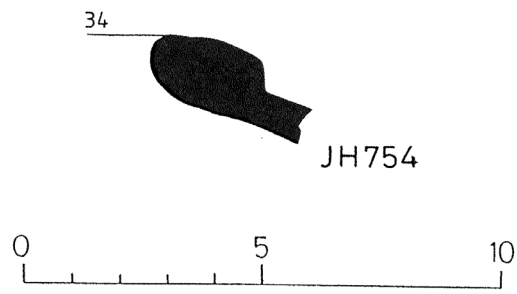


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Fig. 108: MBA Miscellaneous Cooking Pots, Jar, and Beerjar

JH754 Tell el-Dab`a K971(2) Hole-mouth Cooking Pot rim I-e3 AII n/18 (residence) D2-3; MB IIC NAA Provenience: Egyptian Nile alluvium	JH766 (not illustrated) Tell el-Dab`a K2036(1) Cooking Pot rim Macroscopic fabric assignment not available FI j/20 (palace) d?; MB IIA? NAA Provenience: Egyptian Nile alluvium
JH778 Tell el-Dab`a K626a,b(1) Hole-mouth Cooking Pot rim I-c-d AII m/16 (residence) E2-F; MB IIA-B NAA Provenience: most similar to Egyptian Nile alluvium (ADCORR 0.6%; ADSTAT 0.065)	JH769 (not illustrated) Tell el-Dab`a K1389(2) Cooking Pot rim I-c AII m/17, pl. 7-8 (residence) G; MB IIA NAA Provenience: Egyptian Nile alluvium
JH780 Tell el-Dab`a K626a,b(3) Hole-mouth Cooking Pot rim I-c AII m/16 (residence) E2-F; MB IIA-B NAA Provenience: Egyptian Nile alluvium	JH063 Tell el-Dab`a 4552D Jar I-e3 AII l/17, pl. 6 (residence) E3; MB IIB NAA Provenience: Egyptian Nile alluvium
JH157 (not illustrated) Tell el-Dab`a K420 Cooking Pot, body sherd I-e3 AII m/14, pl. 6-7 (residence) E3; MB IIB NAA Provenience: Egyptian Nile alluvium	JH656 Tell el-Dab`a 4771 Beerjar I-c FI k/24, pl. 3-4, pit 52 (residence) b3; MB IIA-B NAA Provenience: Egyptian Nile alluvium

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Fig. 109: MBA Miscellaneous Jars

JH345 (Pl. 14e)

Tell el-Dab`a

381/WA2308

Miniature Jar

I-b2

AI g/4, pl. 3, gr. 3 (burial)

E1; MB IIB

NAA Provenience: Egyptian Nile alluvium

JH658 (Pl. 15a)

Tell el-Dab`a

4773

Jar, with incised mark

II-b

FI k/24, pl. 3 (residence)

c; MB IIA

NAA Provenience: most similar to Tell el-Dab`a JH672, import from Fayyum-Maadi (ADSTAT 0.070)

JH616

Tell el-Dab`a

6448

Jar, complete up to upper body

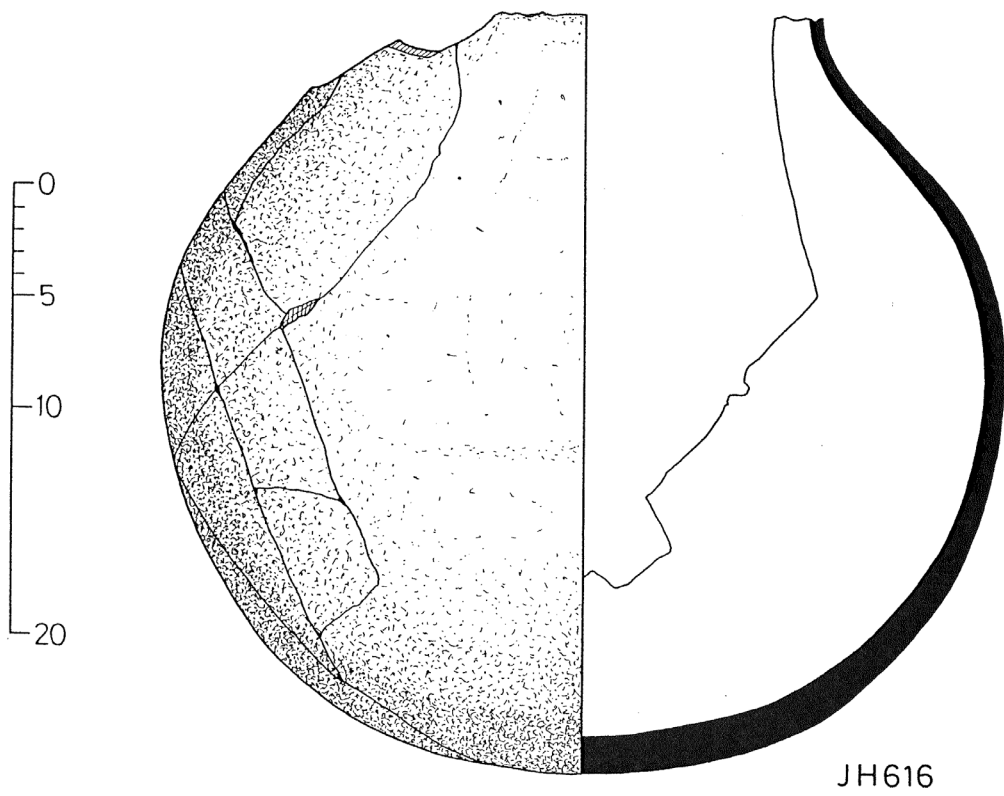
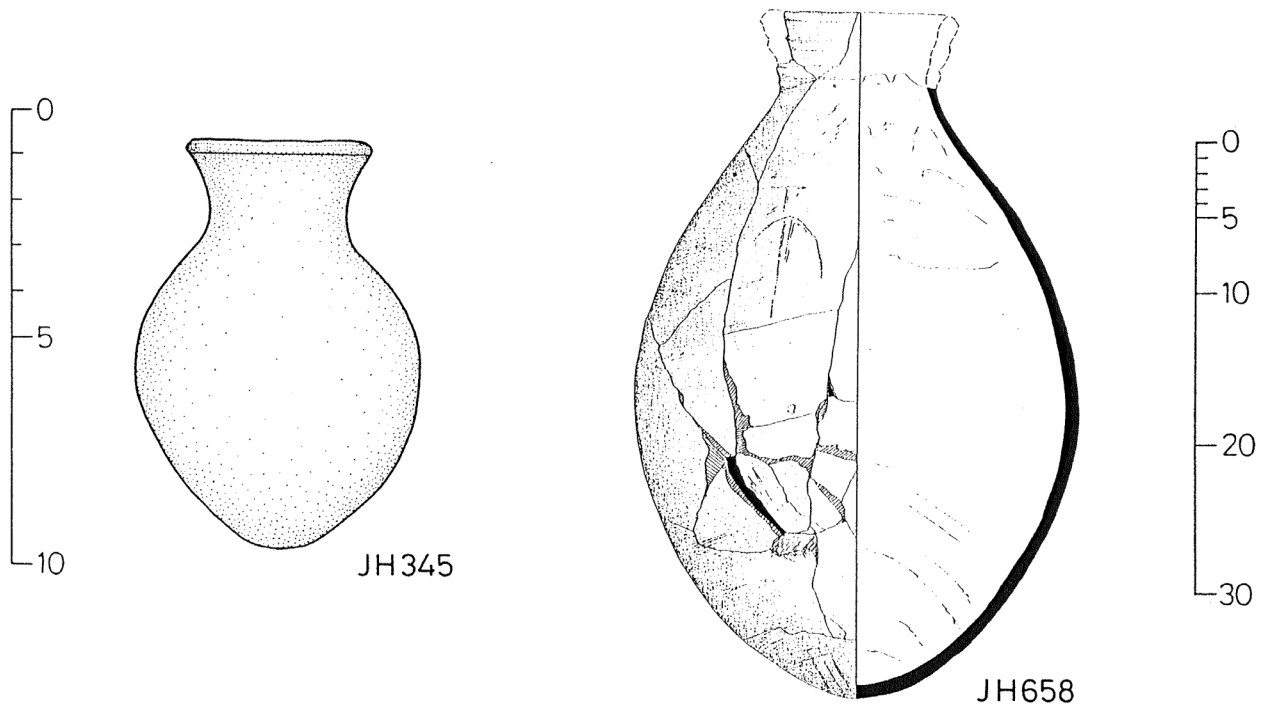
I-e2

AII k/17, pit 3 (residence)

D2-3; MB IIC

NAA Provenience: Southern Palestine

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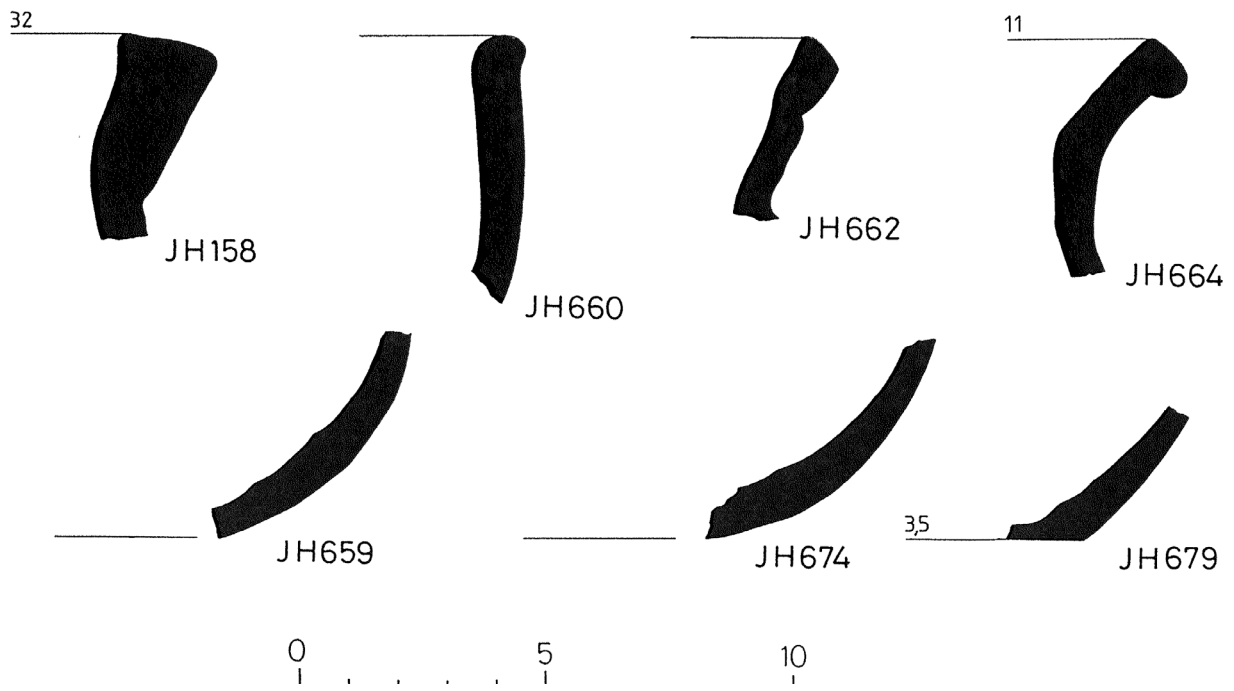
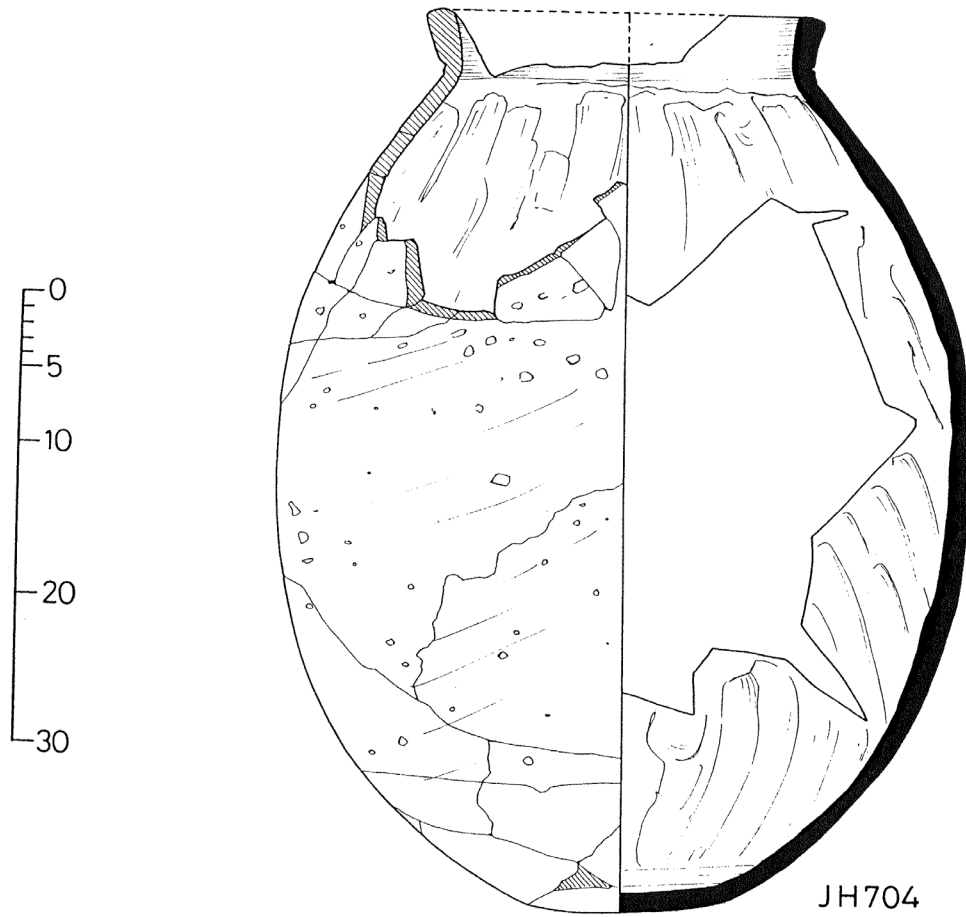


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Fig. 110: MBA Miscellaneous Jars

JH704 (Pl. 15b) Tell el-Dab`a 4783 Jar II-b FI k/23, pl. 3 (residence) b3; MB IIA-B NAA Provenience: Fayyum-Maadi	JH664 Tell el-Dab`a Jar rim I-a No context b2; MB IIB NAA Provenience: Egyptian Nile alluvium
JH158 Tell el-Dab`a K383 Jar rim II-b AII n/15 (residence) E3; MB IIB NAA Provenience: Fayyum-Maadi	JH659 Tell el-Dab`a Jar or Jug base I-a No context c; MB IIA NAA Provenience: Egyptian Nile alluvium
JH660 Tell el-Dab`a Jar rim I-d No context c; MB IIA NAA Provenience: Egyptian Nile alluvium	JH674 Tell el-Dab`a Jar or Jug base I-a No context b3; MB IIA-B NAA Provenience: Egyptian Nile alluvium
JH662 Tell el-Dab`a Jar rim II-b No context c; MB IIA NAA Provenience: most similar to Kahun JH186 and JH190, of local Fayyum-Maadi marl origin (ADSTAT 0.051)	JH679 Tell el-Dab`a Jar or Jug base I-d No context D2; MB IIC NAA Provenience: Egyptian Nile alluvium

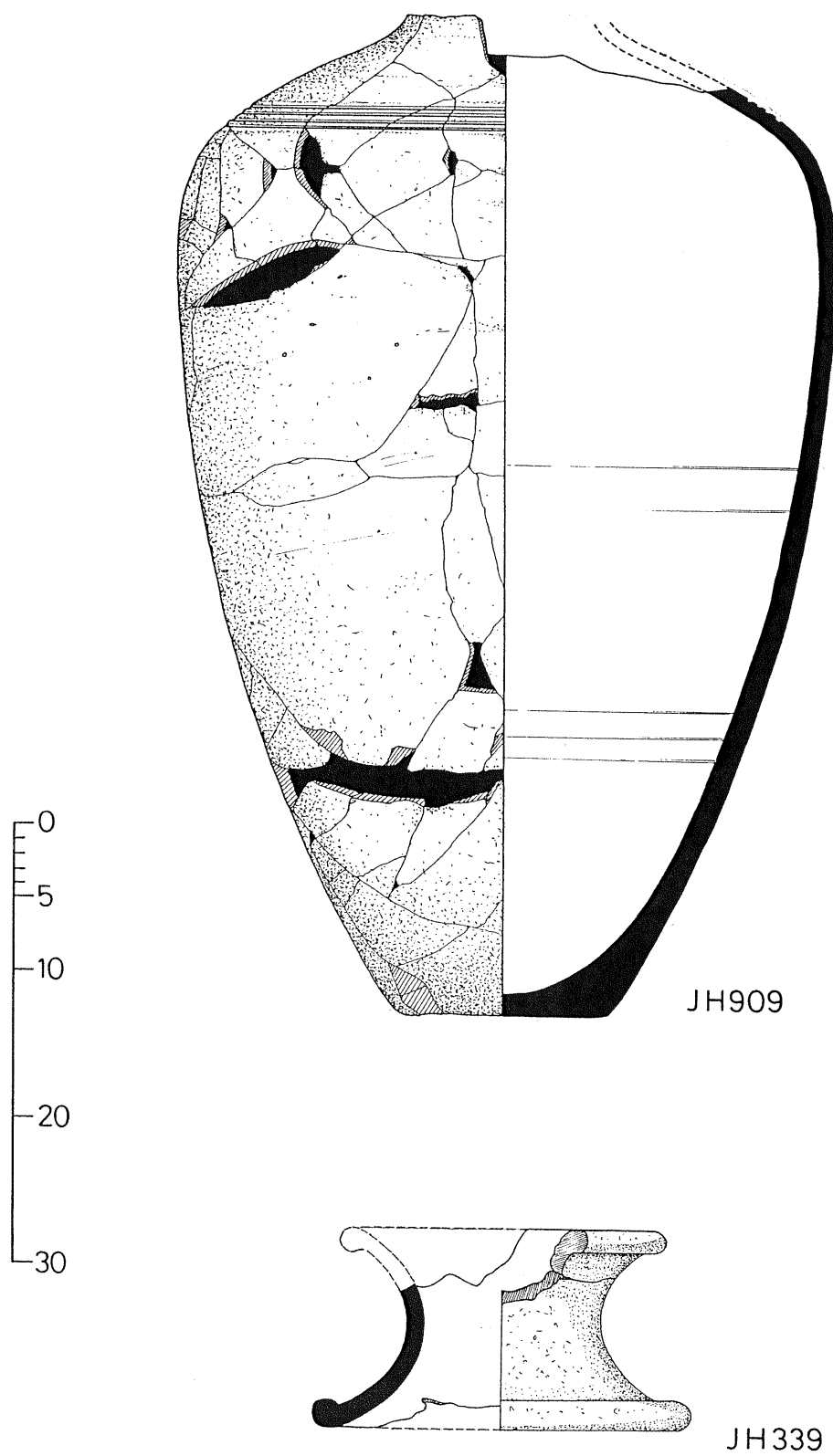
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Fig. 111: MBA Miscellaneous Jar and Ring Stand

JH909 (Pl. 15c) 5251 Jar All k/9, gr. 34 (burial) IV-2c D2; MB IIC NAA Provenience: Cyprus	JH151 (not illustrated) Tell el-Dab'a Body sherd IV-2b Undefined context in palace area d1-2; MB IIA NAA Provenience: ?; most similar to Tell el-Dab'a JH910, of uncertain provenience (ADSTAT 0.054)	I-d No context d1; MB IIA NAA Provenience: Egyptian Nile alluvium
JH339 (Pl. 15d) Tell el-Dab'a 539/WA2382 Ring Stand I-b2 All m/13, pl. 2 (residence) D2; MB IIC NAA Provenience: Egyptian Nile alluvium	JH154 (not illustrated) Tell el-Dab'a K422 Body sherd IV-1b No context E3; MB IIB NAA Provenience: ?; most similar to Tell el-Dab'a JH658, of uncertain provenience (ADSTAT 0.089) JH156 (not illustrated) Tell el-Dab'a K478 Body sherd II-b All m/14, pl. 6-7 (residence) E3; MB IIB NAA Provenience: Fayyum-Maadi	JH669 (not illustrated) Tell el-Dab'a Body sherd I-d No context d1-2; MB IIA NAA Provenience: Egyptian Nile alluvium
JH607 (not illustrated) Tell el-Dab'a 4774 Jar II-b FI k/24, gr. 49 (burial) c; MB IIA NAA Provenience: most similar to Tell el-Dab'a JH156, import from Fayyum-Maadi (ADSTAT 0.073)	JH661 (not illustrated) Tell el-Dab'a Body sherd, neck II-b No context c; MB IIA NAA Provenience: ?; most similar to Kahun JH178, of local Fayyum-Maadi marl origin (ADSTAT 0.09), and Tell el-Dab'a JH662, of uncertain provenience (ADSTAT 0.09)	JH672 (not illustrated) Tell el-Dab'a Body sherd, neck and shoulder II-b No context d1-2; MB IIA NAA Provenience: Fayyum-Maadi
JH767 (not illustrated) Tell el-Dab'a K2036(2) Jar rim IV-1-2c FI j/20 (palace) d?; MB IIA? NAA Provenience: Fayyum-Maadi	JH663 (not illustrated) Tell el-Dab'a Body sherd, neck I-a No context b2; MB IIB NAA Provenience: Egyptian Nile alluvium	JH673 (not illustrated) Tell el-Dab'a Body sherd II-b No context d1-2; MB IIA NAA Provenience: Fayyum-Maadi
JH002 (not illustrated) Tell el-Dab'a K411 Juglet base IV-2b All I/14-15 (residence) D2-3; MB IIB-C NAA Provenience: ?; most similar to Sirkeli AGSR23, of uncertain provenience (ADSTAT 0.077)	JH665 (not illustrated) Tell el-Dab'a Body sherd I-d No context b2; MB IIB NAA Provenience: Egyptian Nile alluvium	JH676 (not illustrated) Tell el-Dab'a 3355 Body sherd I-d No context E1; MB IIB NAA Provenience: most similar to Egyptian Nile alluvium (ADCORR 0.3%; ADSTAT 0.076)
JH667 (not illustrated) Tell el-Dab'a Juglet rim I-d No context c; MB IIA NAA Provenience: Egyptian Nile alluvium	JH666 (not illustrated) Tell el-Dab'a Body sherd	JH678 (not illustrated) Tell el-Dab'a 3355 Body sherd base I-a No context E1; MB IIB NAA Provenience: Egyptian Nile alluvium
		JH680 (not illustrated) Tell el-Dab'a Body sherd I-d No context

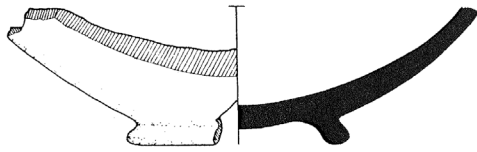


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Fig. 112: MB IIA and IIA-B Follow-Up NAA Group: Canaanite Jars, Polished Jars/Jugs, Kamares Ware, and Miscellaneous Types

PMG103 (Pl. 5a) Tell el-Dab'a 7254C Black Polished Jar/Jug base IV-6b AII o/20, pl. 4-5 F; MB IIA-B NAA Provenience: ?; no matches at mean Euclidean distance 0.1	NAA Provenience: ?; most similar to Athens DFD234, of uncertain origin (mean Euclidean distance 0.050)	Jar rim IV-5 FI p/18, gr. 1 d1; MB IIA NAA Provenience: Fayyum-Maadi
PMG104 Tell el-Dab'a Canaanite Jar rim K3656 IV-3c d1; MB IIA NAA Provenience: Southern Palestine	PMG110 Tell el-Dab'a 7255A-B Cup body sherd, white painted and burnished, Kamares ware VII FI l/23, pl. 5 d1-2; MB IIA NAA Provenience: ?; most similar to Athens DFD631, of probable local origin (mean Euclidean distance 0.045)	PMG125 Tell el-Dab'a K3456 Canaanite Jar handle IV-1, 3, 4? FI l/23, granary 22 c-d1; MB IIA NAA Provenience: ?; most similar to Southern Palestine (ADCORR 0.1; mean Euclidean distance 0.09)
PMG105 (Pl. 5b) Tell el-Dab'a 7029A Black Polished Jar/Jug rim IV-6a FI o/20, pl. 0-1 d1; MB IIA NAA Provenience: ?; no matches at mean Euclidean distance 0.1	PMG111 Tell el-Dab'a K2567 Canaanite Jar rim IV-3c FI p/22, pl. 7-8 d2; MB IIA NAA Provenience: Southern Palestine	PMG126 Tell el-Dab'a K3472 Canaanite Jar base IV-3c FI n/18, gr. 5-6 d1; MB IIA NAA Provenience: ?; most similar to Tell el-Dab'a PMG121 (mean Euclidean distance 0.091)
PMG106 (not illustrated) Tell el-Dab'a Canaanite Jar body sherd K2771 IV-6 FI k/20, pl. 3 c-d1; MB IIA NAA Provenience: ?; most similar to Southern Palestine (mean Euclidean distance 0.085)	PMG112 Tell el-Dab'a K2570 Canaanite Jar rim IV-1b FI i/22, pl. 7-8 d2; MB IIA NAA Provenience: Southern Palestine	PMG128 Tell el-Dab'a K3483 Canaanite Jar rim IV-5 FI l/23, gr. 3-4 c-d1; MB IIA NAA Provenience: Southern Palestine
PMG107 (not illustrated) Tell el-Dab'a Canaanite Jar base and body sherds K478 IV-2c, with exterior white slip AII m/4 G-H; MB IIA NAA Provenience: Southern Palestine	PMG113 (not illustrated) Tell el-Dab'a K2574 Juglet handle IV-3b FI l/23, pl. 5-6 c3-d1; MB IIA NAA Provenience: Southern Palestine	PMG129 Tell el-Dab'a K3483 Canaanite Jar rim IV-3c FI l/23, gr. 3-4 c-d1; MB IIA NAA Provenience: Southern Palestine
PMG108 Tell el-Dab'a 7254K Cup rim, painted, Kamares ware VII FI p/20, gr. 5 b2-3; MB IIA-B NAA Provenience: ?; most similar to Vounari (near Phlamoudhi, northeastern Cyprus) ABVN07, of Cypriot origin (mean Euclidean distance 0.076)	PMG114 Tell el-Dab'a K2574 Platter Bowl rim IV-3b FI l/23, pl. 5-6 c3-d1; MB IIA NAA Provenience: most similar to Tell el-Dab'a JH859, which is most similar to Tell el-Hesi DBPA44, of local origin (mean Euclidean distance 0.072)	PMG130 Tell el-Dab'a K3634 Canaanite Jar rim IV-2c or IV-6 FI l/23, gr. 4-5 d1(2); MB IIA NAA Provenience: Southern Palestine
PMG109 Tell el-Dab'a 3336I Cup base, white painted and burnished, Kamares ware VII FI j/20, pl. 3, gr. 6 (secondary context) c? , MBIIA?	PMG115 (not illustrated) Tell el-Dab'a K2574 Jar body sherd IV-3c FI l/23, pl. 5-6 c3-d1; MB IIA NAA Provenience: ?; no matches at mean Euclidean distance 0.1	PMG131 (not illustrated) Tell el-Dab'a 5816 Canaanite Jar IV2-4c-d FI m/19, pl. 2, granary 29 c-d1; MB IIA NAA Provenience: ?; most similar to Southern Palestine (ADCORR 1%; mean Euclidean distance 0.085)
	PMG116 Tell el-Dab'a K3610	

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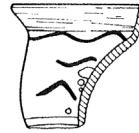
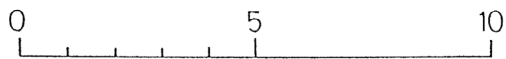
PMG103



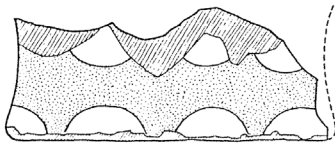
PMG104



PMG105



PMG108



PMG 109



PMG 110



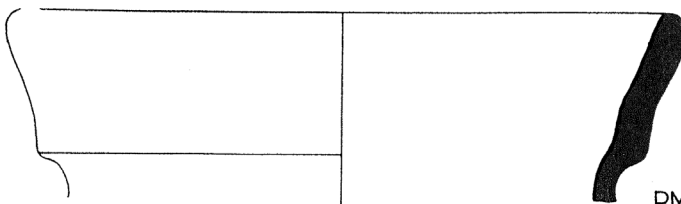
PMG114



PMG111



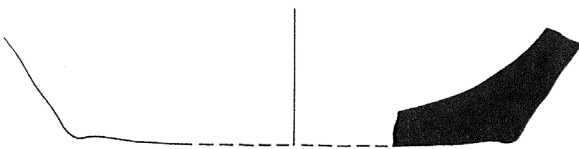
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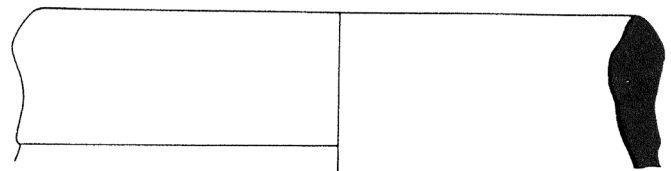
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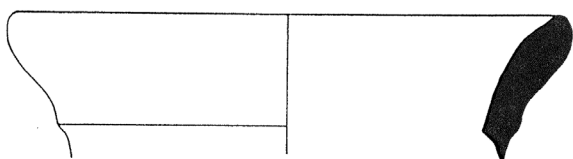
PMG125



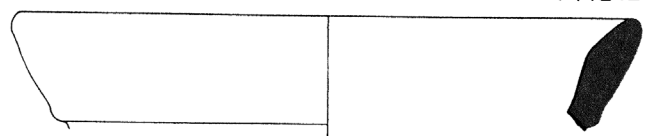
PMG126



PMG128



PMG129



PMG130

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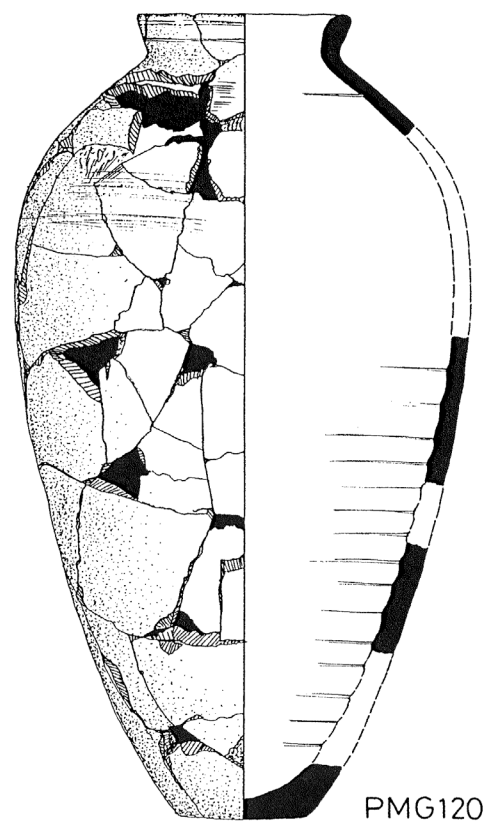
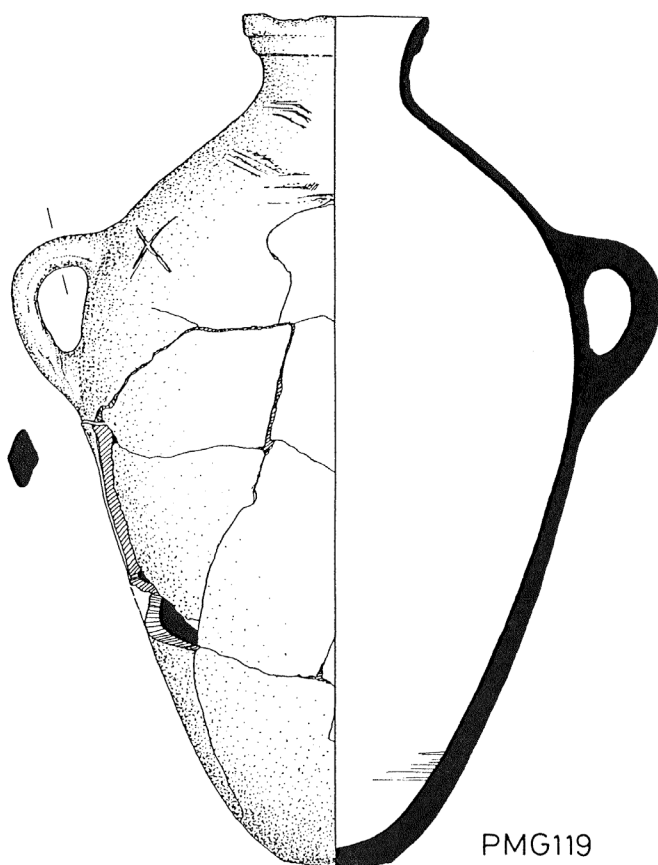
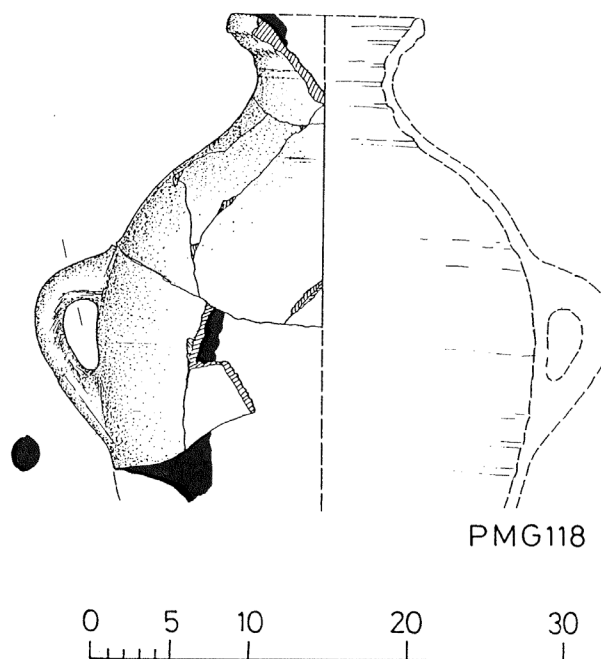
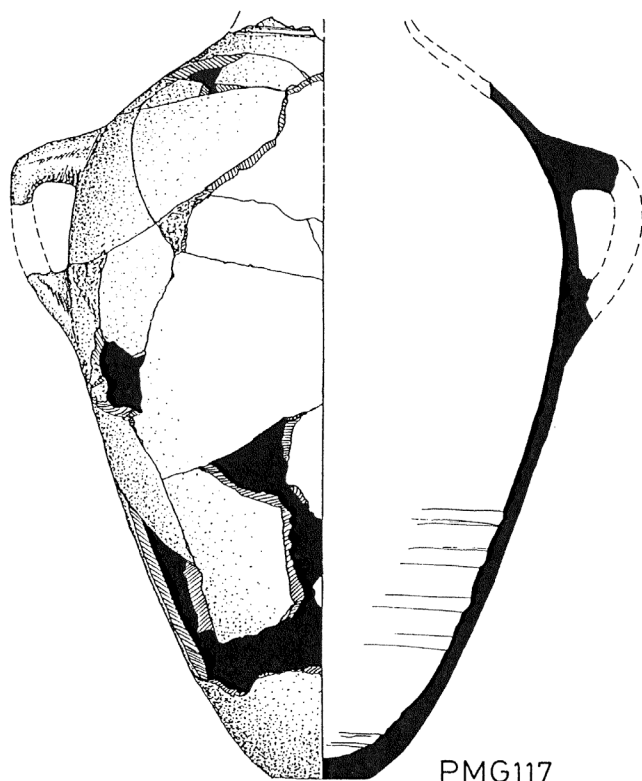
Fig. 113: MB IIA Follow-Up NAA Group: Canaanite Jars

PMG117
Tell el-Dab`a
5826
Canaanite Jar, complete up to upper body
IV-2c
FI m/18, gr. 3
d1; MB IIA
NAA Provenience: Southern Palestine

PMG118
Tell el-Dab`a
5827
Canaanite Jar, missing lower body
FI m/18, gr. 3
IV-2b
d1; MB IIA
NAA Provenience: Southern Palestine

PMG119 (Pl. 1b)
Tell el-Dab`a
5828
Canaanite Jar
IV-2c
FI m/18, gr. 3
d1; MB IIA
NAA Provenience: Southern Palestine

PMG120 (Pl. 1c)
Tell el-Dab`a
5894
Canaanite Jar, missing handles
IV-3c
FI m/18, gr. 3
d1; MB IIA
NAA Provenience: ?; no matches at mean Euclidean distance 0.1



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Fig. 114: MB IIA Follow-Up NAA Group: Canaanite Jars

PMG121

Tell el-Dab`a

5894C

Canaanite Jar, missing rim and lower body

IV-3c

FI k/20, below palace floor

d1; MB IIA

NAA Provenience: ?; most similar to Tell el-Dab`a PMG126 (mean Euclidean distance 0.091)

PMG122

Tell el-Dab`a

5825

Canaanite Jar

IV-2d

FI m/18, gr. 3

d1?; MB IIA?

NAA Provenience: ?; most similar to Tel Aphek JH641, of local origin (mean Euclidean distance 0.091)

PMG123

Tell el-Dab`a

5824

Canaanite Jar

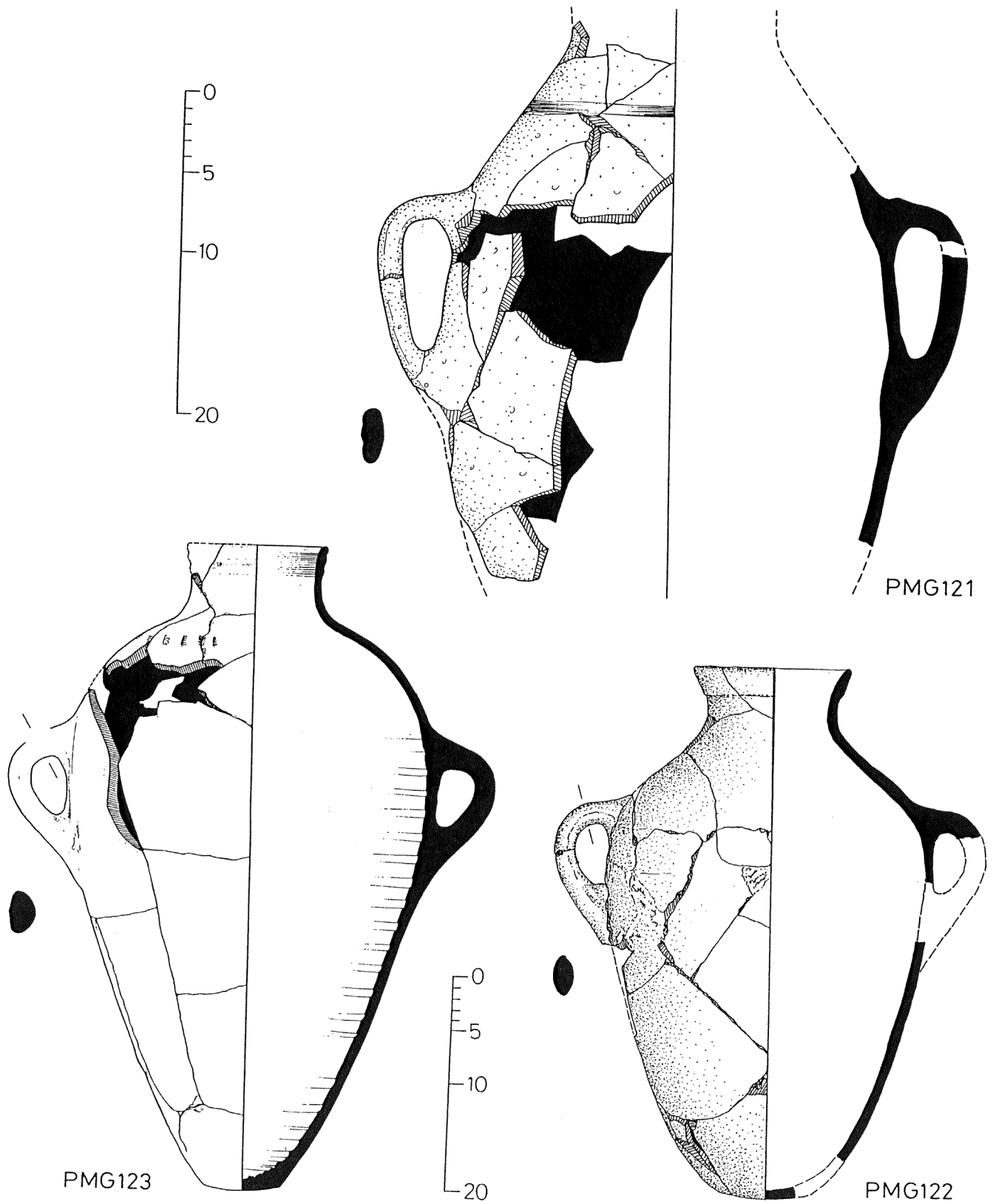
IV-2c

FI m/18, gr. 3

d1; MB IIA

NAA Provenience: Southern Palestine

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Fig. 115: MB IIA Follow-Up NAA Group: Canaanite Jar and Cypriote Globular Jug

PMG124

Tell el-Dab`a

5709

Canaanite Jar

IV-1c

FI m/18, gr. 3

d1; MB IIA

NAA Provenience: Southern Palestine

PMG127

Tell el-Dab`a

7131

Globular Jug, missing neck and rim, Cypriot Bichrome Cross Line Style

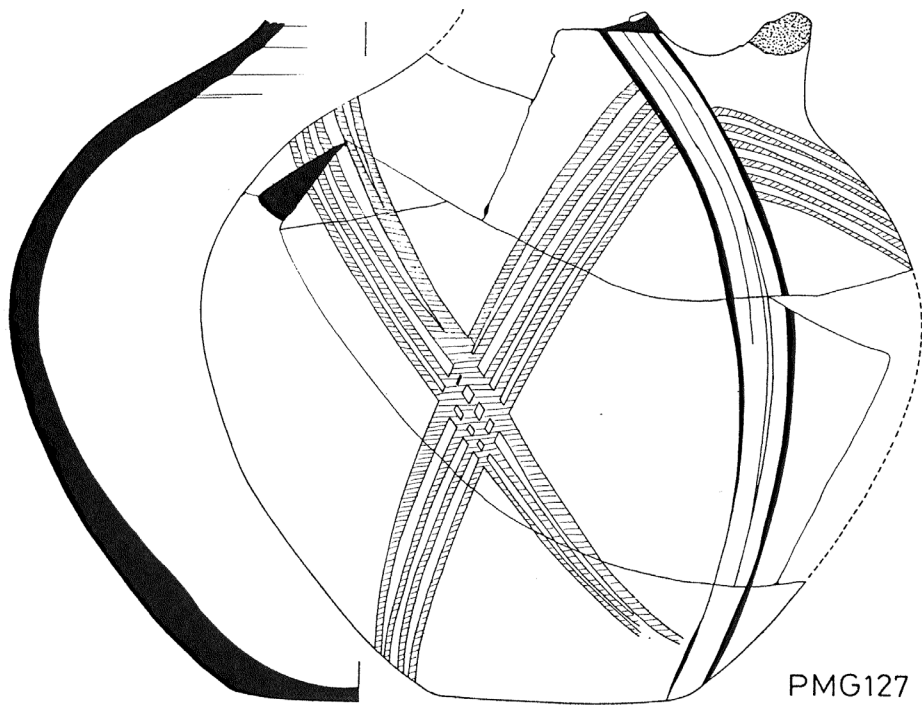
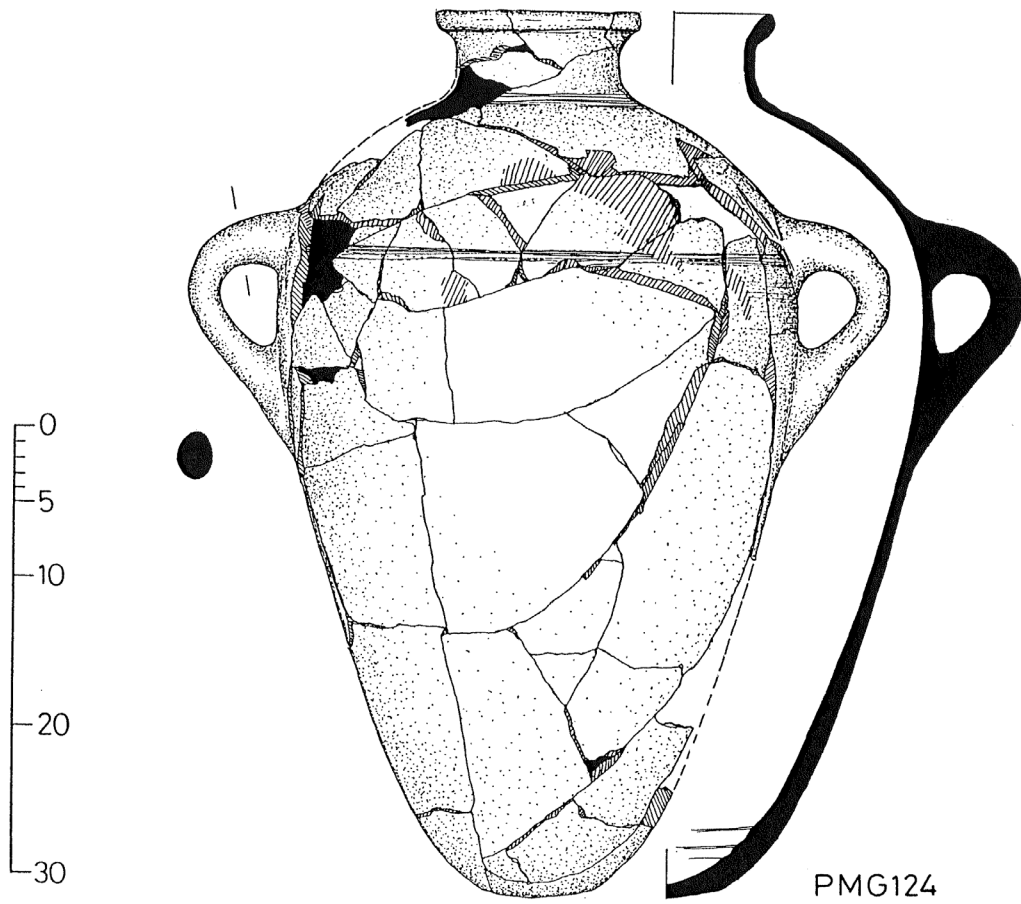
VI

AII i/11, pl. 4

B3; 18th Dynasty

NAA Provenience: Egyptian Nile alluvium

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JH804 (Fig. 56)	JH857 (not illustrated)
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JH842 (Fig. 37)	JH895 (not illustrated)
JH843 (Fig. 37)	JH896 (Fig. 93)
JH844 (Fig. 38)	JH897 (Fig. 104)
JH845 (Fig. 38)	JH898 (Fig. 62)
JH846 (Fig. 38)	JH899 (Fig. 103, Pl. 7e)
JH847 (not illustrated)	JH900 (not illustrated)
JH848 (not illustrated)	JH901 (Fig. 98, Pl. 11b)
JH849 (Fig. 38)	JH902 (not illustrated)
JH850 (not illustrated)	JH903 (Fig. 93)

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JH904--see JH011	PMG113 (not illustrated)
JH905 (Fig. 105)	PMG114 (Fig. 112)
JH906 (Fig. 71, Pl. 9a)	PMG115 (not illustrated)
JH907 (Fig. 103)	PMG116 (Fig. 112)
JH908 (not illustrated)	PMG117 (Fig. 113)
JH909 (Fig. 111, Pl. 15c)	PMG118 (Fig. 113)
JH910 (not illustrated)	PMG119 (Fig. 113, Pl. 1b)
JH911 (not illustrated)	PMG120 (Fig. 113, Pl. 1c)
JH912 (not illustrated)	PMG121 (Fig. 114)
JH913 (Fig. 55)	PMG122 (Fig. 114)
JH914 (not illustrated)	PMG123 (Fig. 114)
JH915 (Fig. 99)	PMG124 (Fig. 115)
JH916 (Fig. 103)	PMG125 (Fig. 112)
JH976 (not illustrated)	PMG126 (Fig. 112)
JH977 (not illustrated)	PMG127 (Fig. 115)
JH978 (not illustrated)	PMG128 (Fig. 112)
JH979 (not illustrated)	PMG129 (Fig. 112)
JH980 (Fig. 62, Pl. 3a)	PMG130 (Fig. 112)
JH981 (Fig. 62, Pl. 3b)	PMG131 (not illustrated)
MB010 (Fig. 103)	
MB011 (Fig. 99)	
MB012 (Fig. 99)	
MB013 (Fig. 99, Pl. 11d)	
MB014 (Fig. 99)	
MB015 (Fig. 99)	
MB016 (Fig. 99, Pl. 11d)	
MB017 (Fig. 103, Pl. 12d)	
MB018 (Fig. 99, Pl. 11f)	
MB019 (Fig. 105)	
MB020 (Fig. 102)	
MB021 (Fig. 99)	
MB022 (Fig. 99, Pl. 11g)	
MB023 (Fig. 100)	
MB024 (Fig. 95)	
MB025 (Fig. 100)	
MB026 (Fig. 104)	
MB027 (Fig. 100, Pl. 11h)	
MB028 (Fig. 100, Pl. 12a)	
MB029 (Fig. 100, Pl. 12b)	
MB030 (Fig. 104)	
MB031 (Fig. 101)	
MB032 (Pl. 104, Pl. 12e)	
MB033 (Fig. 101)	
PMG103 (Fig. 112, Pl. 5a)	
PMG104 (Fig. 112)	
PMG105 (Fig. 112, Pl. 5b)	
PMG106 (not illustrated)	
PMG107 (not illustrated)	
PMG108 (Fig. 112)	
PMG109 (Fig. 112)	
PMG110 (Fig. 112)	
PMG111 (Fig. 112)	
PMG112 (Fig. 112)	