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SUPPLÉMENT XVIII

RECHERCHES
SUR LA
CÉRAMIQUE BYZANTINE

ÉDITÉ PAR

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THE CARGO AMPHORAS
ON THE 7th CENTURY YASSI ADA
AND 11th CENTURY
SERÇE LIMANI SHIPWRECKS:
TWO EXAMPLES OF A REUSE OF BYZANTINE
AMPHORAS AS TRANSPORT JARS

A study of the cargo amphoras from two Byzantine-period shipwrecks excavated in Turkish waters is yielding considerable evidence that the amphoras were being reused as transport jars, an apparently rare practice in antiquity (PARKER, 1973, 380). This paper will present a general description of these amphoras, with emphasis given to the evidence for their reuse.

One of the shipwrecks was excavated at Yassi Ada during the summers of 1961 through 1964 under the direction of George F. Bass for the University Museum of the University of Pennsylvania. The latest-dated coin from the wreck gives a *terminus post quem* of 625/26. Particularly in view of an absence of weapons on board, it is likely that the voyage took place after the withdrawal of the Persian fleet from the Aegean in 626.

Of 822 transport amphoras found on the shipwreck, 719 were British Bi type globular amphoras with a rounded, knobless base, and 103 were Bii type wheel-ridged cylindrical amphoras with a slightly-pinched waist. Eighty of the first type and 30 of the second type were raised during the excavation and were described in the final excavation report published in 1982 (BASS-VAN DOORNINCK 1982, 155-165).

The chance discovery in 1980 of graffiti on seven of the amphoras (BASS-VAN DOORNINCK 1982, 162) led to a decision to raise those remaining on the seabed so that all of the amphoras might be studied. It was also hoped that an examination of the organic contents of intact amphoras raised might reveal what the amphoras had been carrying. To date, approximately 570 additional amphoras have been raised; about 140 now remain on the seabed. Since a restudy of the cylindrical amphoras has not yet been begun, little more will be said about them in this paper.

Some 460 globular amphoras have now undergone a partial, preliminary cataloguing. Approximately 80% belong to one of four seemingly closely-related

subtypes whose fabrics generally range in surface color from reddish-brown to buff and have much fine mica and fine quartz, gypsum and grog inclusions.

One of the subtypes has a broad, continuous band of combing on the shoulder below handles that are noticeably angular in shape (BASS-VAN DOORNINCK 1982, 158, fig. 8-4, middle row, left and right). Some 130 catalogued examples of this subtype are remarkably uniform in form and dimensions. A proportional ideal is closely adhered to in which the maximum diameter occurs at one-half and equals three-fourths the total height and the height and maximum diameter of the neck equals one-fourth the total height. Remarkably, maximum diameters all fall within 1.5 cm of an average maximum diameter of 43 cm. The few capacity measurements so far taken suggest that capacity variances within this subgroup may also be quite minimal. Thus the seeming lack of standard sizes among the amphoras on the Yassi Ada ship (WALLACE 1986, 93) may prove to be a mirage resulting from a lumping together of different amphora subtypes.

The second subtype, with some 30 examples catalogued, is much like the first, but its handles are not angular and are uniquely triangular in section. The third subtype (BASS-VAN DOORNINCK 1982, 158, fig. 8-4, middle row, center), with some 130 catalogued examples, and the fourth subtype (BASS-VAN DOORNINCK 1982, fig. 8-4, top row, center), with some 50 catalogued examples, both have uniformly-curving handles oval in section. The third subtype is decorated with a normally from 4- to 6- tined band of combing that spirals around and down the amphora between the handles and the mid zone of the body giving the illusion of a number of separate combing bands; the potter frequently pinched together the comb tines and then allowed them gradually to spread out again so that the combing band steadily became wider as it spiralled downward. The fourth subtype was decorated with a broad, continuous band of spiral grooving on the shoulder.

Examples of three of these subtypes have been found on Samos (HAUTUM, 1981, 184-186, Kat. Nrs. 7-9, 13 and 15) at the Eupalinos tunnel, which was used as a place of refuge during the Persian presence in the Aegean in the 620's. Thus it seems likely that these subtypes constituting approximately 80% of the Yassi Ada globular amphoras were produced not long before the ship's sinking.

The other catalogued globular amphoras belong to some 40 distinct subtypes, the great majority represented by only one amphora. Only a few general observations can be made about them here. Their range of decoration and forms are represented fairly well by the amphoras shown in fig. 1, to which can be added the amphora illustrated by BASS-VAN DOORNINCK 1982, 160, fig. 8-6.

Roughly half the subtypes have fabrics that appear, for reasons other than fabric color, to be unlike that of the four major subtypes. Of the amphoras illustrated by fig. 1, only amphoras 3 and 6 have quite similar fabrics. Nevertheless, roughly half of the some 40 subtypes and the four major subtypes all have very similar fabrics. This possibly reflects the existence of a single primary region within which the Bi-type amphora was made. The presence of somewhere between a dozen and two dozen distinctly different fabrics among the subtypes, on the other hand, suggests that Bi amphoras were made in quite a number of other locales as well.

Patterns of decoration other than those occurring on the four major subtypes include: a wide shoulder band of combing with a narrow band of combing at the shoulder/neck juncture (fig. 1, 6); a wide shoulder band of combing with small, inverted-

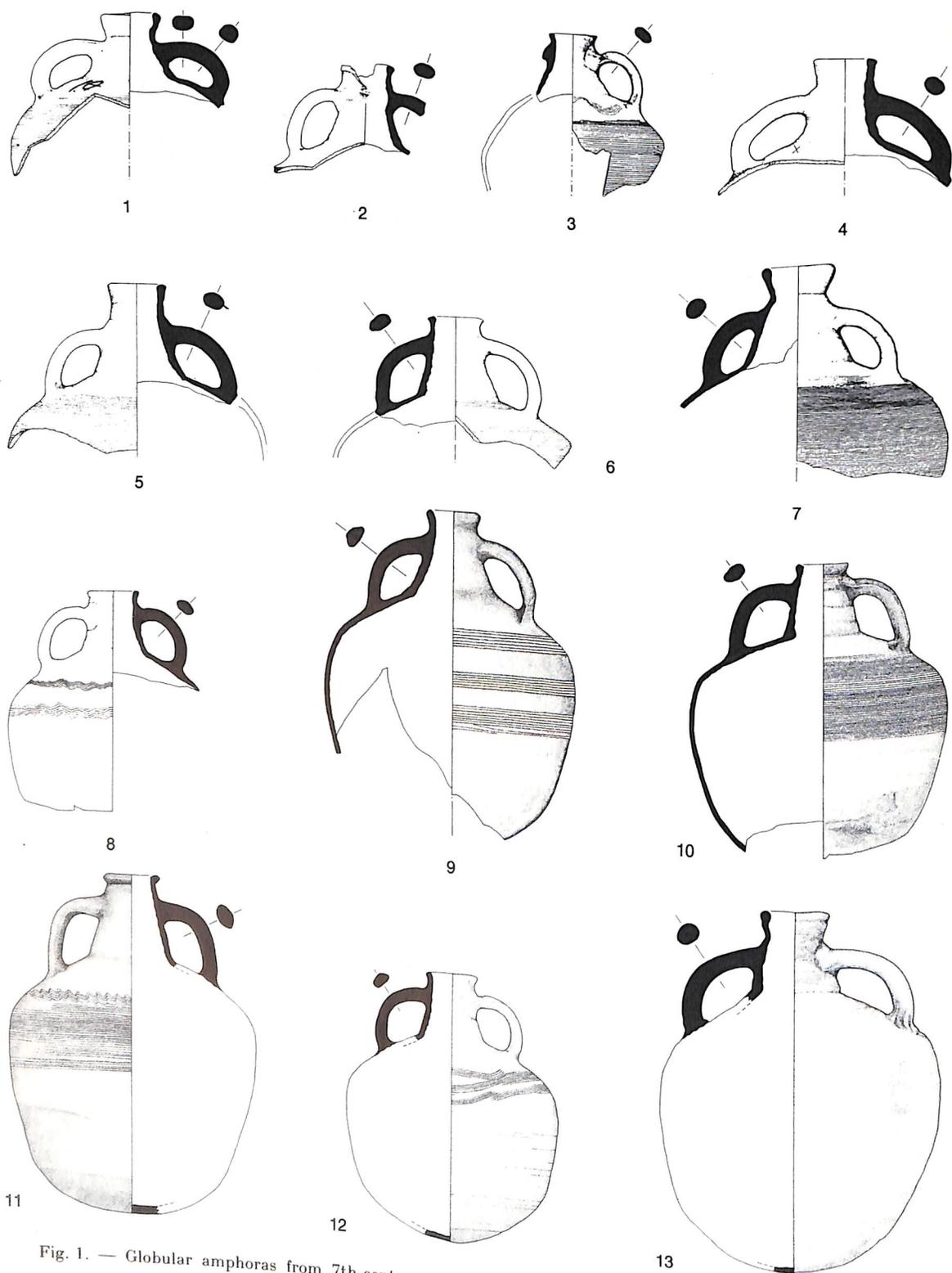


Fig. 1. — Globular amphoras from 7th-century shipwreck at Yassi Ada. Some subtypes represented by only one amphora from wreck. Drawings Selma Karan. 1:10.

trapezoidal neck panels of combing between the handles at their upper end; a wide shoulder band of combing with a four-tined band of combing just under the lip between the handles (**fig. 1, 10**); a wide shoulder band of combing surmounted by a contiguous narrow band of wavy combing (**fig. 1, 11**); a wide shoulder band of combing with an undulating band of wavy combing above between the handle bases (**fig. 1, 3**); a wide shoulder band consisting of contiguous bands of straight but interwoven combing; three unconnected bands of combing on the shoulder and upper body (**fig. 1, 9**); a wide shoulder band of spiral grooving with a single, wavy line below; a single narrow band of wavy combing on the shoulder; two narrow bands of wavy combing on the shoulder (**fig. 1, 8**); and a shoulder band consisting of several loosely-interwoven bands of wavy combing (**fig. 1, 12**). It is important to note that all but the first of these distinctive patterns of decoration occur on amphoras that have equally distinctive shapes and/or fabrics. This is also true of two of three subtypes, including **fig. 1, 13**, that are entirely undecorated.

Just one stamped amphora, only partially preserved (**fig. 1, 2**), has been recovered to date. Two different circular stamps appear on the neck, one on either side, midway between the two handles at their upper end. The amphora has an unusual reddish-yellow (7.5 YR 6/6) slip that otherwise occurs only on amphora 9 in **fig. 1**.

It seems clear that some of the subtypes represented by only a single amphora are significantly earlier in date than the four major subtypes. These amphoras have low-, horizontally-set bow handles and/or a strongly conical neck with everted, funnel-shaped rim. The three examples illustrated here (**fig. 1, nos. 1, 4 and 7**) are representative of almost a dozen subtypes possessing these features either wholly or in part, including an already-published amphora, P79 (BASS-VAN DOORNINCK 1982, 186). The dating of these amphoras is made particularly difficult by the unfortunate fact that, other than P79, they all are now missing their base. One can only note that although most of the globular amphora sherds from the wreck have now been raised and examined, not one example of a knobbed base, a feature that seems to have disappeared from the Bi amphora during the 2nd half of the 6th century (OPAIT 1984, 316), has yet been found.

Graffiti have been found on 95 of the some 460 catalogued globular amphoras. However, only 19 of the amphoras in the four major subtypes have graffiti. Furthermore, only one of these has more than one graffito, and four merely have a simple X inscribed before firing. Graffiti are equally rare on the cylindrical amphoras; 3 of the some 60 now recovered have in each case a single graffito. Graffiti abound, on the other hand, among the globular amphoras belonging to the other subtypes. About 70% of these amphoras have at least one graffito, while 20% have from two to four.

In total, 116 graffiti have been recorded; all but six (five X's and one abbreviated name) appear to have been inscribed after firing. Although many of the graffiti are enigmatic, almost half would appear to be owner's names. These names are abbreviated (**fig. 2, 2**), in monogram form (**fig. 2, 3-4 and 14**), or, in two instances, written out (**fig. 2, 1**). In all but possibly three or four instances, the names occur on amphoras *not* belonging to one of the four major subtypes. In only two instances does the same name written by the same hand occur on more than one amphora - on three amphoras of three different subtypes in the one case (**fig. 2, 2**) and on two amphoras of different subtypes in the other.

At least one-quarter of the graffiti on amphoras not belonging to the four major subtypes appear to have some identifying function other than designating

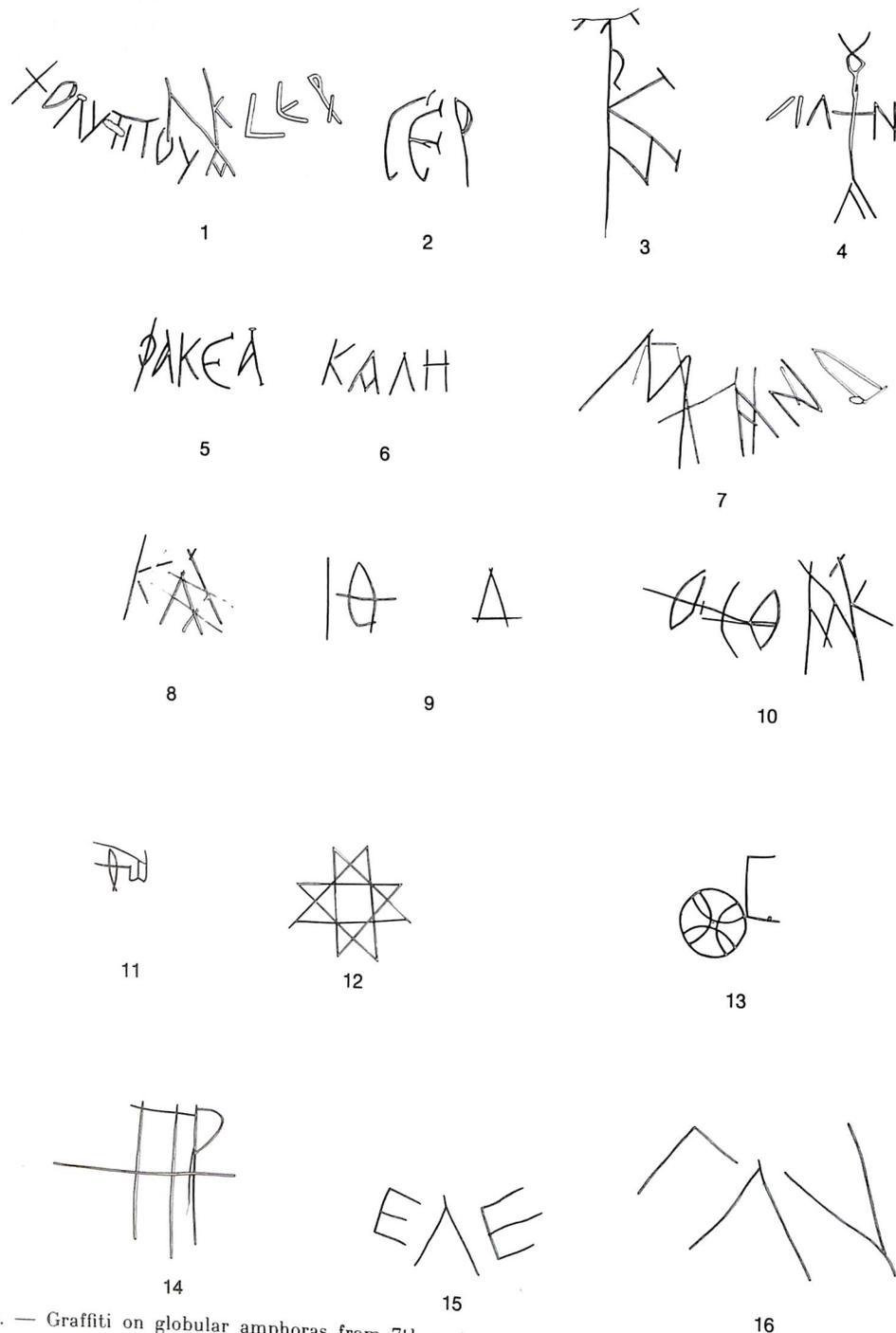


Fig. 2. — Graffiti on globular amphoras from 7th-century shipwreck at Yassi Ada. Drawings F. H. and B. J. van Doorninck. 1:4.

ownership. The great majority take the form either of a solitary letter or a group of short parallel strokes that almost certainly represent a single-digit number under ten. Higher numbers possibly occur in just a few instances and may indicate capacity. Only three graffiti on amphoras not belonging to the four major subtypes refer to the identity (lentils: **fig. 2, 5**) or quality (good: **fig. 2, 6**) of an amphora's contents. Several instances of graffiti being overwritten (**fig. 2, 7**) or scratched-out (**fig. 2, 8**) probably reflect a change in ownership or contents.

The letters ΙΘ and Δ on one of the earliest amphoras (**fig. 1, 1** and **fig. 2, 9**) might possibly stand for the numbers 19 and 4 respectively and represent a date: 19(th year of the reign of Maurice Tiberius), 4(th indiction), or A.D. 600/1. However, without other examples of this form of dating on amphoras, this is merely speculation.

Allusions to the Christian faith occur frequently among the graffiti and include Christograms, crosses (**fig. 2, 12**) and invocative or dedicative monograms, such as "God is victorious" (**fig. 2, 10**), "he is victorious" (**fig. 2, 1**), "Christ God" (?) (**fig. 2, 13**) and "for God" (**fig. 2, 11**). One monogram (**fig. 2, 14**) may have been a priest's (+ πρ[εσβύτερος]).

The organic contents of 120 of the intact globular amphoras raised since 1980 have been analyzed. Seeds found in 30 amphoras and at first tentatively identified as being from some kind of Umbelliferae plant (BASS-VAN DOORNINCK 1982, 329) have since been positively identified as being from thorny burnet (*Sarcopoterium spinosum*) bushes, which we now believe were used as dunnage to protect the ship's hull from the cargo.

A total of 1380 grape seeds, sometimes showing traces of pitch, were found in 69 amphoras. Since the occurrence of these grape seeds appears to be random among the many different globular subtypes, it is likely that when the ship sank most, if not all, of the globular cargo amphoras contained wine (*defrutum* can be ruled out since the seeds were never subjected to a temperature above 50 degrees C). What the cylindrical amphoras carried is not as yet known, although analysis of the contents of some intact ones raised last year may soon shed light on this.

Eroded olive stones, again sometimes with traces of pitch, were found in 31 amphoras. Noteworthy is the fact that all but one of the 27 of these amphoras catalogued belong to the four major subtypes. Two of these amphoras belong to the first major subtype and have the graffito EAE (**fig. 2, 15**), which may be an abbreviation for major subtype and have the graffito EAE (**fig. 2, 15**), which may be an abbreviation for *ἐλαῖαι* (olives) or *ἐλαιον* (olive oil). Three other amphoras of the first major subtype, but no longer having organic contents, also have this graffito, while three additional amphoras of this subtype, unfortunately also no longer having organic contents, have the graffito ΓΑΥ (**fig. 2, 16**), an abbreviation for γλυκύς (sweet: ZEEST 1960, 119). All of these EAE and ΓΑΥ graffiti may very well have been written by the same hand. In view of the eroded condition of the olive stones, their almost exclusive association with amphoras of the four major subtypes, and the surprising frequency of their occurrence, we must entertain the possibility that most of the amphoras belonging to the four major subtypes had been employed to transport olive oil sometime not long before the ship's final voyage. The ΓΑΥ graffiti suggest, however, that at least some of the amphoras of the first major subtype had contained sweet wine or olives preserved in sweet wine. This in turn raises the possibility that the amphoras of all four major subtypes had earlier carried olives in wine. These are working hypotheses that future analyses of the archeobotanical remains inside the amphoras and within their linings and fabrics will be designed to test.

It seems clear that many of the other globular amphoras had served as storage containers prior to the ship's final voyage — some for a considerable length of time — and as a group had been in the possession of a great many different owners. One hopes that a thorough study of the amphoras and their graffiti may shed some light on how and where they came together to be reused as transport jars. Whether such reuse was considered normal at the time or instead an expedient of a long, exhausting war just concluded is a question that future shipwreck excavations may answer.

The other shipwreck was excavated at Serçe Limani during the summers of 1977 through 1979 by the Institute of Nautical Archaeology under the direction of George F. Bass. The ship had sunk in the latter part of the 3rd decade of the 11th century while carrying a mixed cargo including ceramic wares, glassware and glass cullet, most probably from the Fatimid Syrian coast to some glass-making center in Byzantine waters (VAN DOORNINCK 1986).

Most, if not all, of 89 Byzantine piriform amphoras (BRUSIĆ 1979, Group II) on the ship were undoubtedly part of the cargo in view of their great number and probably contained wine, although this is as yet uncertain. We wondered for some time why these amphoras were on the ship and thus seemingly traveling in the wrong direction, but then discovered that they had already been used previously.

Like the 7th-century Yassi Ada globular amphoras, these amphoras are a heterogeneous group in which a number of distinctly different subtypes and variants occur (compare, as an example, amphoras 1 and 2 in fig. 4). A major subtype (fig. 4, 1) with some 50 examples has a light-red to reddish-yellow fabric originally covered by a pale-yellow wash. These amphoras were somewhat crudely made and vary greatly in their capacity. Thus while three distinct sizes appear to be involved, the capacity (filled to rim) of these sizes ranges from approximately 9 to 14, 12 to 15, and 17 to 19 liters, respectively. Another major subtype consists of the 22 smallest piriform amphoras. Originally covered with a white wash, the fabric is again light red to reddish yellow in color but is quite crumbly so that these amphoras are as a group in a poorer condition than the others. They vary considerably in their proportions and in the amount of fabric inclusions and cluster into 3 size groups with capacities ranging from about 4.9 to 7.4 liters. The remaining amphoras belong to about a half-dozen other subtypes including one (fig. 4, 2) with a small stamp (fig. 3, 26) on either handle; another with a rather angular transition from shoulder to lower body and a small stamp (fig. 3, 28) on one handle; and another with an unusually long shoulder and a light-gray to yellowish-brown fabric.

As in the case of the Yassi Ada globular amphoras not belonging to the four major subtypes, there is a high incidence of graffiti on the Serçe Limani piriform amphoras. A total of 120 graffiti (and six stamps) occur on 73 of the 89 amphoras. Only in the case of six of the smallest amphoras is it reasonably certain that no graffiti was ever present; the other amphoras without graffiti are only partially preserved. Of the 73 amphoras with graffiti, no more than 35 have only one graffiti; the rest have from two to five. Some of the graffiti occur more than once. For example, no. 1 in fig. 3 occurs six times; no. 3, three times; no. 5, twice; no. 9, twenty-nine times; no. 13, five times; no. 14, five times; and no. 15, three times. Nevertheless, about 70 distinctly different graffiti occur on these amphoras, a clear indication that their history had been remarkably diverse.

The letter M (fig. 3, 9), occurring alone 24 times, occurs five times with one of five other graffiti joined to its left leg (fig. 3, 10-12). These graffiti appear to have been made

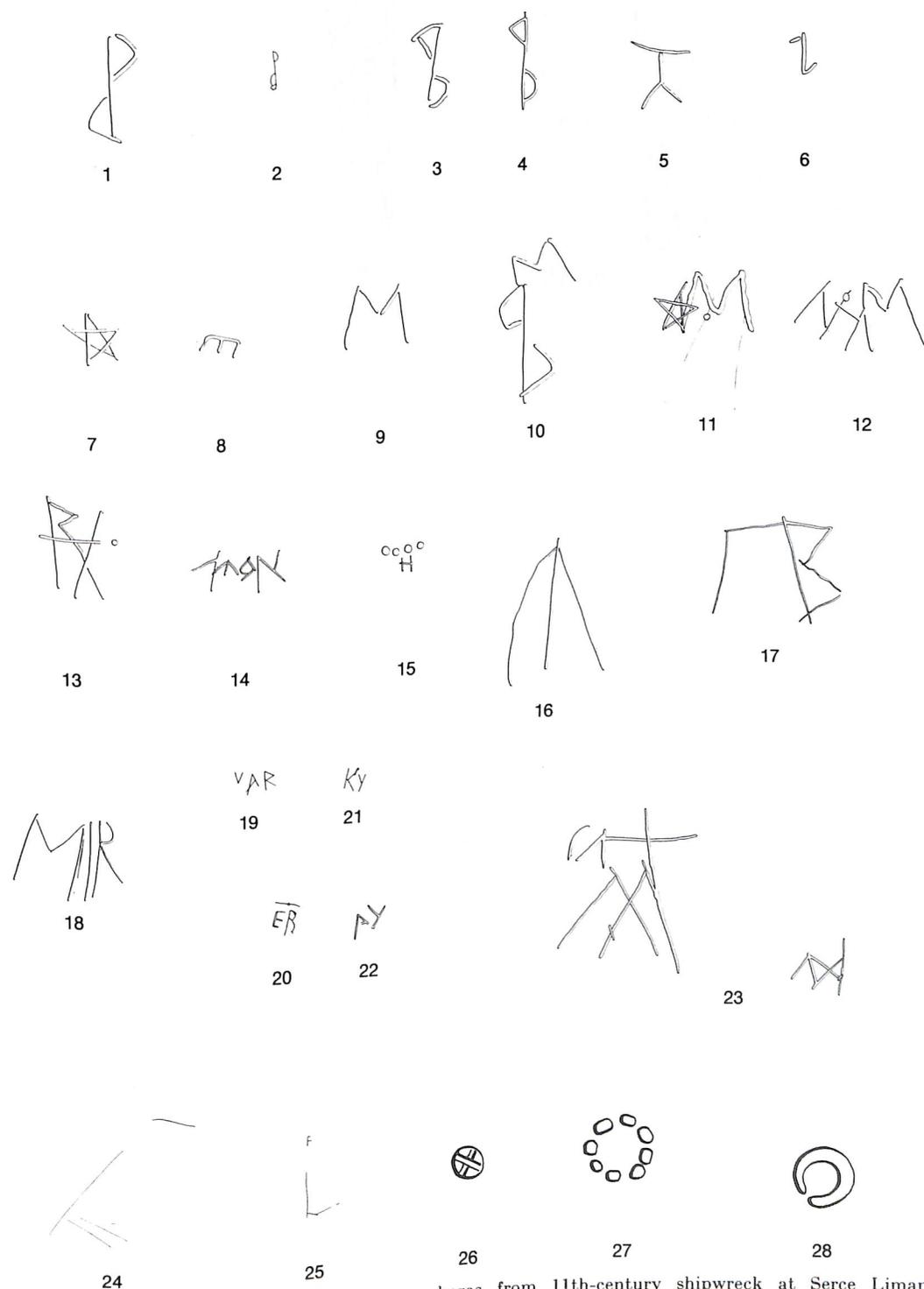


Fig. 3. — Graffiti and stamps on piriform amphoras from 11th-century shipwreck at Serçe Limani. Drawings F. H. and B. J. van Doorninck. 3, 1-25: graffiti. 1:4. 3, 26-28: stamps. 1:1.



Fig. 4. — Piriform amphoras from 11th-century Serçe Limani shipwreck. 4, 1-2: two different subtypes. 4, 3-6: examples of amphora damage due to prior use. Photographs Gündüz Kayra.

before firing and possibly combine a potter's mark with that of the amphora's future owner. Amphoras bearing the letter M were found together in the ship's stern, while those with the name Leon (fig. 3, 14) were found together amidships, as were those with the monogram illustrated by fig. 3, 13. These graffiti may be marks of ownership employed by some of the merchants involved with the ship's last voyage. Graffiti on two amphoras (fig. 3, 24 and 25) were at first thought possibly to be Arabic writing, but a closer examination has revealed that the marks were made before firing, making this interpretation highly unlikely.

All but five of the piriform amphoras have rims that are either significantly damaged or missing. About two dozen of the amphoras were damaged during or after the shipwreck, but at least 64 of them have rims that were already damaged prior to the ship's sinking. Such damage is recognizable because it occurs primarily on the inside of the rim, is in the great majority of cases confined to one or both of the two rim quadrants located between the handles, and in many cases was clearly caused by one or more vertical grooves cut into the rim's inner surface (fig. 4, 3). Generally speaking, this damage appears to have occurred as the result of someone prying out a stopper with a pointed object with one hand while holding one of the amphora's handles with the other. In a great many instances, pry damage became so severe that the rim was subsequently carved down to reduce unevenness (fig. 4, 4).

Pre-shipwreck damage to some of the amphoras was of an even greater magnitude. Fifteen were missing a handle, and even more remarkably, three amphoras were devoid of both handles and the entire neck. Not only were none of these missing parts found during excavation, but in a majority of cases where stumps of handles had remained it is clear that they had been carved down into rounded knobs, while in two instances, where the neck is missing there is also evidence of the removal of uneven edges through carving (fig. 4, 5).

One of the amphoras without handles and neck has also lost virtually all of its exterior surface (fig. 4, 6). We initially thought, of course, that this loss of surface had occurred while the amphora was under water. However, the removal of some of the pitch used in plugging a hole that had been cut into the amphora's bottom, probably in order to sample contents, has revealed that the surface was also gone underneath the pitch overlapping the edges of the hole, indicating that the surface loss had already occurred before the hole was plugged. Fabric analysis will be undertaken in an attempt to learn the cause of the surface deterioration.

The evidence just outlined suggests that many of these amphoras had seen multiple reuse as transport jars. The presence on the collection of the Bodrum Museum of some late Byzantine amphoras with like signs of reuse from several different shipwrecks further suggests that such reuse was not uncommon during those times. I suspect that this phenomenon was directly connected with that of the decreasing role played by the amphora as a transport container. In his economic study of the Geniza documents, Goitein (1967, 334) noted that skins were much preferred over amphoras as transport containers in Fatimid maritime commerce, while the many ceramic containers on three shipwrecks of the Fatimid period investigated in recent years off the southern coast of France include hardly any amphoras (JONCHERAY 1973; VISQUIS 1973; XIMENES 1976). Perhaps an increasing reuse of amphoras as transport jars was one response to their decreasing availability.

Frederick H. van DOORNINCK JR.

Acknowledgements

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March 14, 1986

Miss Virginia Grace
 Agora Excavations
 American School of Classical Studies
 Odos Souidias 54
 GR - 106 76 Athens
 GREECE

Dear Miss Grace,

I am undertaking a restudy of the amphoras from the 7th-century Byzantine shipwreck at Yassi Ada. ^{9.10.86} It has recently emerged that the globular amphoras from this shipwreck consist of a remarkable number of different types; many had been in use for a prolonged period of time prior to the ship's sinking. Thus these amphoras afford an unusual opportunity to learn a great deal about a general type of amphora of which so little is presently known. I hope therefore to make this restudy as comprehensive as possible and wonder if there is any unpublished material in the Agora collection that might prove helpful.

If you wish to receive further information on these amphoras from time to time as it becomes available, please let me know. I fear that the restudy will take some years to complete.

Sincerely,

Frederick H. van Doorninck Jr.

Frederick H. van Doorninck, Jr.
 Associate Professor of
 Nautical Archaeology

rec'd
 ca 8.11.86

To B. Johnson any time
 this year?

⊗ Throckmorton
 Wreck 3

(THRAKEMORTON
WRECK 3)

with covering with date 14.III.86
revised A.C. S.V. 82

2.02

Enclosed are drawings of graffiti occurring on 58 cargo amphoras from the 7th-century Byzantine shipwreck at Yassi Ada. We anticipate that drawings of graffiti on approximately 70 additional amphoras will be made before the project is completed. The drawings are arranged in groups on the basis of amphora decoration and type. The classification designations employed are only temporary, for convenience; reference should not be made to them in any publication.

The amphoras in Group A are decorated with a broad band of combing. Eight out of 11 distinct types of amphoras from the wreck decorated in this way are shown in this group of drawings. Group B amphoras are decorated with a broad band of spiral grooving. Twelve out of just over two-dozen types decorated in this way are shown in the drawings. Group C amphoras are decorated with a spiral band of combing. Only one type of amphora decorated in this way has been distinguished up to now. Group D amphoras are undecorated. Only one of three types of undecorated amphoras appears in the drawings. Group E amphoras are too fragmentary to be classified according to type. Group F amphoras are of the hourglass or pinched-waist type. Three of the amphoras of this type that have been recovered have graffiti; only one of them is included here.

Other amphora types not represented by the enclosed drawings are 6 types decorated with wavy bands of combing, one type decorated with several horizontal bands of combing, and one type bearing two stamps. A total of approximately 50 different types of cargo amphoras have been distinguished to date. Drawings of the different types will be made available to interested colleagues as soon as they are completed.

The 7th-century Byzantine shipwreck at Yassi Ada was excavated during the summers of 1961 through 1964 under the direction of George F. Bass. A final excavation report was recently published: G.F. Bass and F.H. van Doorninck, Jr. (eds), Yassi Ada I: A Seventh-Century Byzantine Shipwreck (College Station 1982).

The latest-dated coin from the wreck indicated that the ship had sunk in 625/26 or shortly thereafter. Particularly in view of the absence of any evidence of the presence of weapons on board, it is likely that the voyage took place after the withdrawal of the Persian fleet from the Aegean following an unsuccessful attempt to capture Constantinople in 626.

The ship was carrying between 850 and 900 transport amphoras; 822 were recorded during excavation. Of these, 719 were globular (Scorpan VII A) and 103 had an hourglass shape (Scorpan VIII B). Eighty globular and 30 hourglass amphoras were raised and catalogued during the excavation; the rest were left on the seabed.

In 1980, graffiti were discovered on seven of the raised globular amphoras. Tentative drawings of these graffiti were immediately made for last-minute inclusion in the final excavation report. Revisions in some of these drawings have

since been made after a thorough cleaning of the graffiti (compare Yassi Ada I, fig. 8-8, A-E with drawings B1.1, B1.2, B1.8, C1.1 and C1.2).

It was decided to raise over a period of several years as many as possible of the amphoras remaining on the seabed so that a comprehensive study of graffiti on them might be made. Since I was particularly interested in the project, Dr. Bass kindly appointed me to undertake it. To date (Spring 1986), approximately 470 additional amphoras have been raised; about 240 remain to be raised.

Another purpose of the project has been to study the organic contents of intact amphoras and the interior surfaces of broken amphoras in an attempt to determine what the amphoras contained when the ship sank and any earlier use they possibly had been put to. A preliminary analysis of the organic contents of 16 intact amphoras was included in the final excavation report (pp. 327-31). A complete analysis of these contents and those of well over 100 other intact amphoras is still in progress, but a strong case can already be made that most, if not all, the globular amphoras were carrying some sort of spiced wine when the ship sank; identification of the spices involved has not yet been completed. A rather frequent presence in these amphoras of olive pits, often quite fragmentary and abraded, raises the distinct possibility that at least many of the globular amphoras had earlier contained olive oil. This is of particular interest, since it has recently been suggested that amphoras of this general type were primarily designed for the transport of olive oil (W. Hautumm, *Studien zu Amphoren der spätrömischen und frühbyzantinischen Zeit* [Fulda 1981] 45-51). The amphoras raised since 1980 have unfortunately not included even one example of an intact hourglass amphora; no concrete evidence concerning their contents or earlier use has as yet come to light.

Only after a substantial number of additional globular amphoras had been raised did it become evident that the original sample of 80 globular amphoras had been deceptively homogenous and thus not representative--a restudy of the amphoras themselves thus became necessary. To date, this restudy has been confined to the globular amphoras, some 420 of which have now undergone a partial, preliminary cataloging. Although roughly 85% of these amphoras are represented by the amphoras published in the final excavation report, the others exhibit significant differences from them in shape, decoration, or fabric.

Approximately 360 of the catalogued amphoras belong to one of four seemingly closely-related types. Some 130 of them, including those shown in drawing A1.1-1.10, are represented by CA 13 in Yassi Ada I; some 30, including A2, by CA 17; some 130, including C1.1-1.7, by CA 18-20; and some 50, including B1.1-1.13, by CA 14-16.

Examples of the first three of these types have been found on the island of Samos in the passageway connecting the cisterns at the Eupalinos underground aqueduct (Hautumm: Kat.

Nrs. 7-9, 13 and 15); the amphoras there contained traces of olive oil. The Eupalinos tunnel was used as a place of refuge by the local population during the Persian presence in the Aegean in the 620's and later during the Arab expedition against Constantinople in the 670's. It would appear, then, that the four closely-related types constituting roughly 85% of the globular amphoras on the 7th-century Yassi Ada ship and the amphoras in the cistern passageway on Samos were all produced shortly before the sinking of the ship and the Persian siege of Constantinople.

The some 60 other catalogued amphoras belong to some 40 different types, including A 3-8, B 2-12, and D 1, and include almost 2/3 of the amphoras with graffiti. The great majority of these types are represented by only one amphora. Some of these amphoras, judging from their shape, would appear to have been in existence for a substantial length of time prior to the ship's sinking. They include B 11 and P 79 (Yassi Ada I: 186), which Bass thought possibly an antique on the ship.

Amphora B 11 is of particular interest in this regard. On one side it bears the letters θ and Δ . I tentatively propose that this is a date, the θ representing the number 19 and the Δ representing the number 4, and read: 19th year (of the reign of Maurice Tiberius), 4th indiction. This would be the year A.D. 600/1.

I am presently inclined to believe that the some 40 amphora types represented by only one to several examples had been collected from quite a number of different private owners. This would explain the great variety of types involved, the high frequency of graffiti including a great variety of monograms and names appearing on them, and the long period of time that some of them had been in use. (Two amphoras, of different types, A4 and B1.12, had been used by a single individual for the storage of lentils; the word $\phi\alpha\kappa\epsilon\alpha$ had been carved on both by the same hand.)

Any comments or parallels that would contribute to a better understanding of these graffiti or of how and where the amphoras had been used would be greatly appreciated. If you are interested in receiving more information about these amphoras and their graffiti as it becomes available, please let me know.

Frederick H. van Doorninck, Jr.
 Institute of Nautical Archaeology
 P.O. Drawer AU
 College Station, TX 77840

Athens, May 19, 1986

Professor H. van Doorninck, Jr.
at the Conference,
Kindness of Professor C.G. Koshler

Dear Professor van Doorninck:

I am interested to hear that you are taking up for further study the amphoras from the 7th century Byzantine wreck published by George Bass and his associates including yourself.

I am sorry to say I have not yet looked at the book (problems about mobility). But since in his preliminary article (Anzeiger 1962) George reports (p.538) that I dated the wreck from the amphoras before the coins were found, you may have assumed that there were at the Agora good and well-dated parallels for your main amphora shape. But in fact it was the well-dated parallels at the British dig on Chios, which I had seen during visits to the excavations, and passed on the information to George, and he got photos from Boardman, cf. his p.554. We have a few whole-jars comparanda at the Agora for your globular kind, but not very close and not very well-dated; also some tops of jars with graffiti that might be related. We do have a lot of amphoras related to your "hour-glass" kind I think; I mean I think ours are like yours, but have only seen the drawing in the Anzeiger.

Your parallels from the Eupalinos tunnel are particularly interesting. I wonder if your globular jars do not come from Samos, which in antiquity exported oil, not wine. I would be interested to hear what your evidence is for "spiced wine". Apparently it is impossible to use for wine ~~was~~ an earthenware container that has held oil. A shipload of oil is of course much more valuable than a shipload of wine.

Among your various shapes, perhaps in the book you have the Agora parallel for your "wine-thief"; context like yours; a fairly recent find of John Camp.

Do come to the Agora if you have time. I am here Monday - Friday about 11 or 11:30 to 5:30. Maybe Carolyn could come with you.

Yours sincerely,

[Oil jars would be found in Athens, which had oil]

American School of Classical Studies
54 Swedias Street, Athens 108 76, Greece

May 27, 1986

Professor Frederick H. van Doorninck, Jr.
Texas A and M University
College of Liberal Arts
Department of Nautical Archaeology
College Station, Texas 77843-4352
U. S. A.

Dear Professor van Doorninck:

I enclose my letter to you of May 19, addressed under the impression that you were attending the archaeometry conference going on in Athens. (This was true of a couple of other people I was writing to at the time.) I am sorry for the extra delay.

On oil rather than wine being the export from Samos in antiquity, see in Hesperia XL, 1971, pp. 79-80, my article on Samian amphoras, with references. As noted there (p.80), one would not expect to find in Athens, another oil² producing state, many containers for imported oil. And so we don't have good parallels for your globular jars.

Yours sincerely,

14.V.86

(to Van Dornum)

NotesAgave has lots of his raw type

(9N3 series) [not so very ^{in the wood} rare, but few
or no whorls in Agave]

But few approaching his common

"globular" type (X)

and no context approaching the Chios
contextParallels for other items:

"win Chief" - one in Agave
(found by J. Camp) in same -
but context

spatheia [this is small]

(X) For various, related, see end of 7 = 2
look also at 951
(cards herewith)

see
OVER

on individual items

Try also N. Basant, Blocks VIII (?)
- X look at cards first, most of
them were catalogued because they had
graffiti (or depictions)

20.V.86

On 752, something like "globular" jars from
7th cent. Byz. Louchei

cf. B 17:11

P 19202, from ΠΠ, Bldg P, Room 2; bowl feet
on floor, 8.12.03. Henrich deslindat
— But this has a "small low ring foot"
See Kaup 1949, pl. 41, 2, "

P 3674 Site K, apparently in context

P 3454 K, locus in south below Turkish level
with coin of Arcadius, 395-408 AD
Fine wheel-made groove on shoulder
Deposit N

Maybe these are sort of predecessors of the
"globular" shape? They are not yet so
square. Note foot still on P 19202.

But I am guessing that the "globular" in the
wreck are oil jars from Samos.

cf also 951 P 26187
(6th & 8th cent
AD)

953 P 20359 115.?
9295 Byz. 115.9
3482 LR jar

Context

with coming letter from

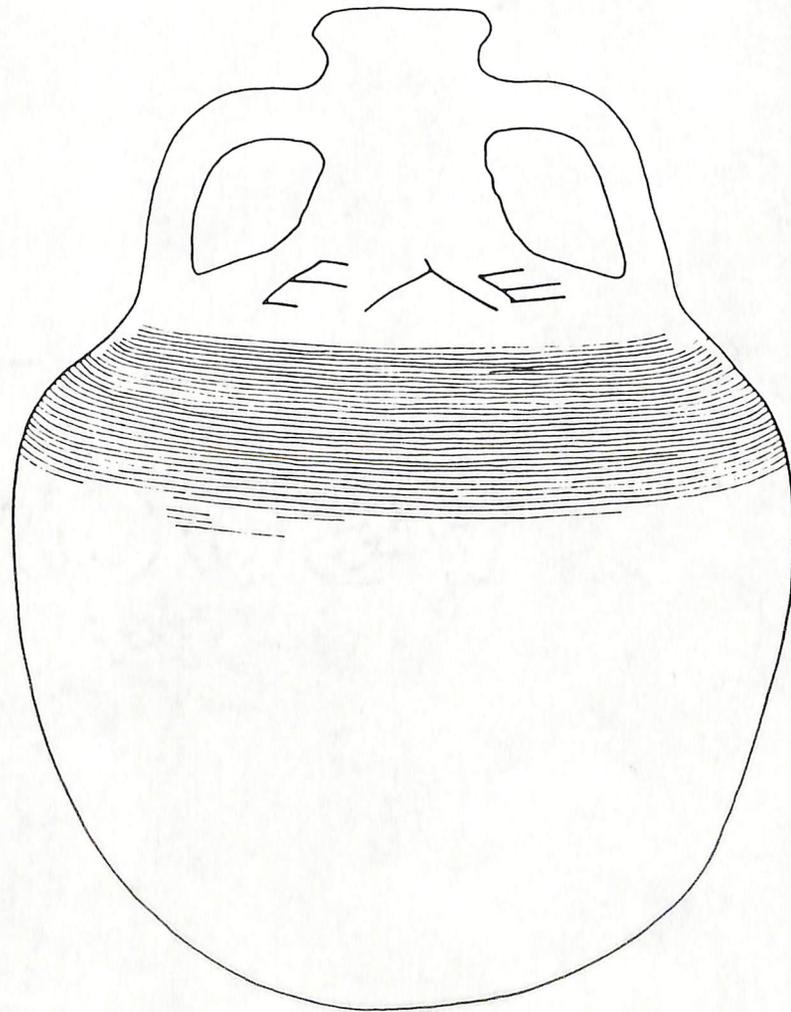
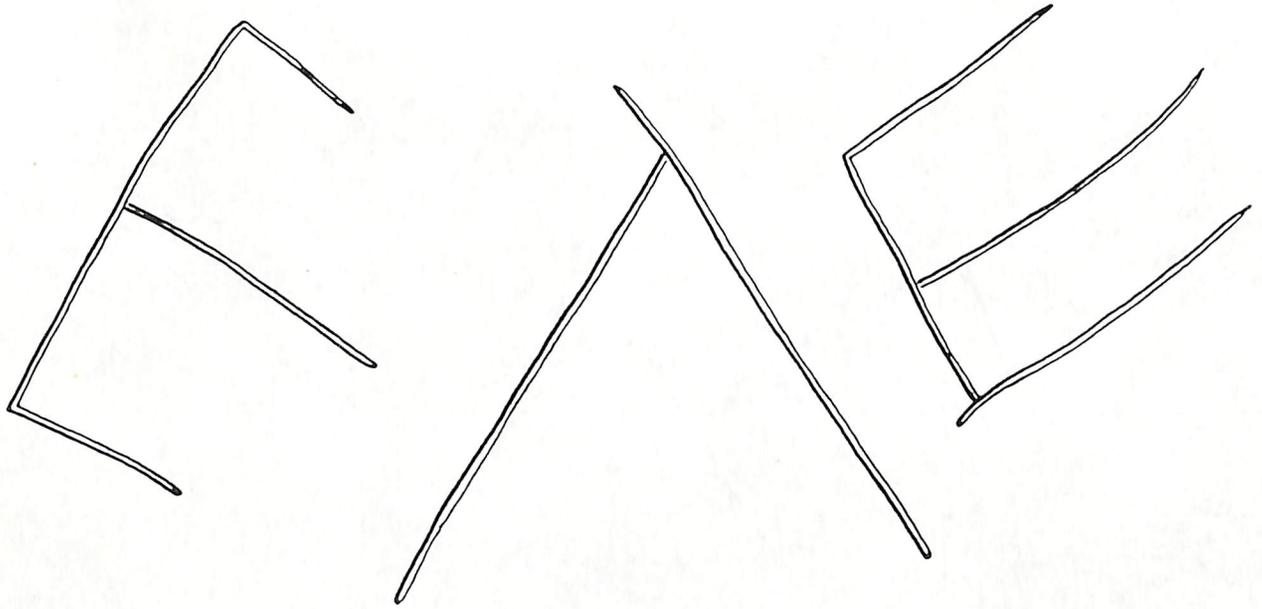
Van Doornumel

dated 14. III. 86

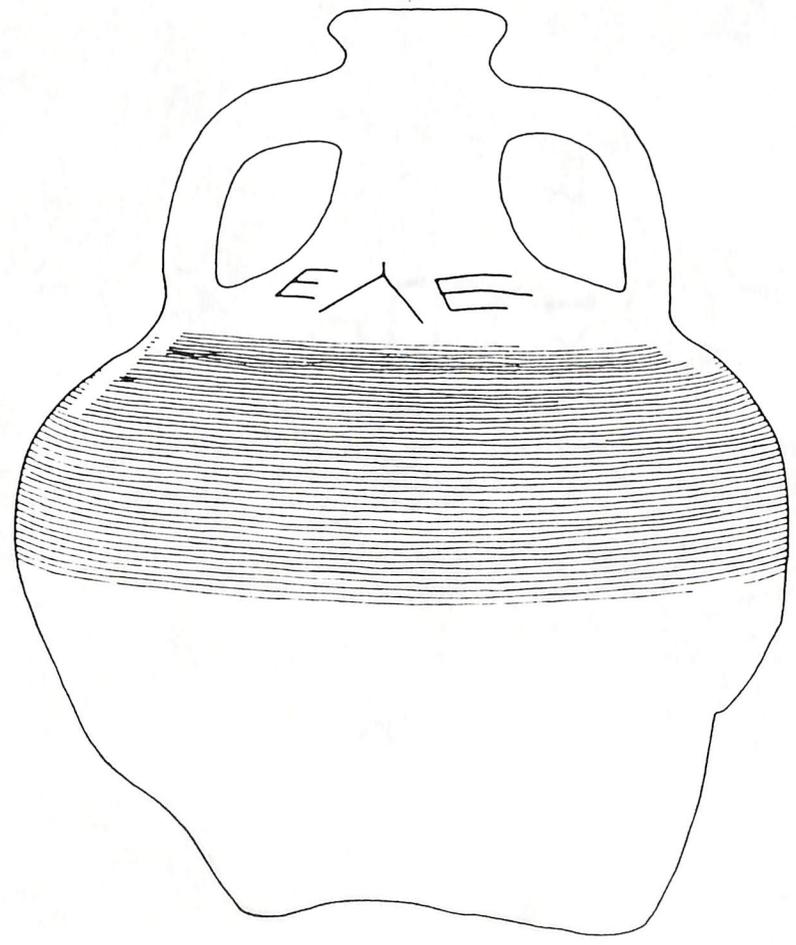
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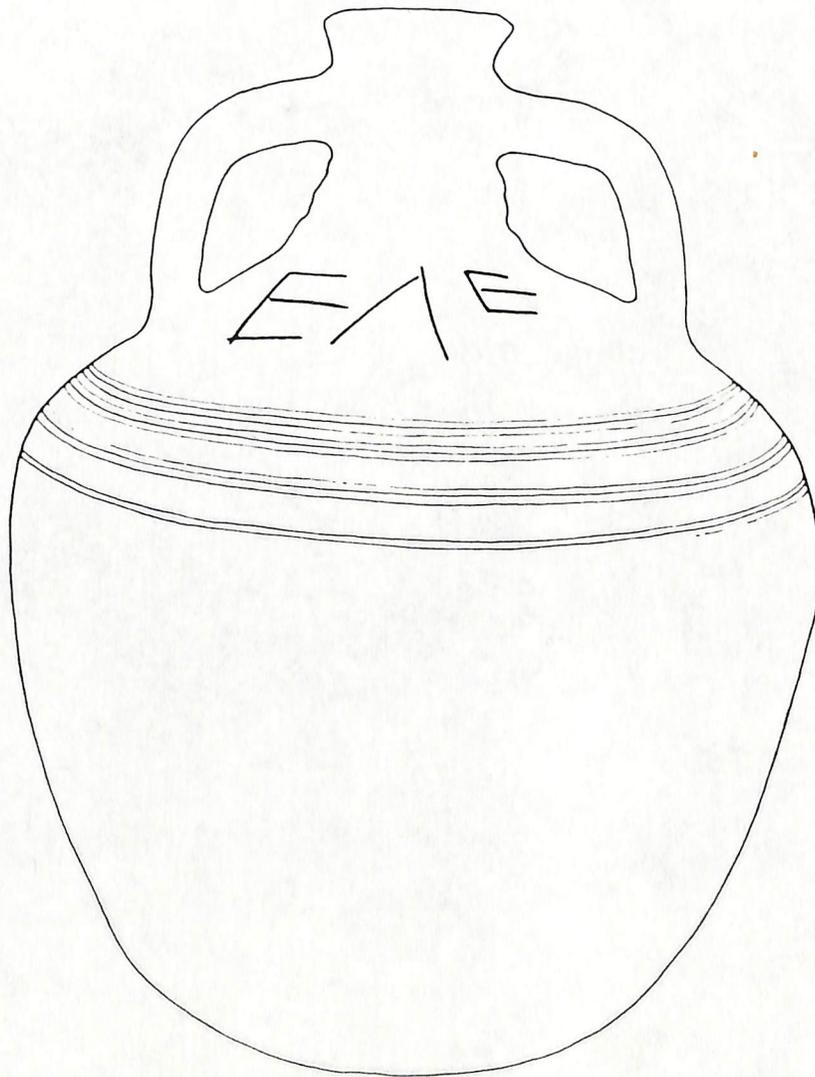
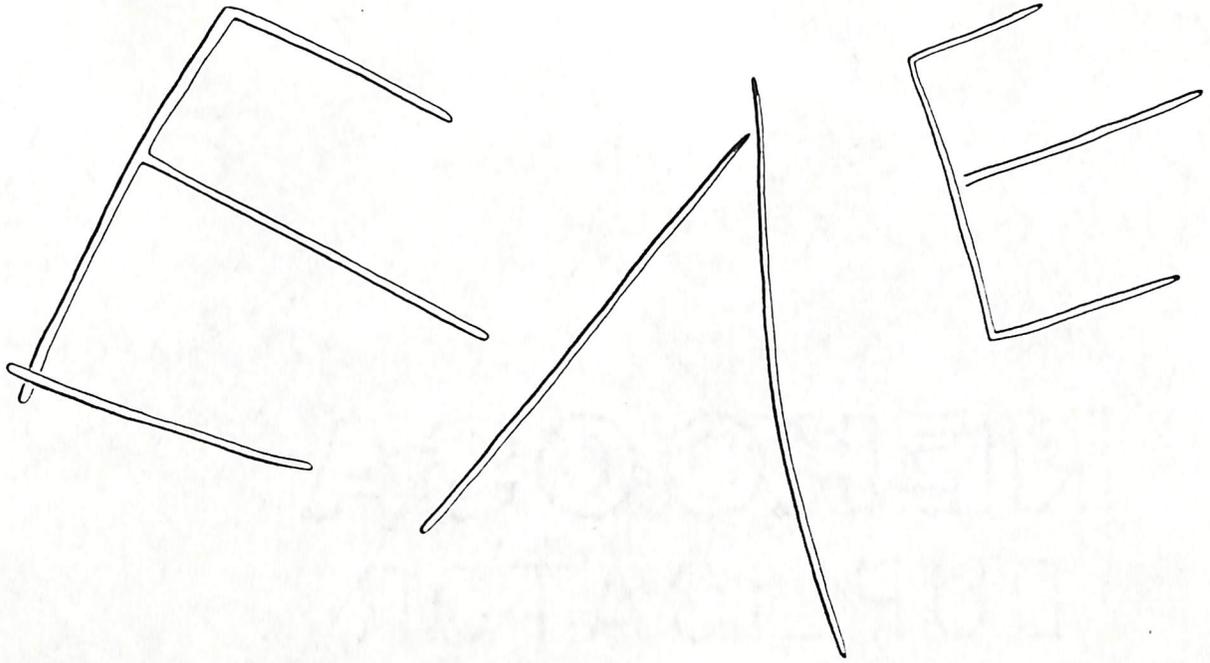
GROUP A:
Globular Amphoras Decorated with Broad Band of Combing

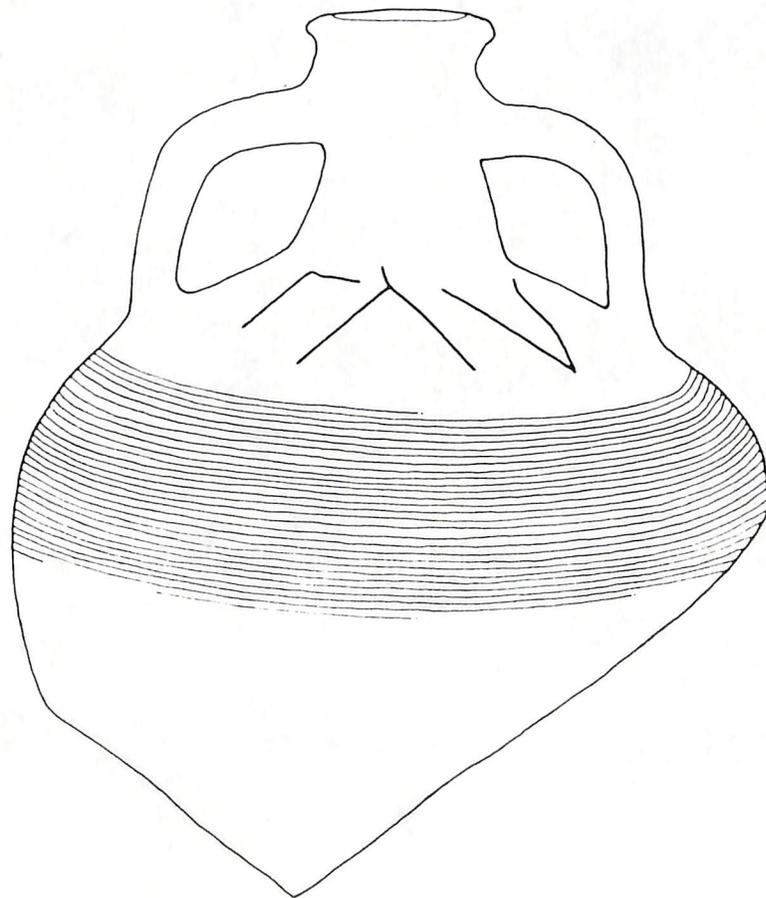
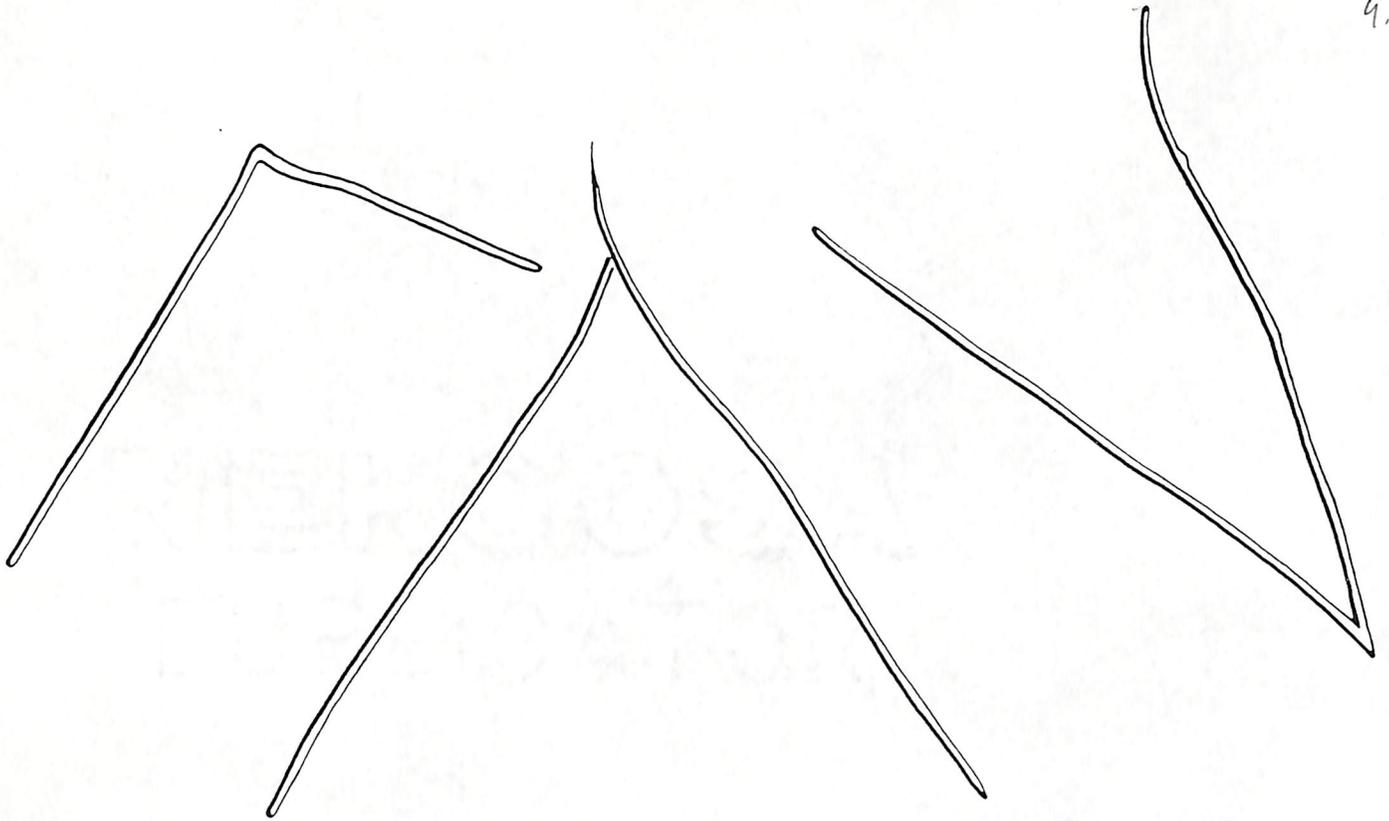
REPRODUCED
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PLATE 1

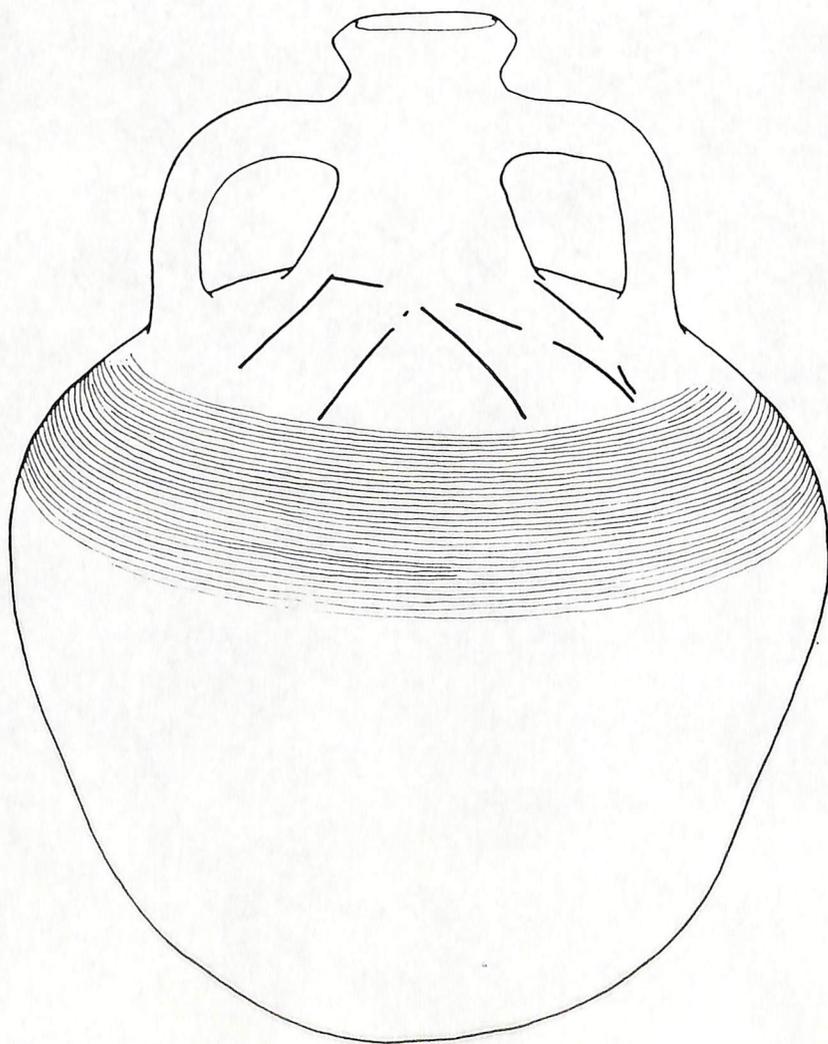
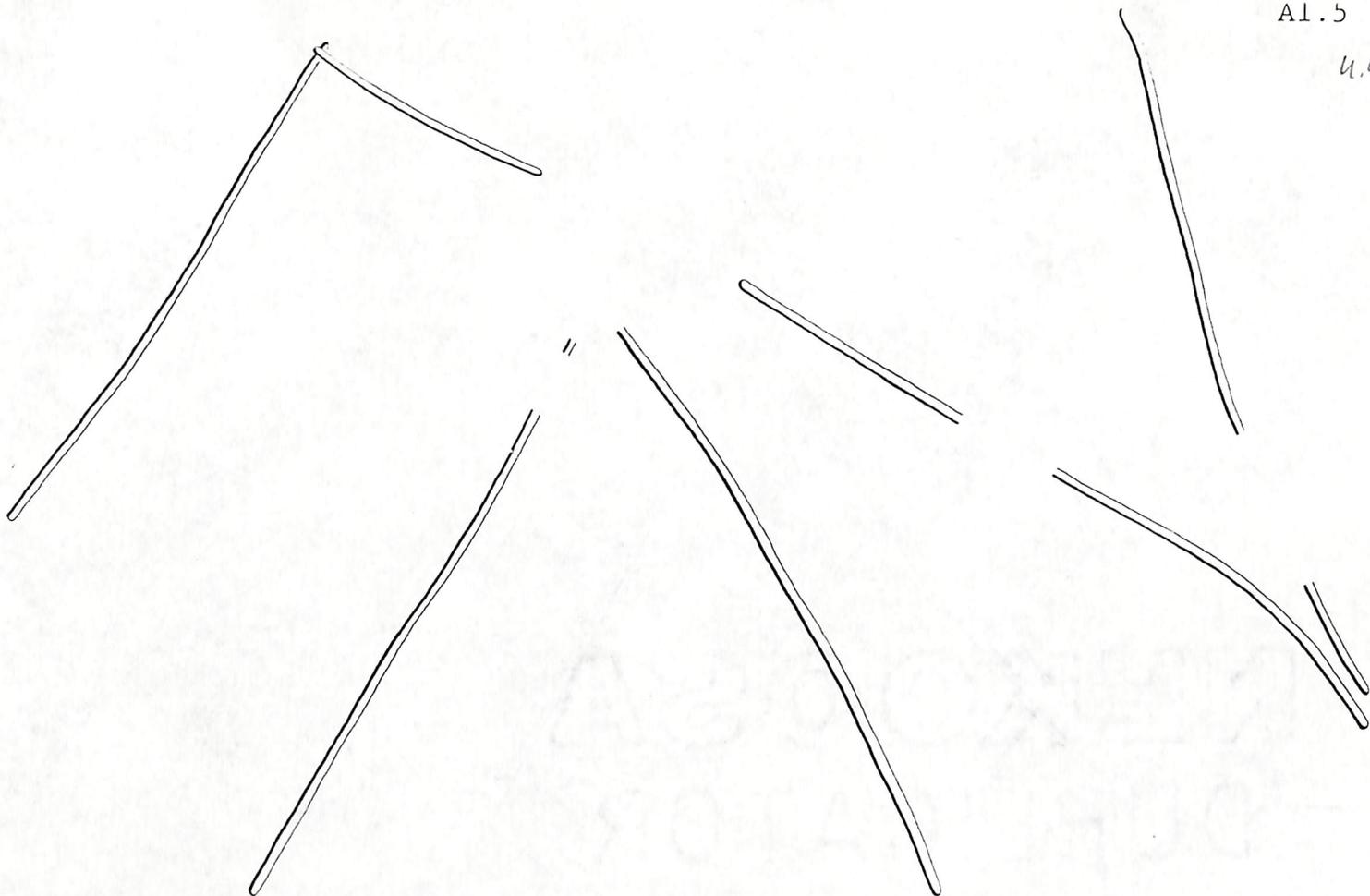


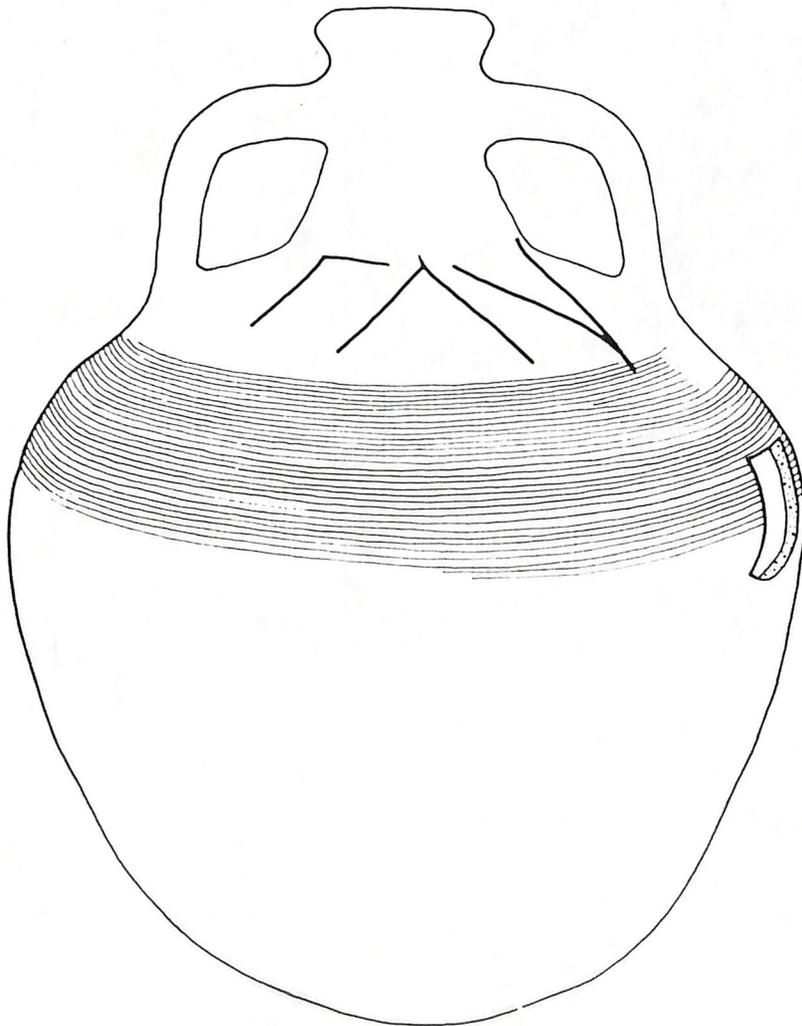
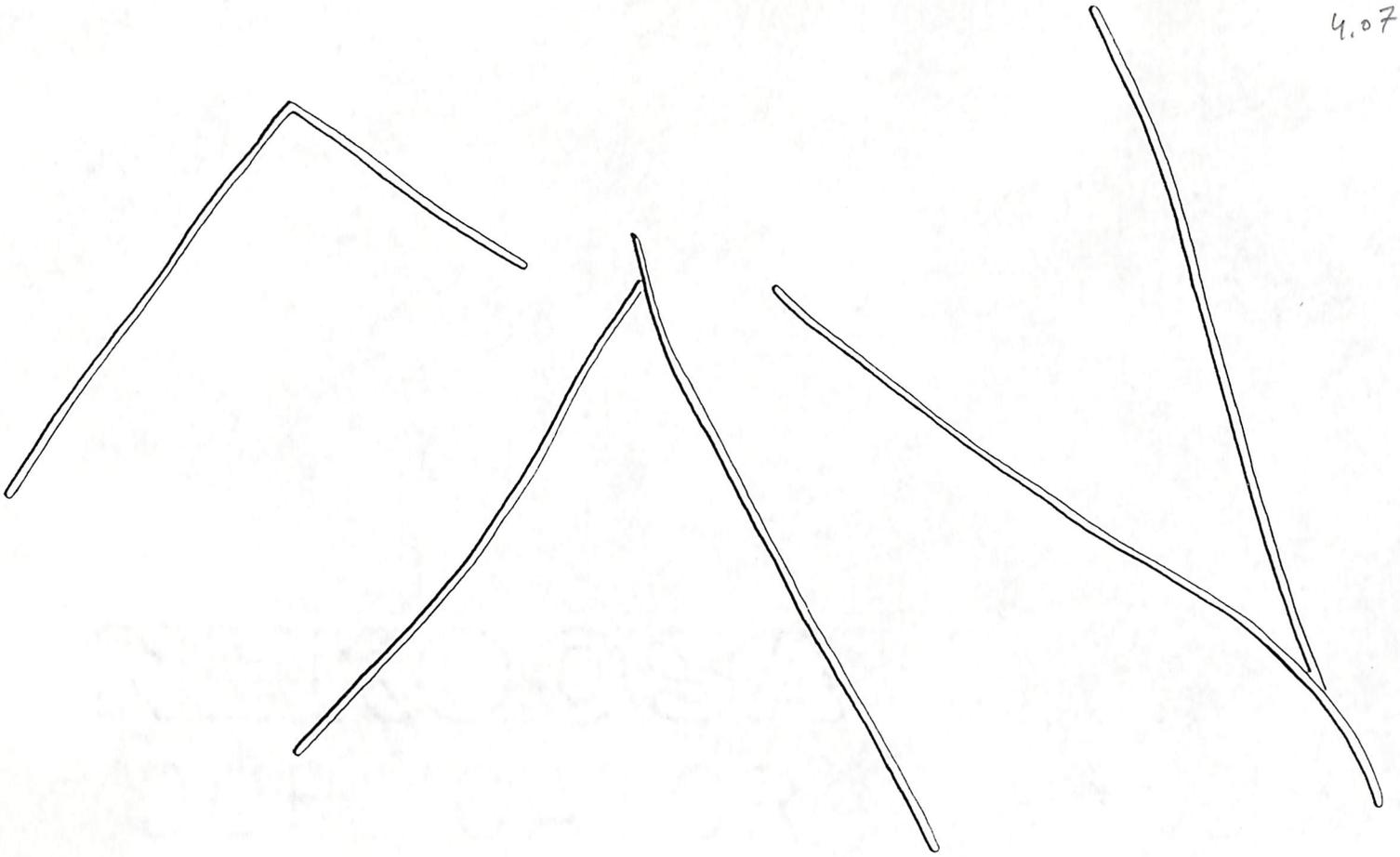
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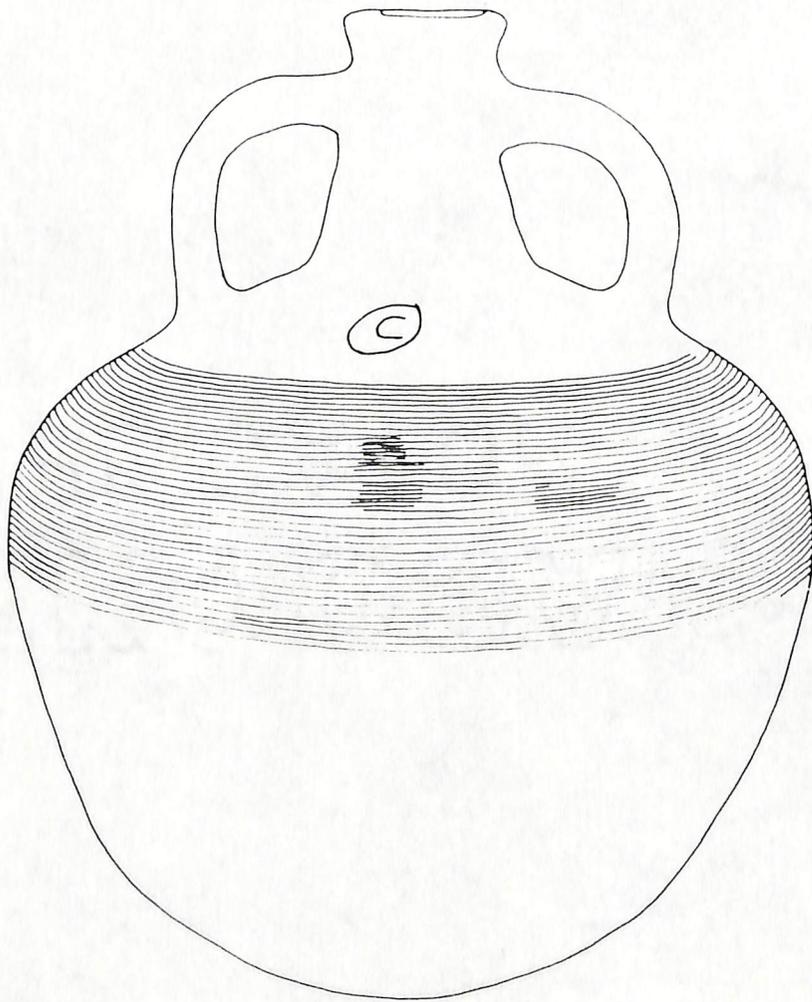


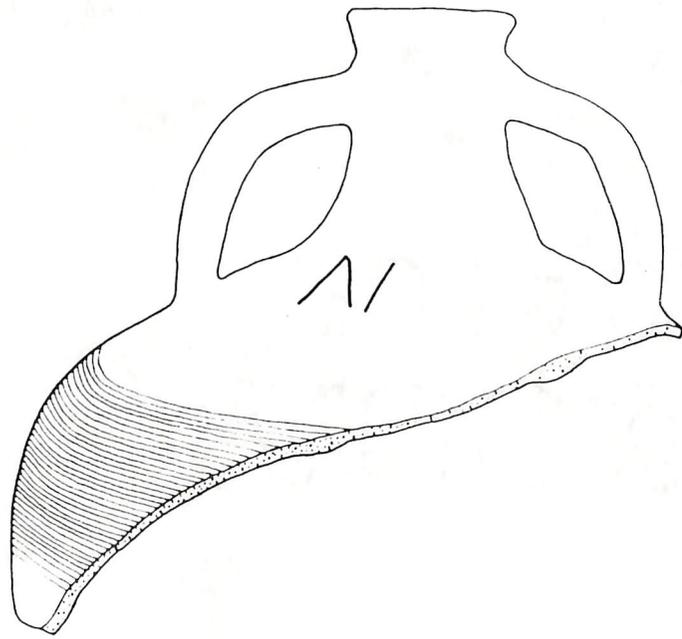
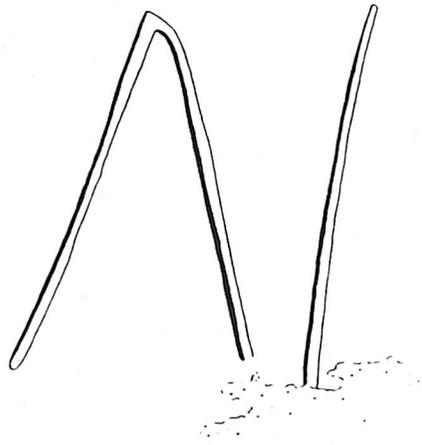


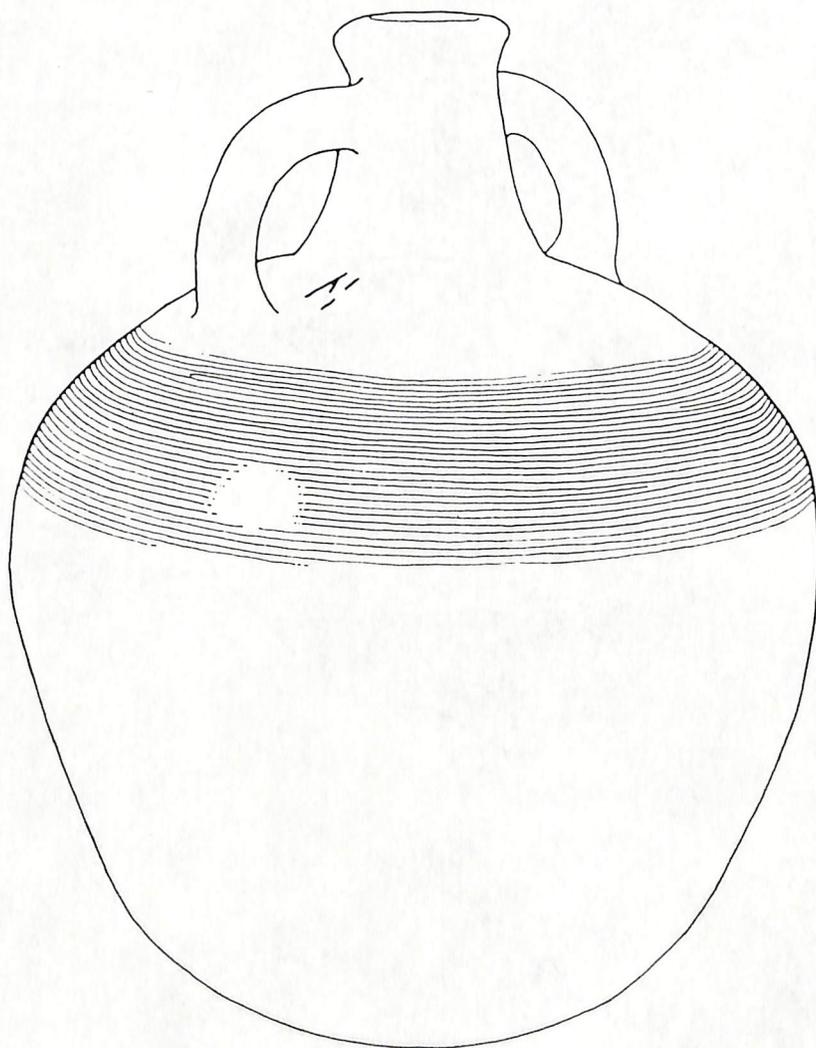
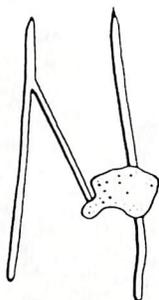


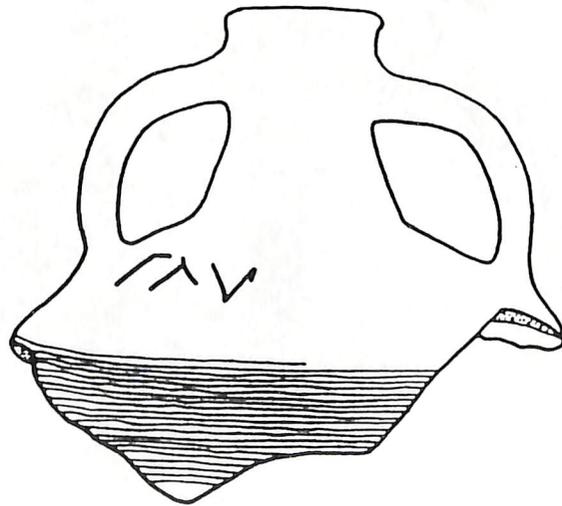
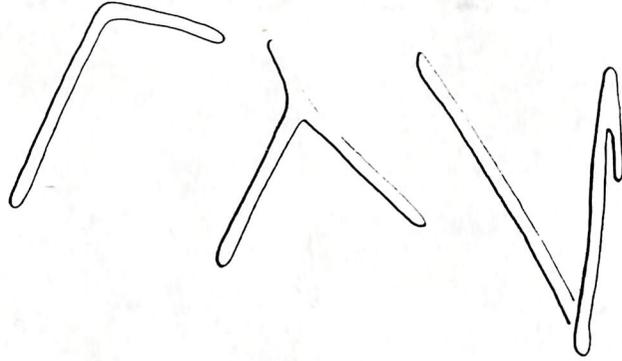


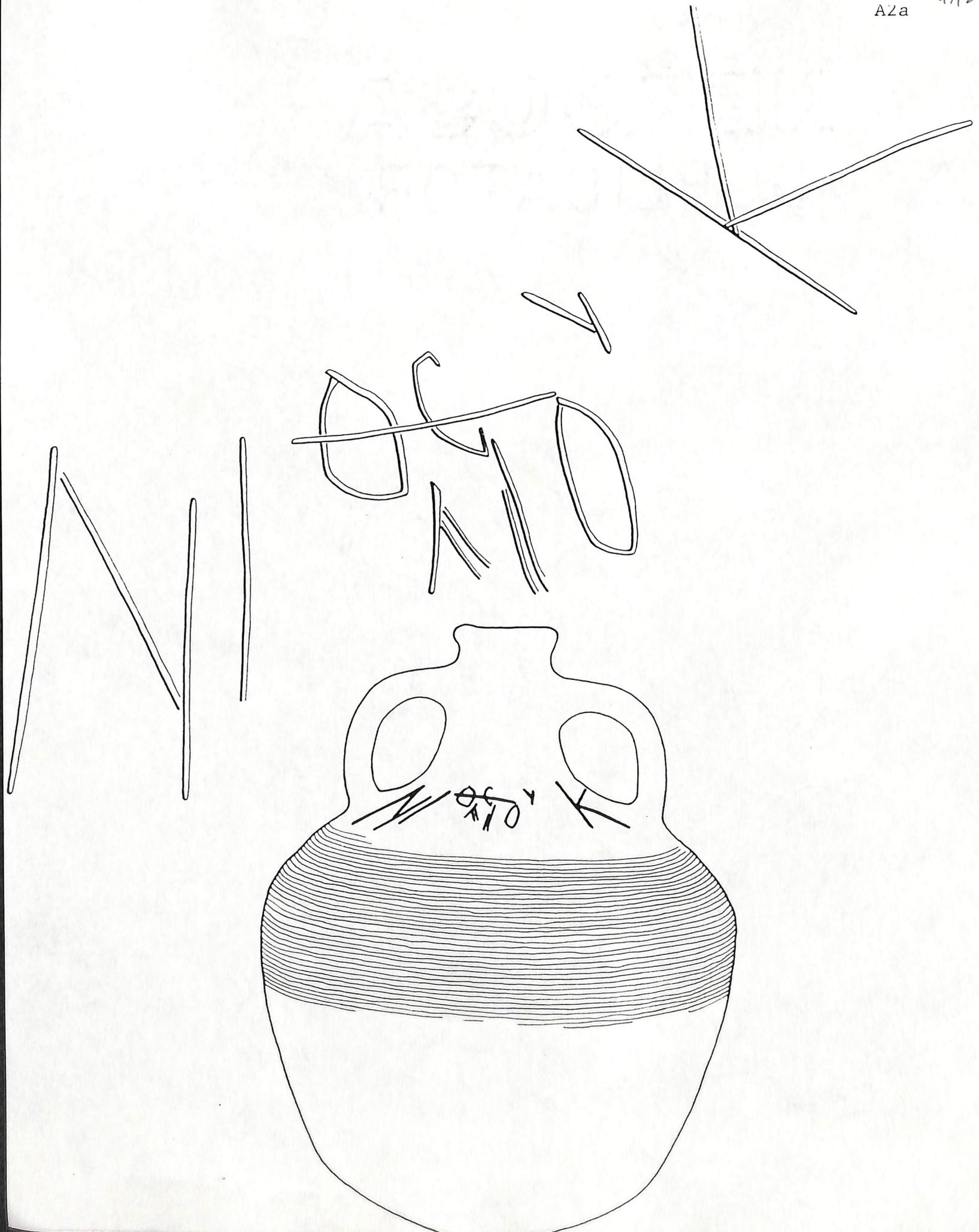




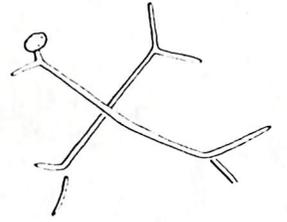


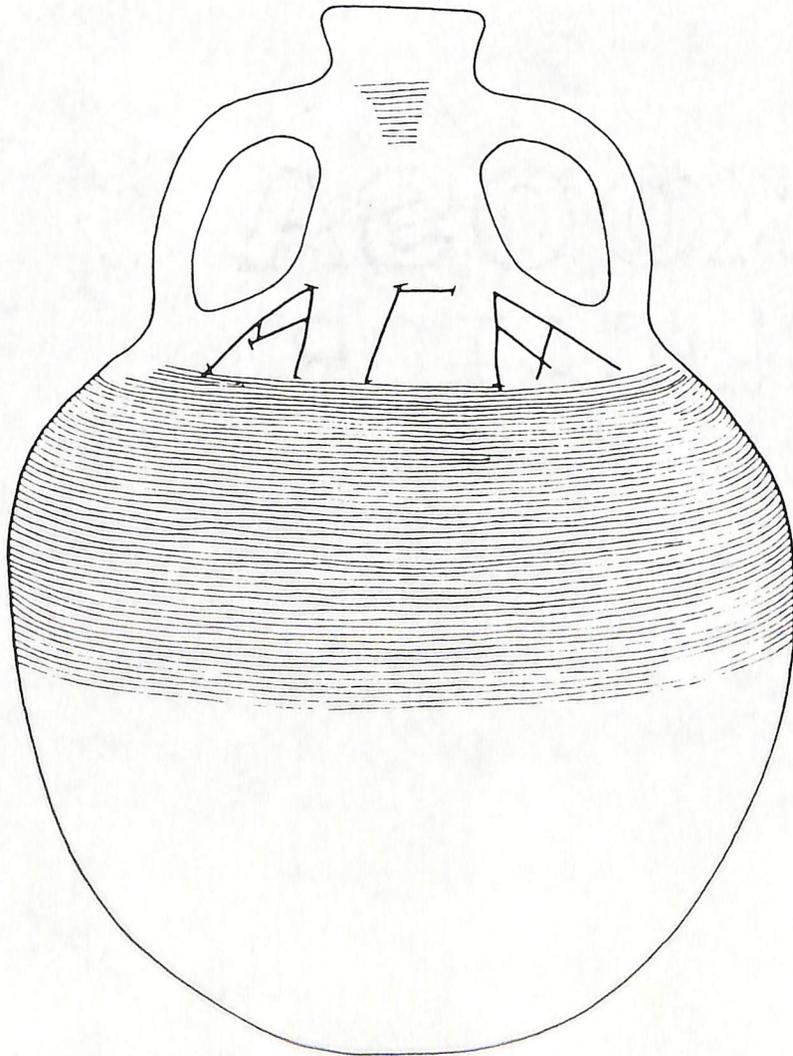
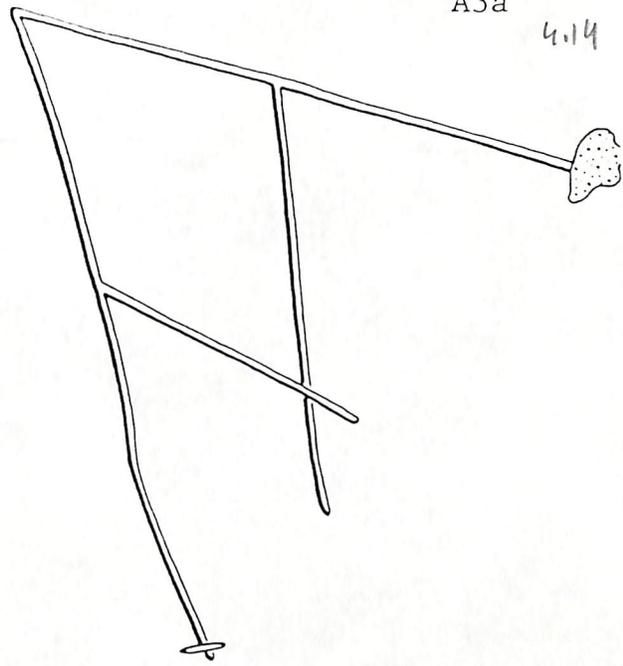
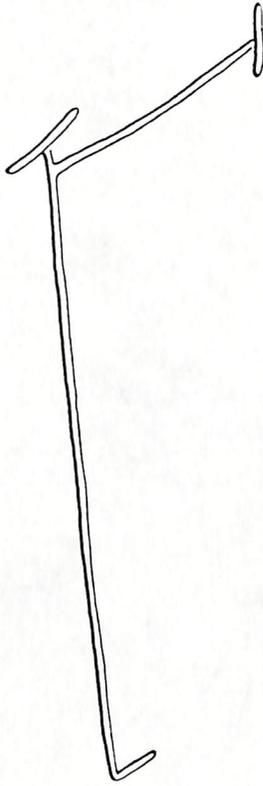
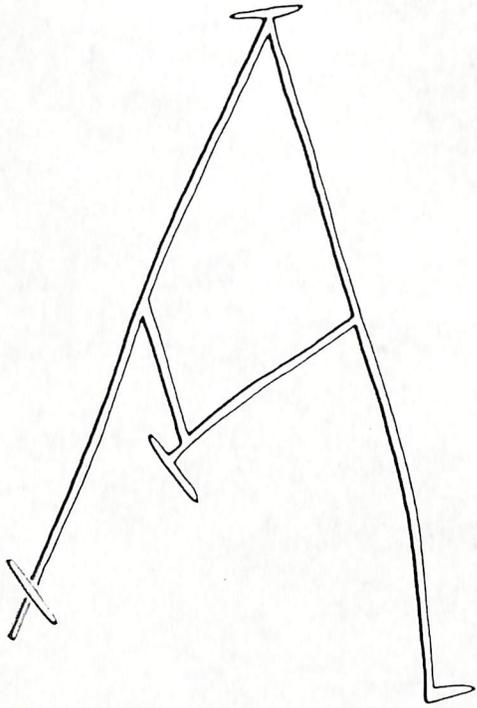


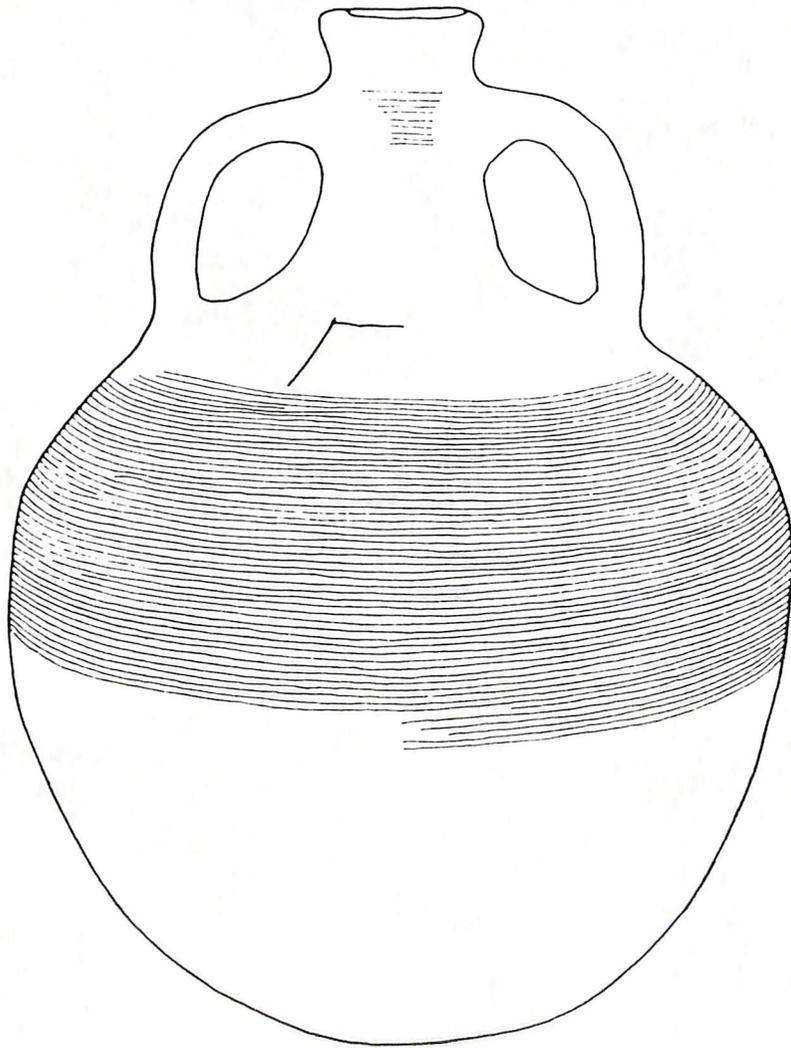
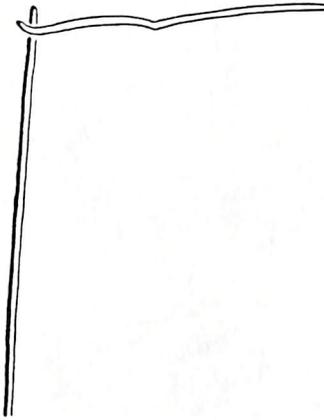




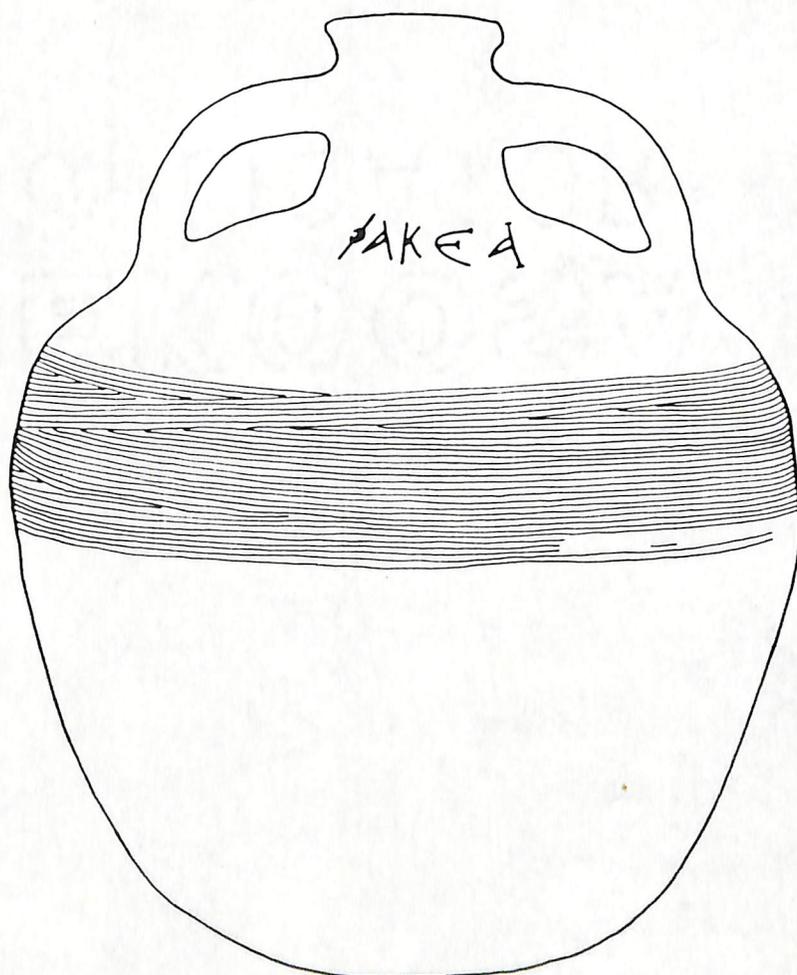
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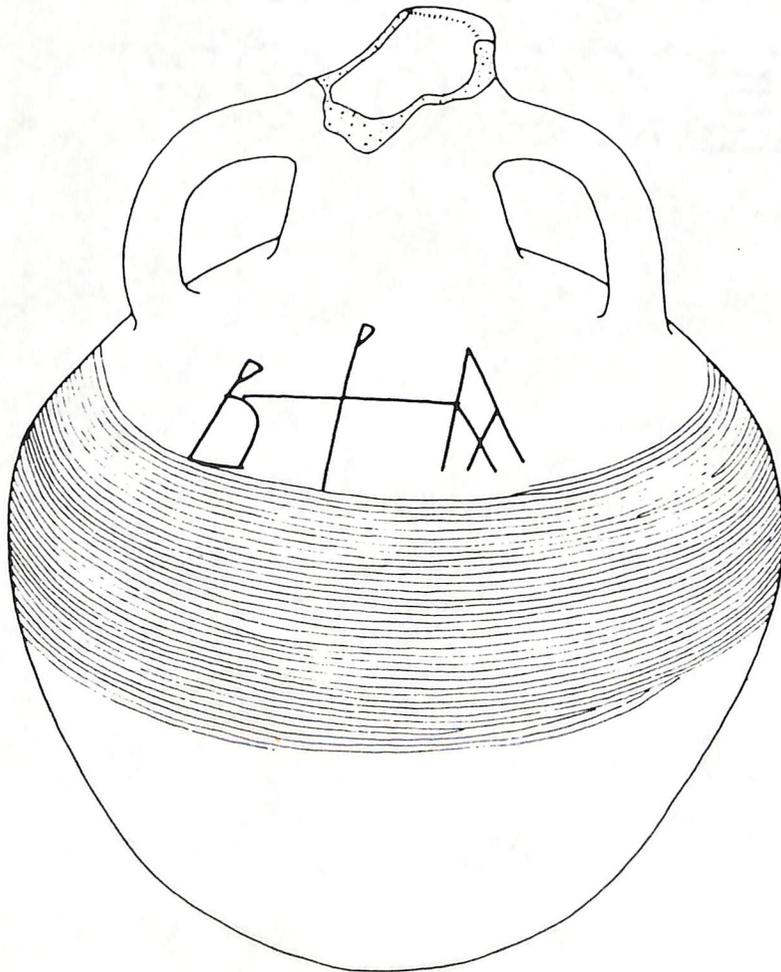
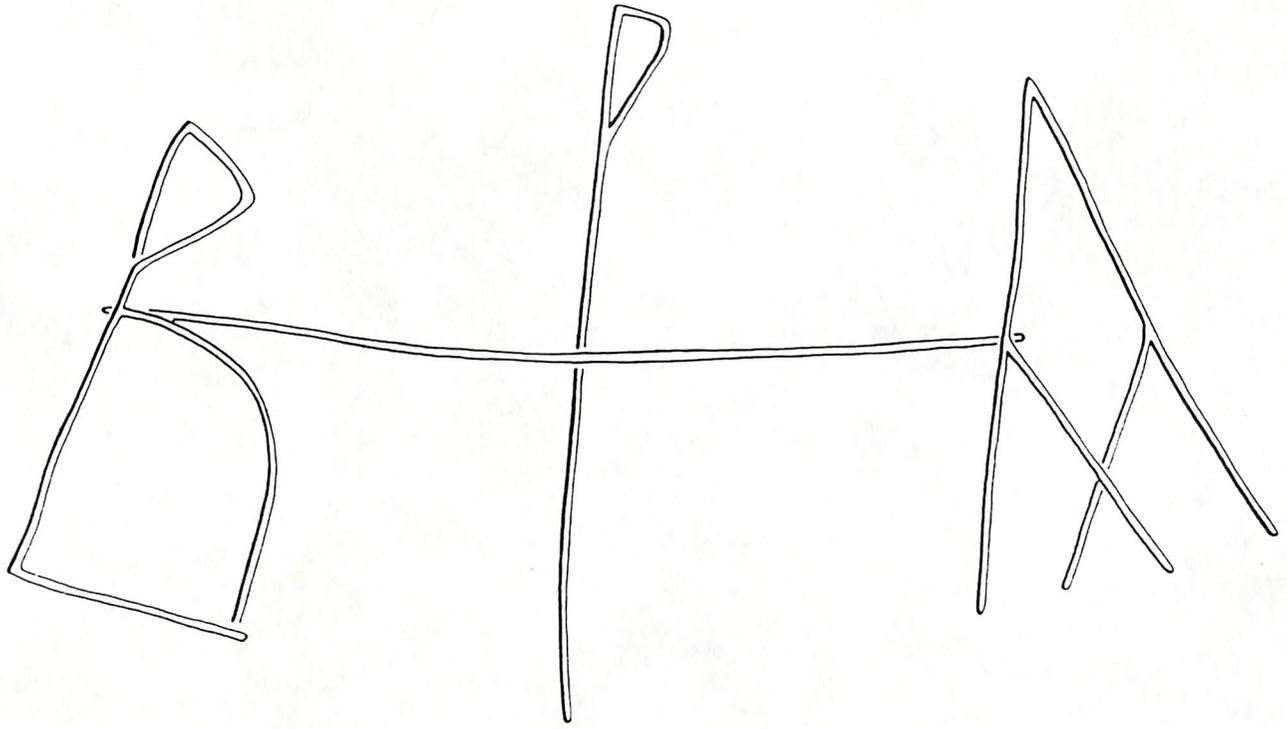


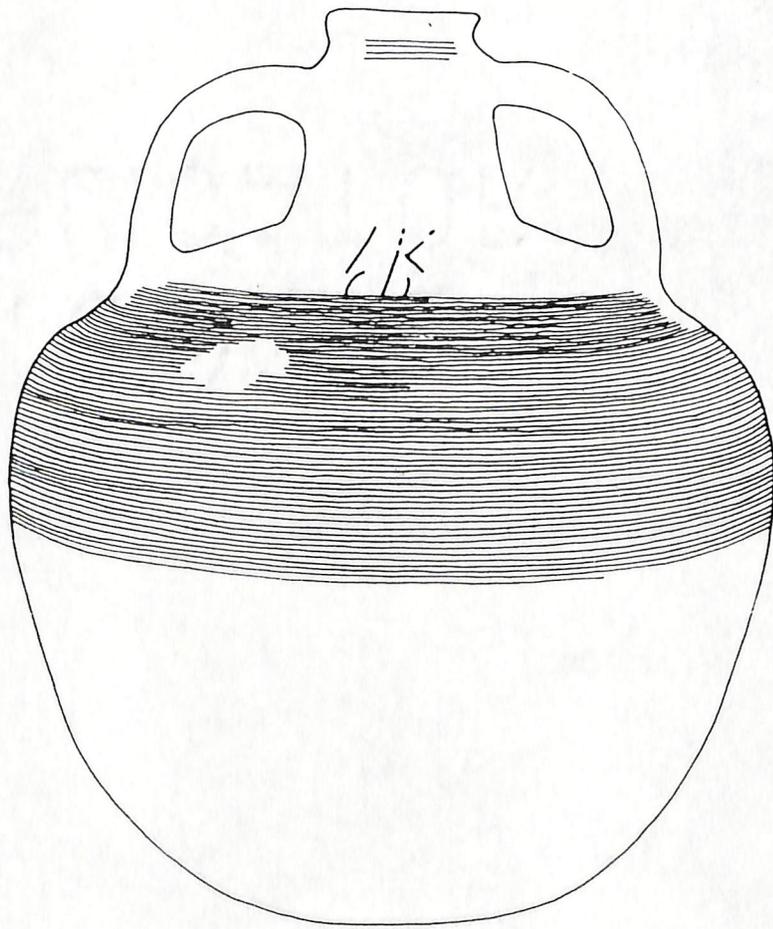
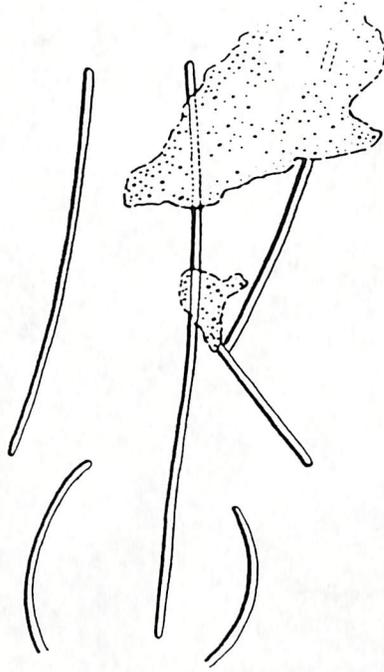


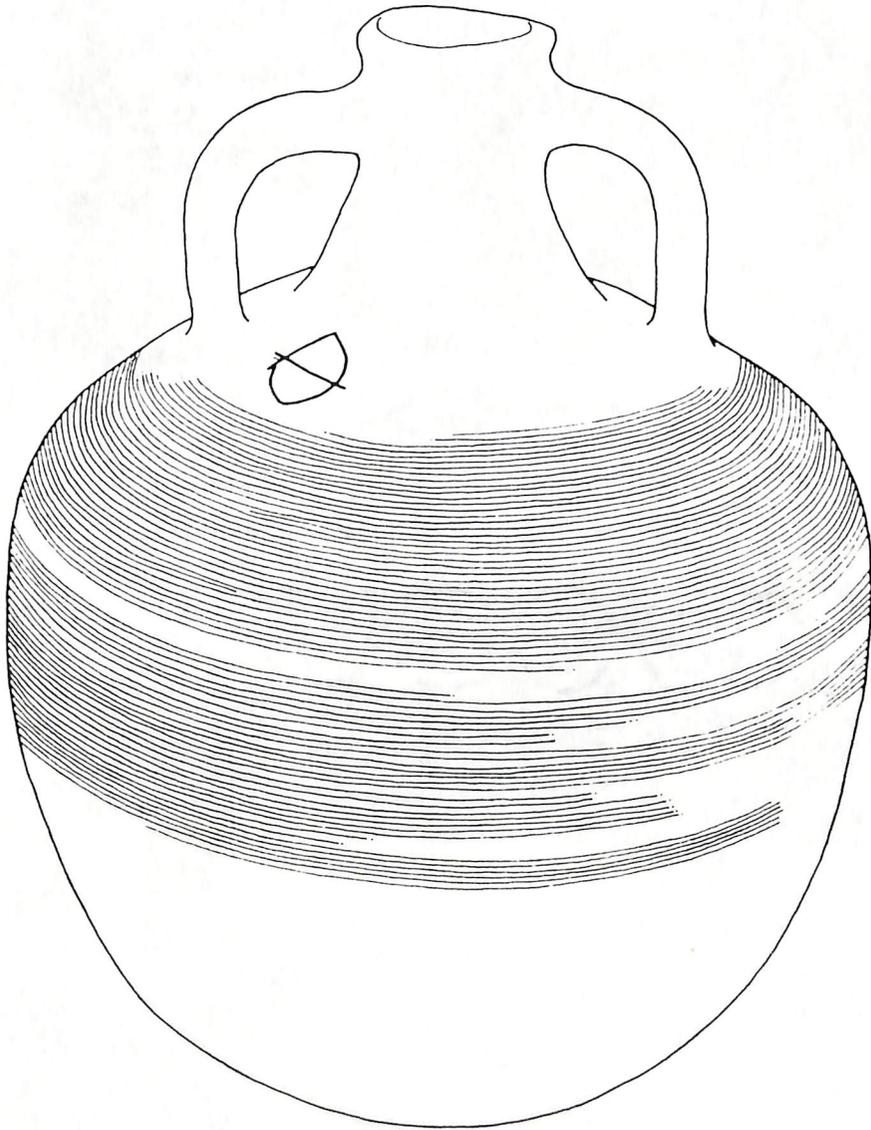
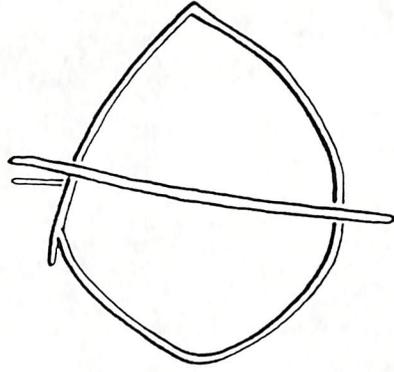


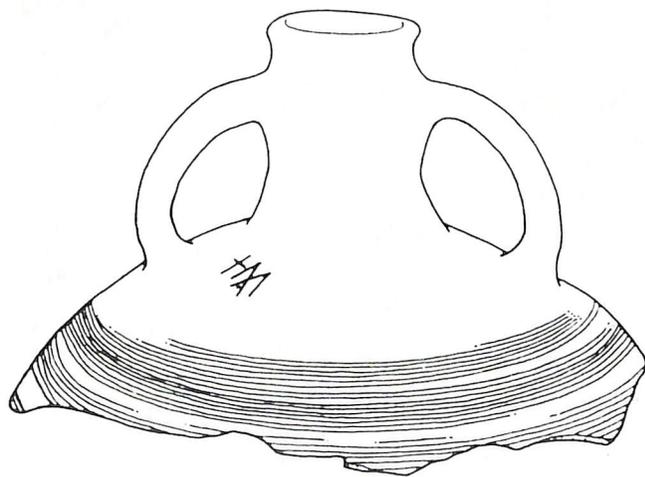
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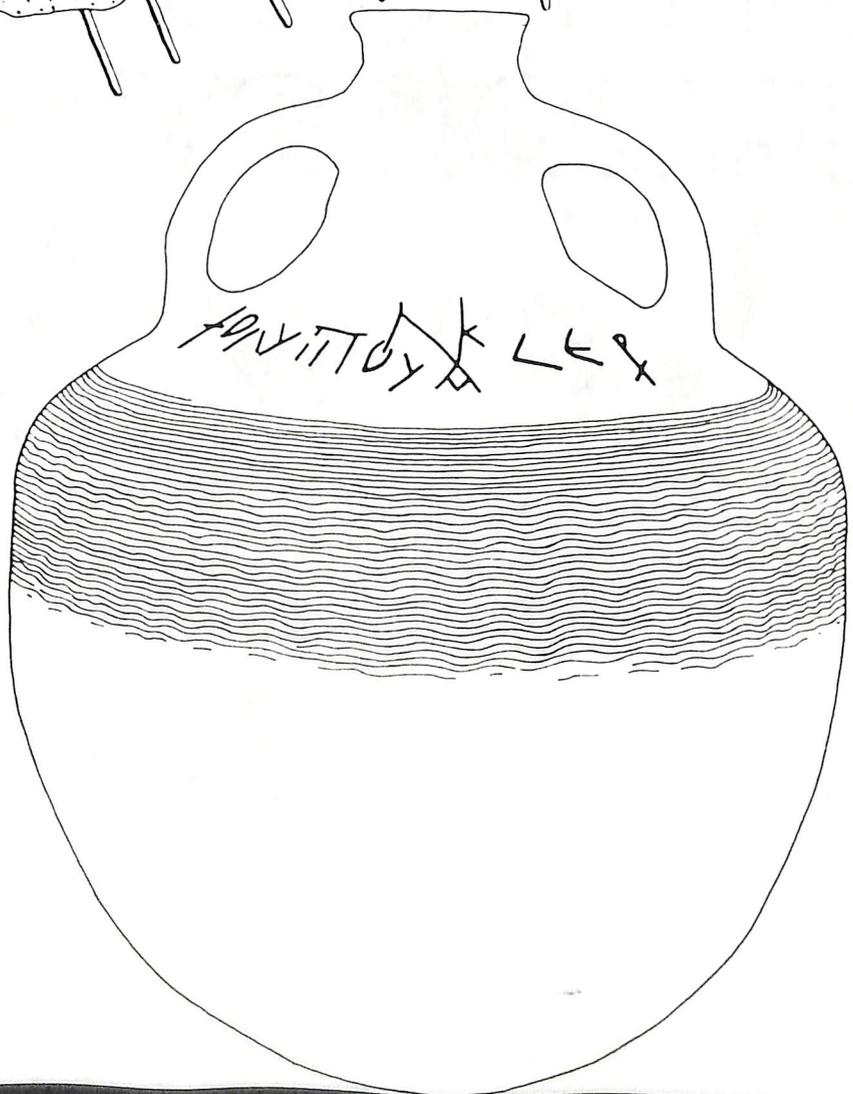
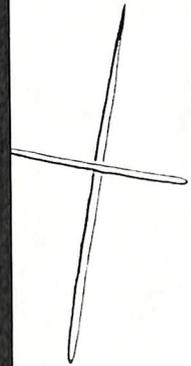
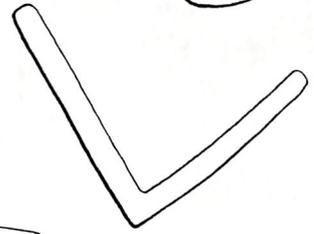
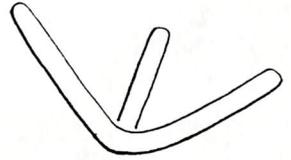
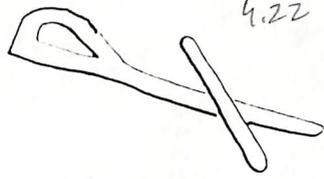




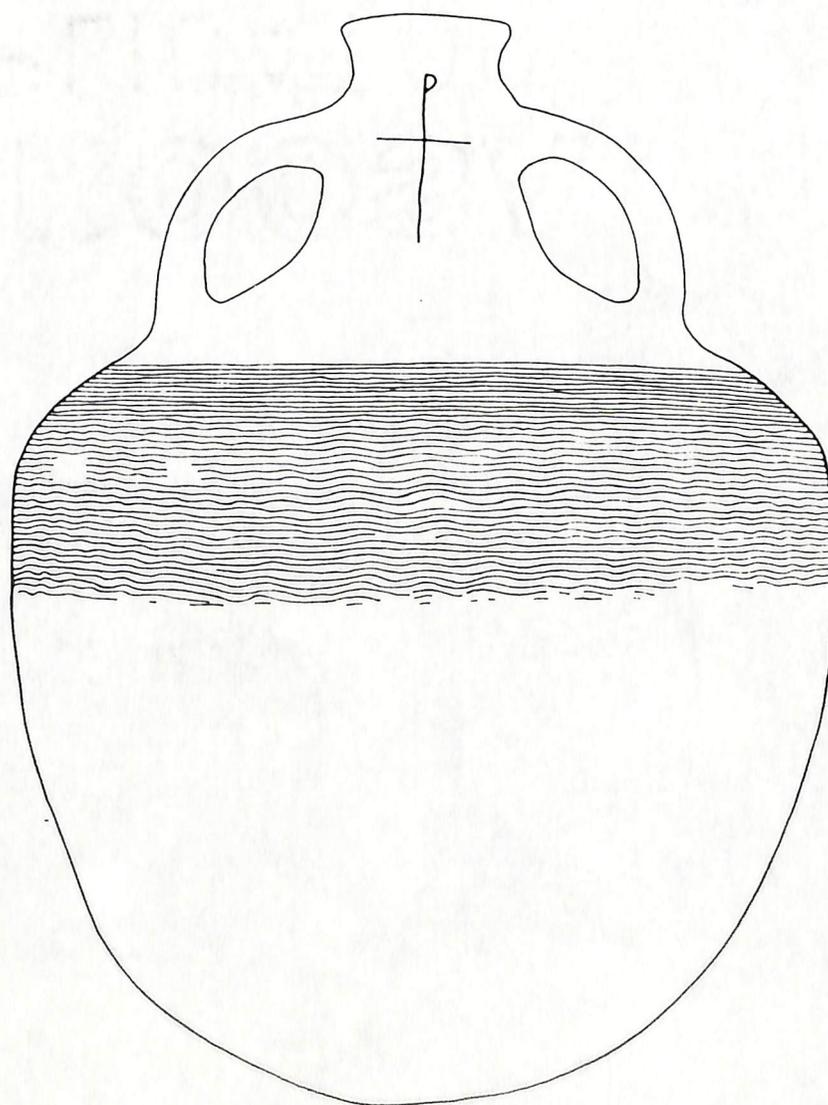
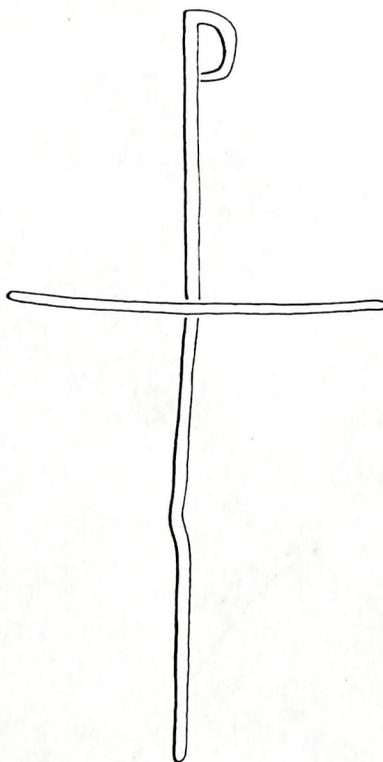


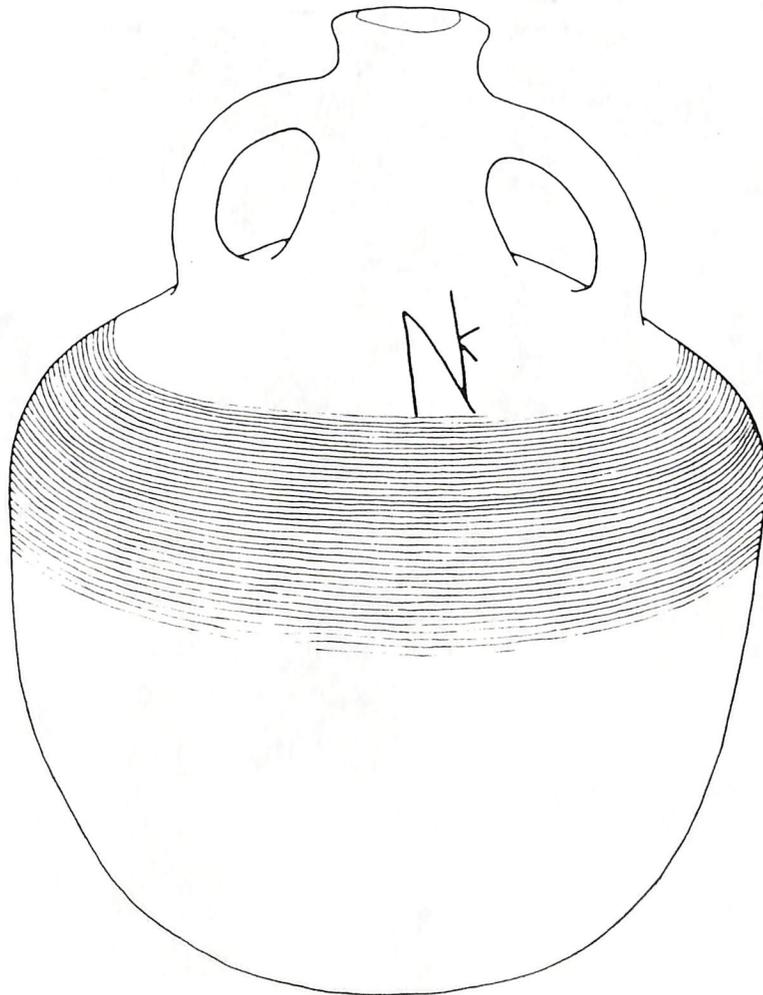


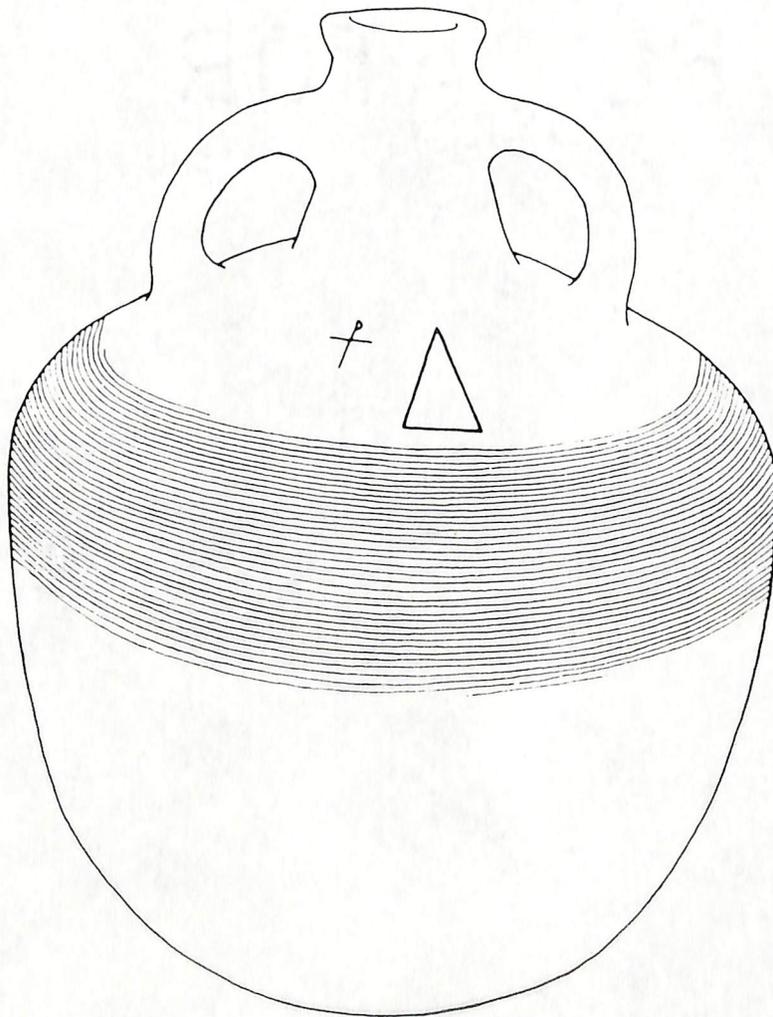
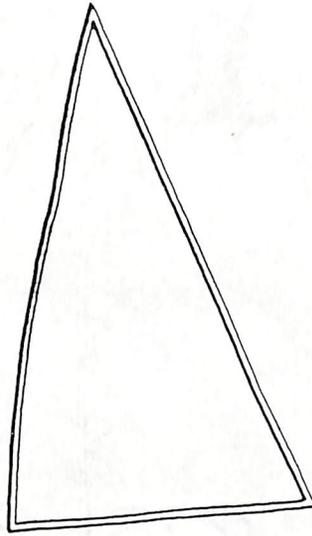
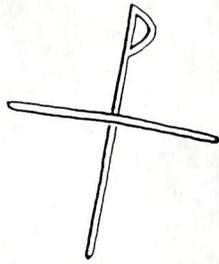
GROUP B:
Globular Amphoras Decorated with Spiral Grooving

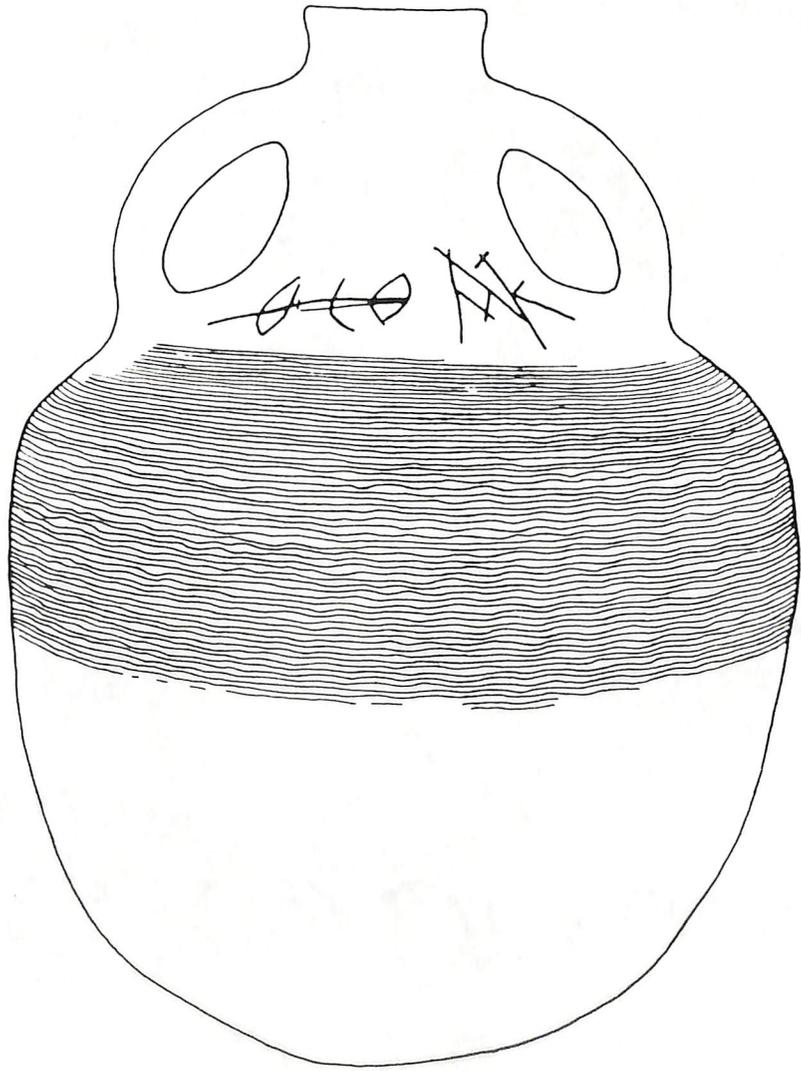
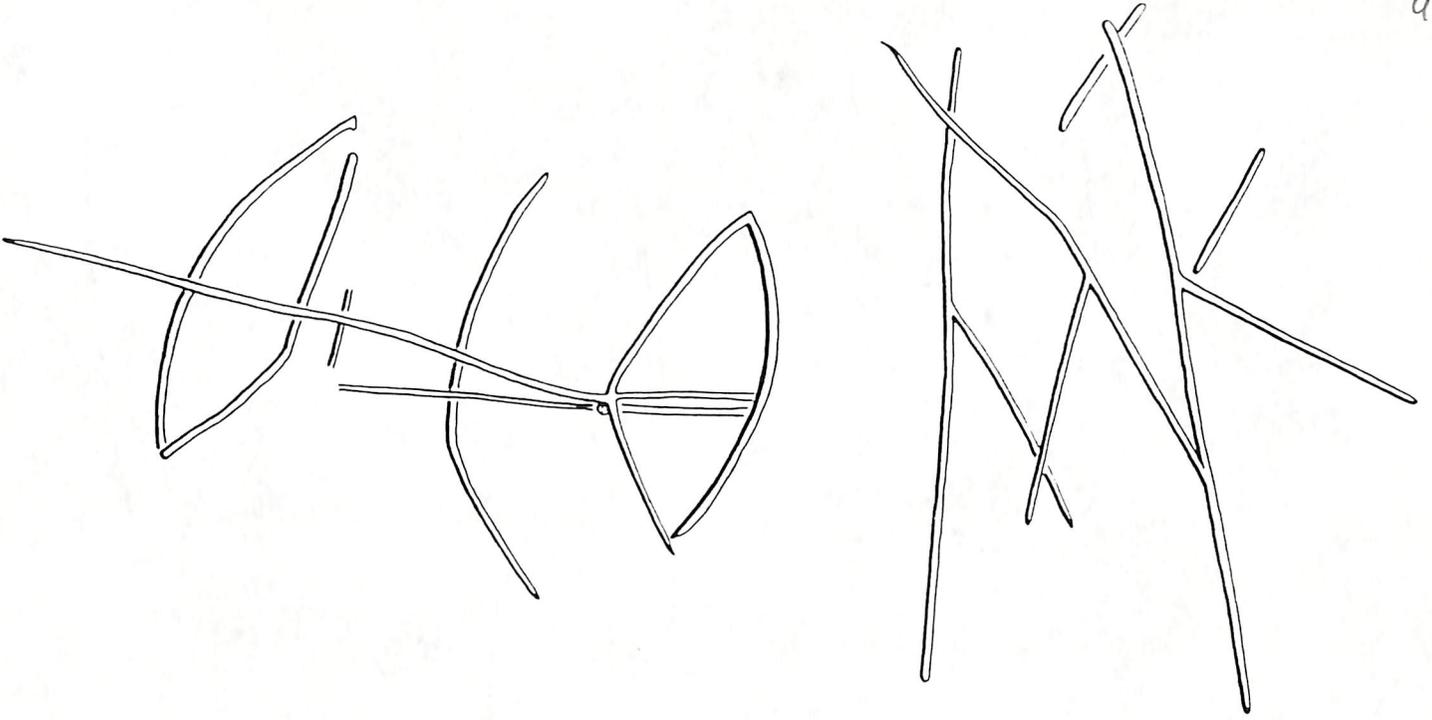


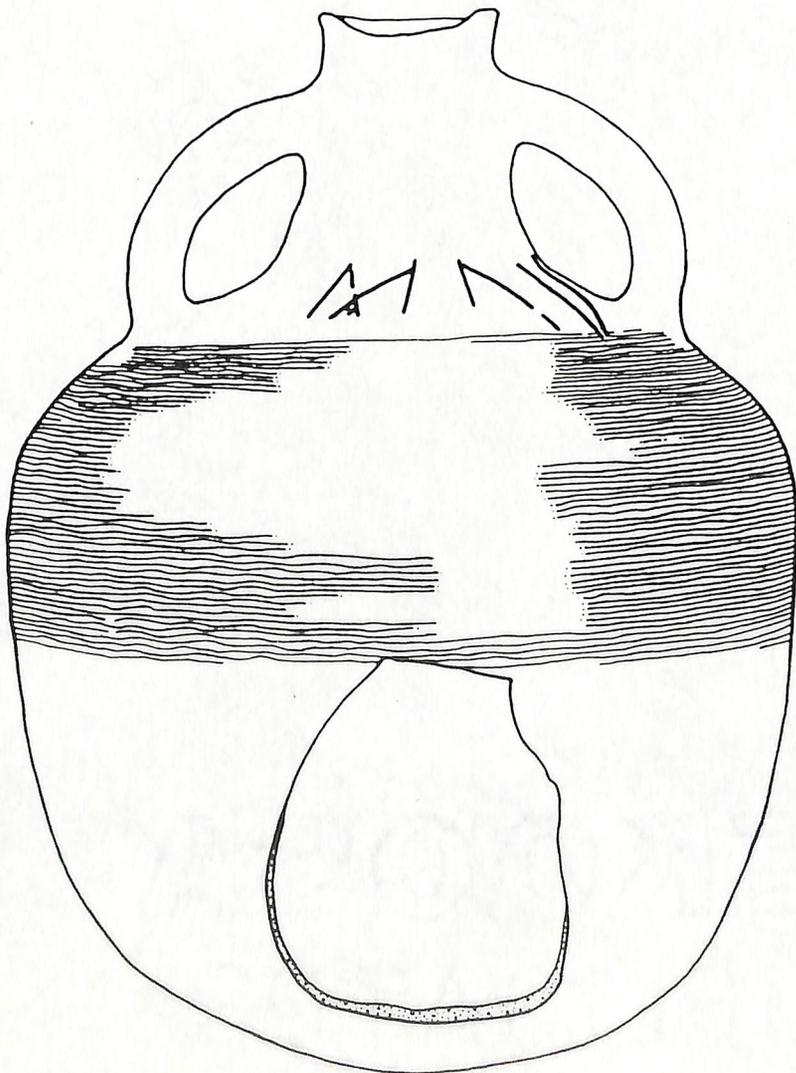
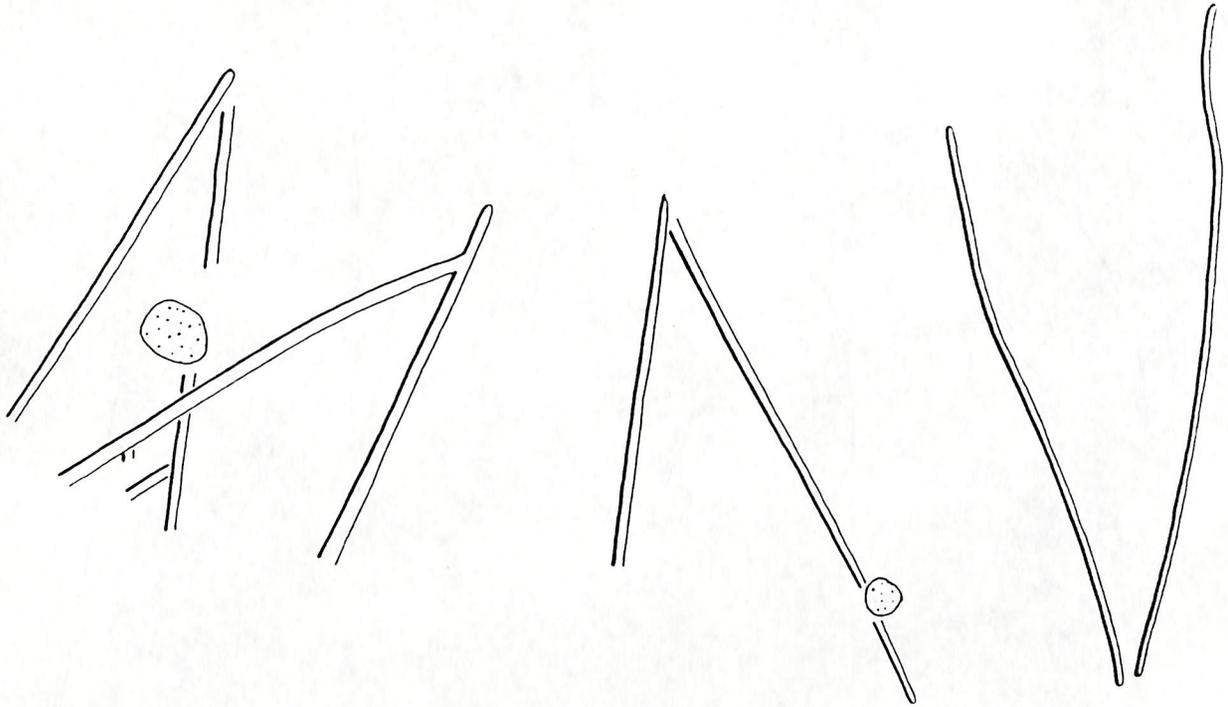
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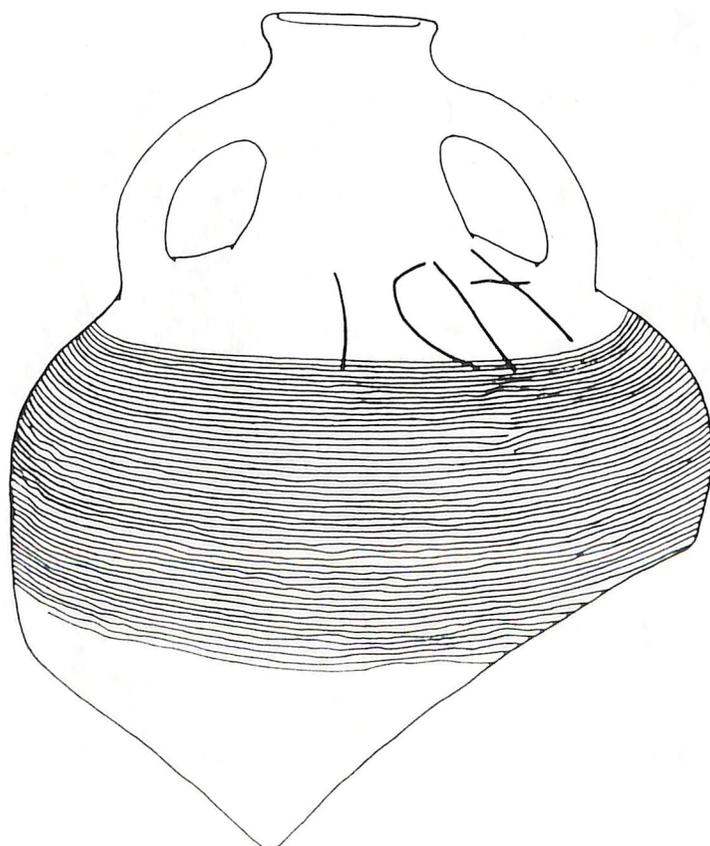
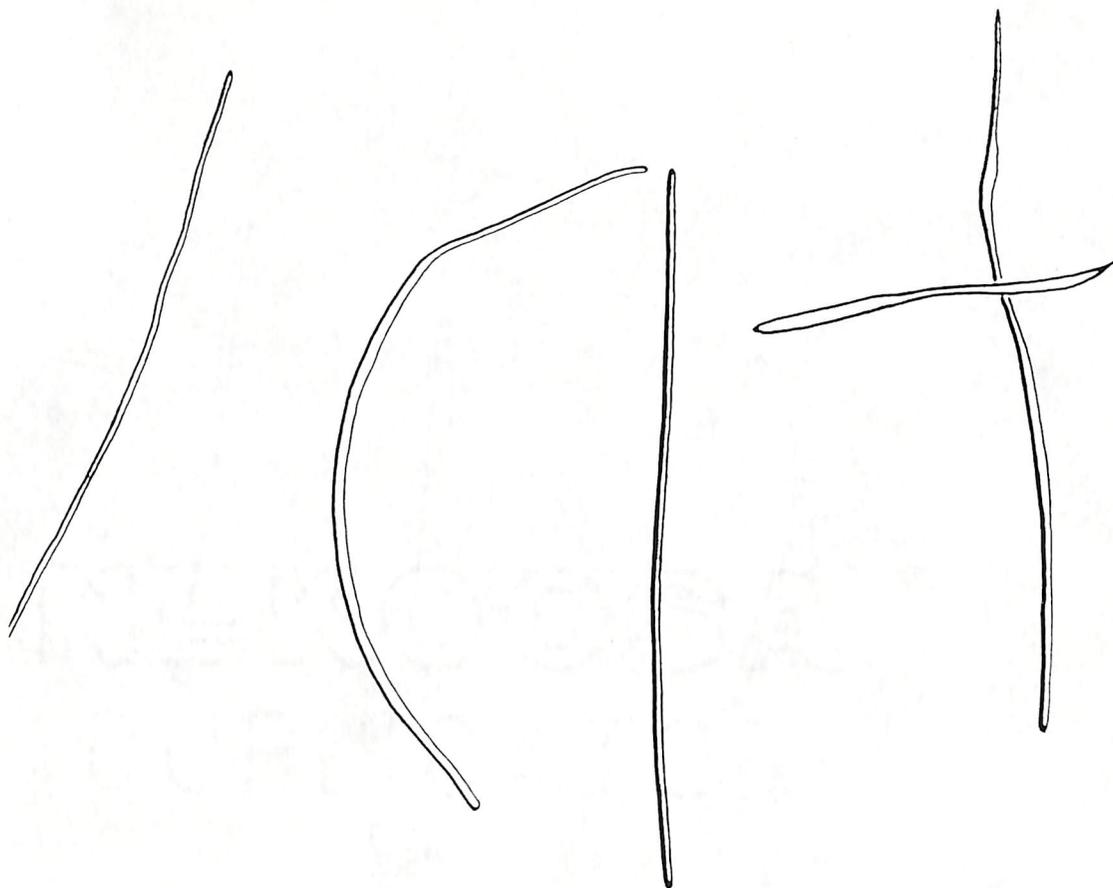


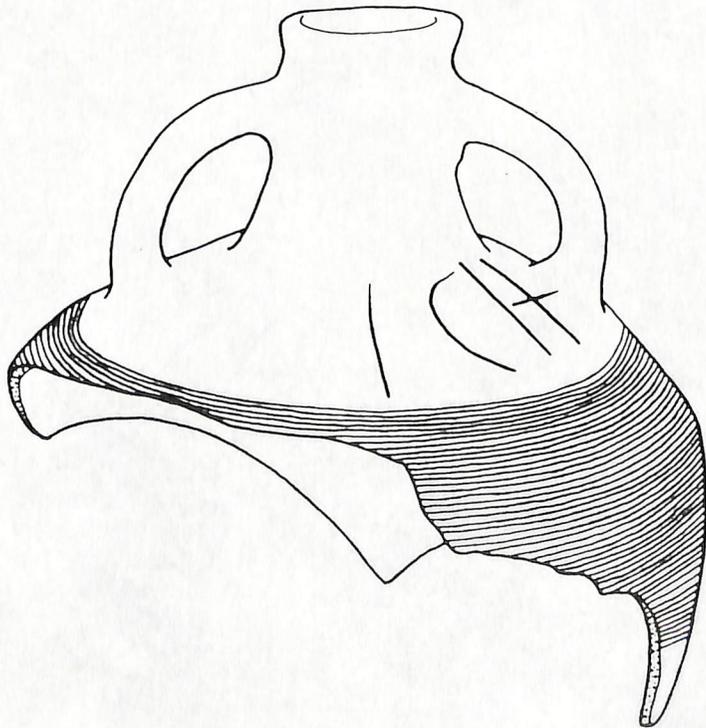
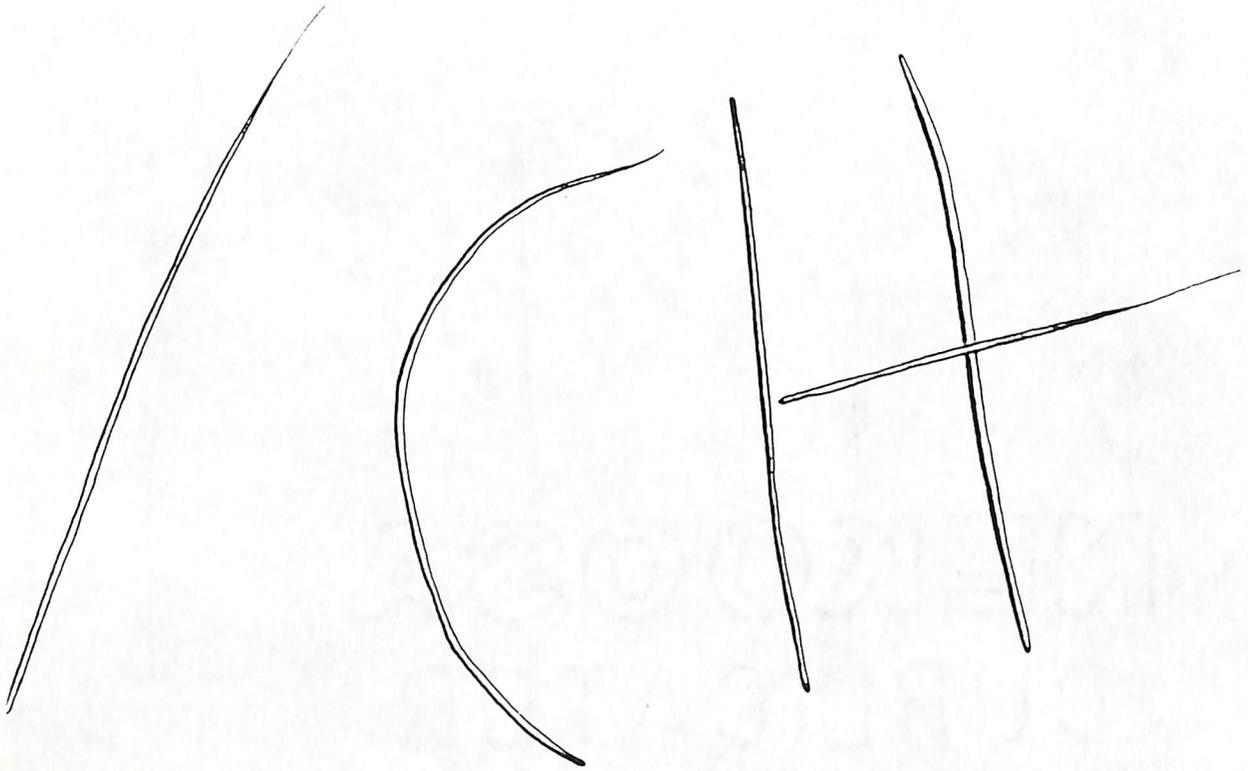


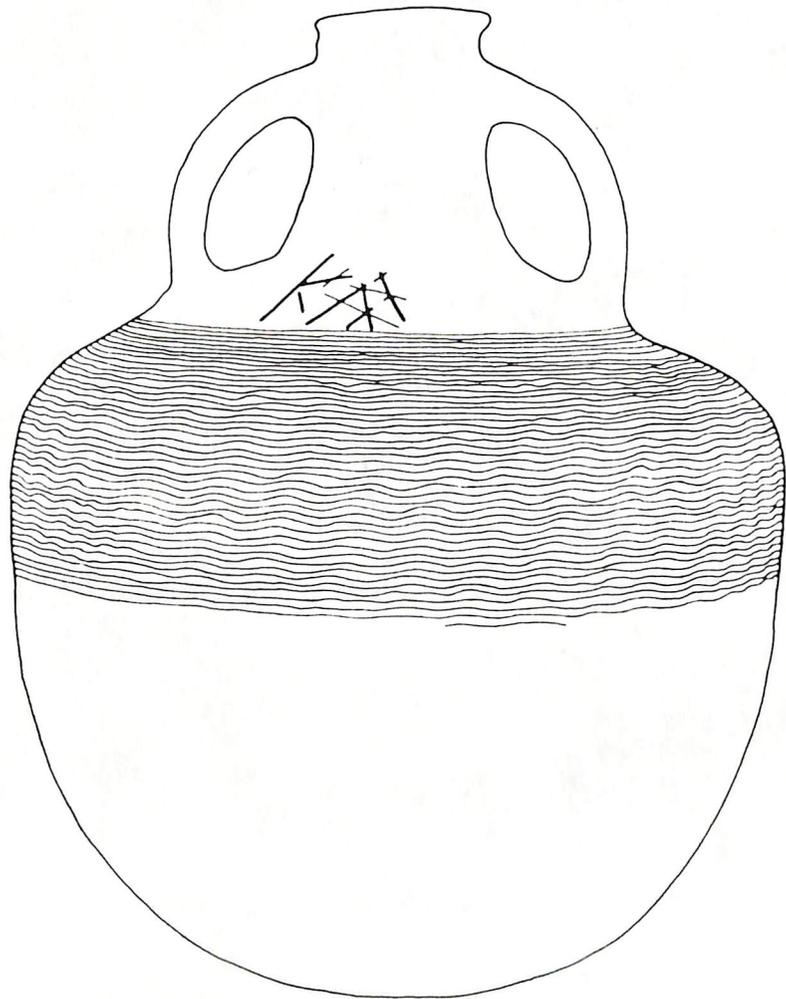
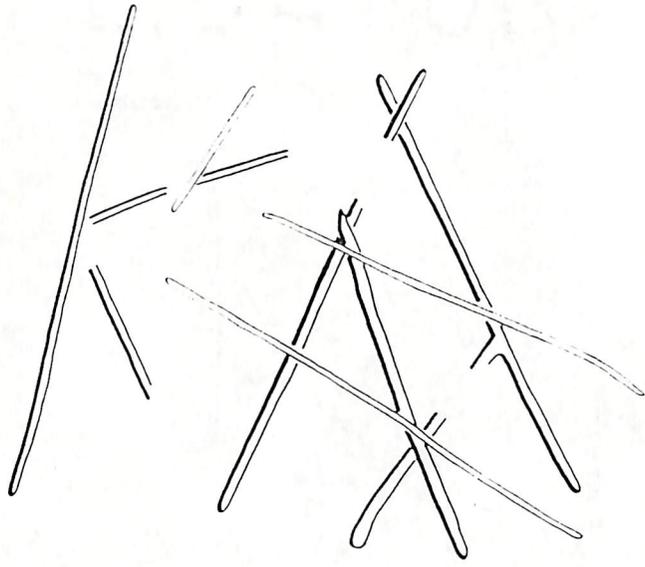


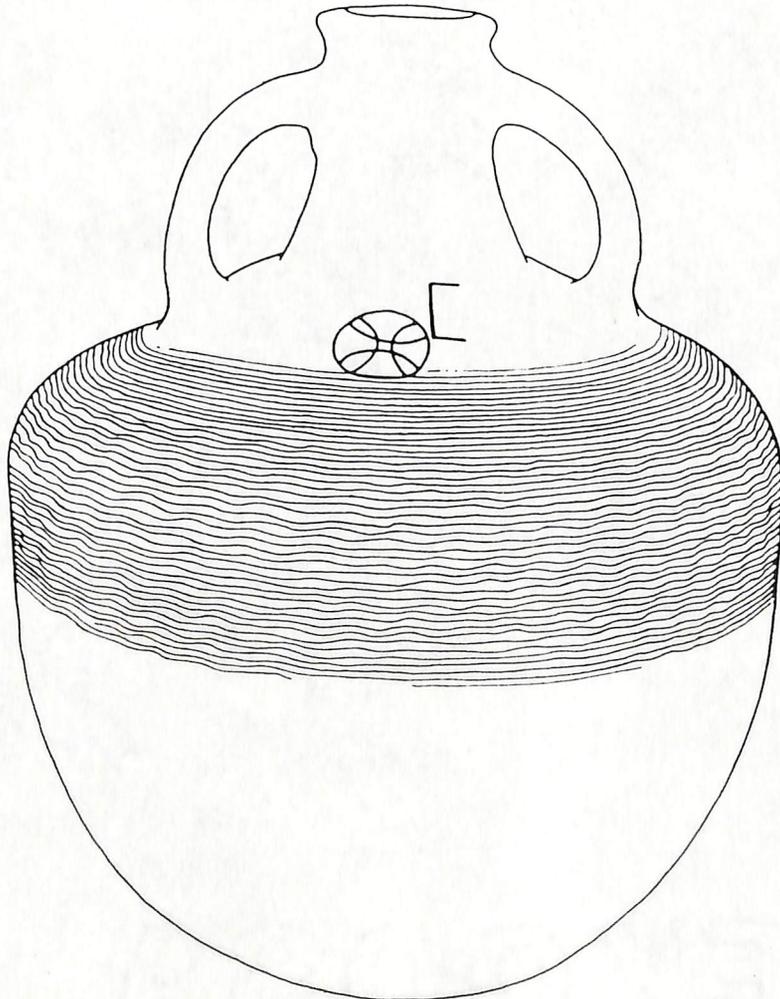
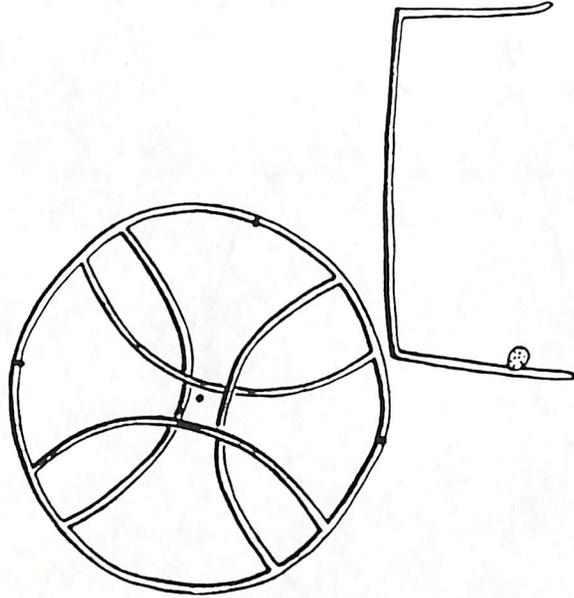


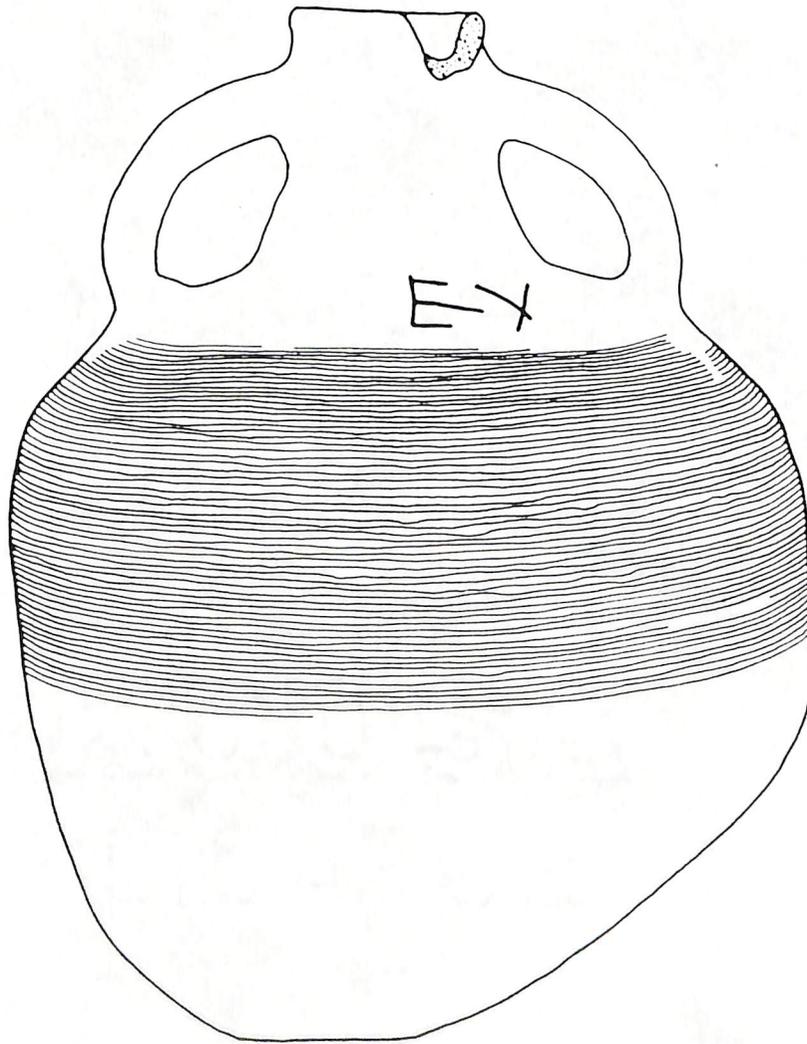
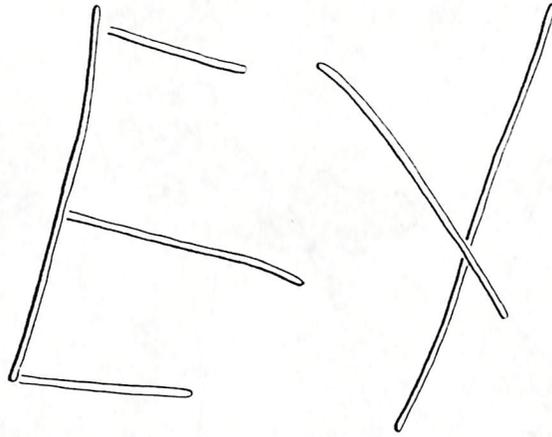


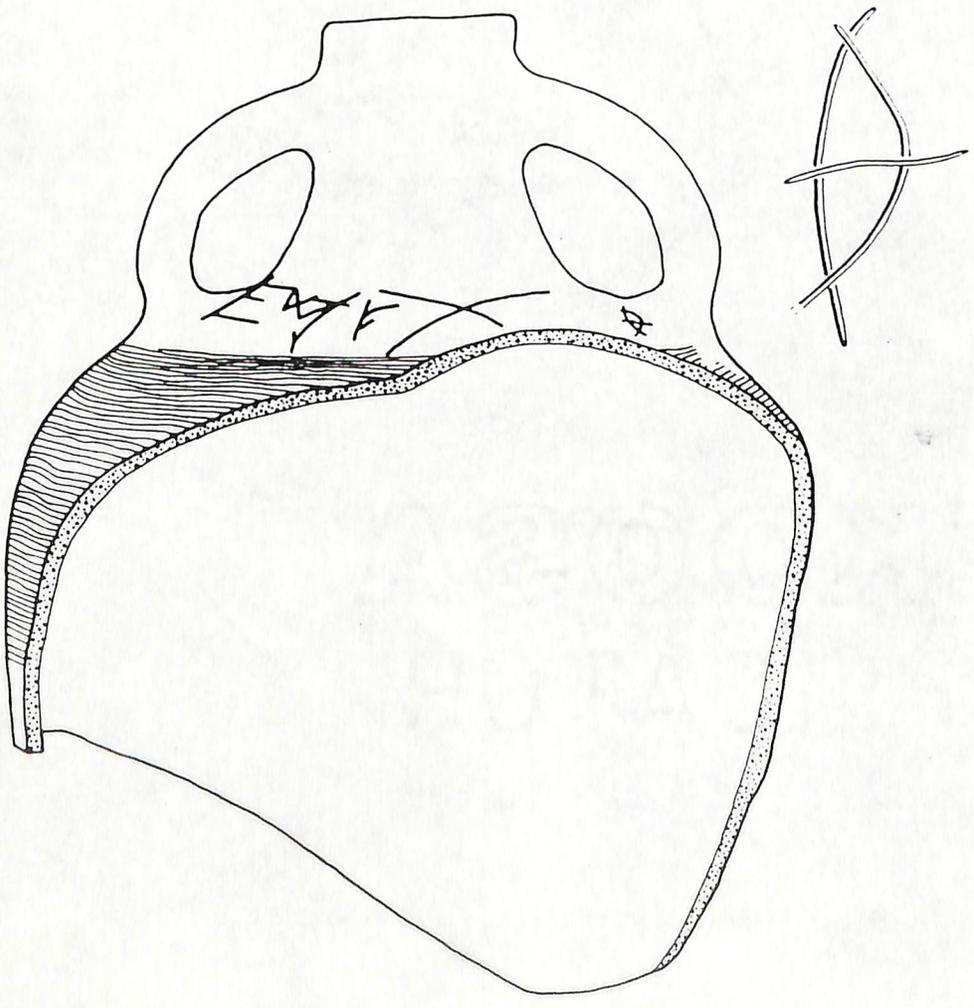
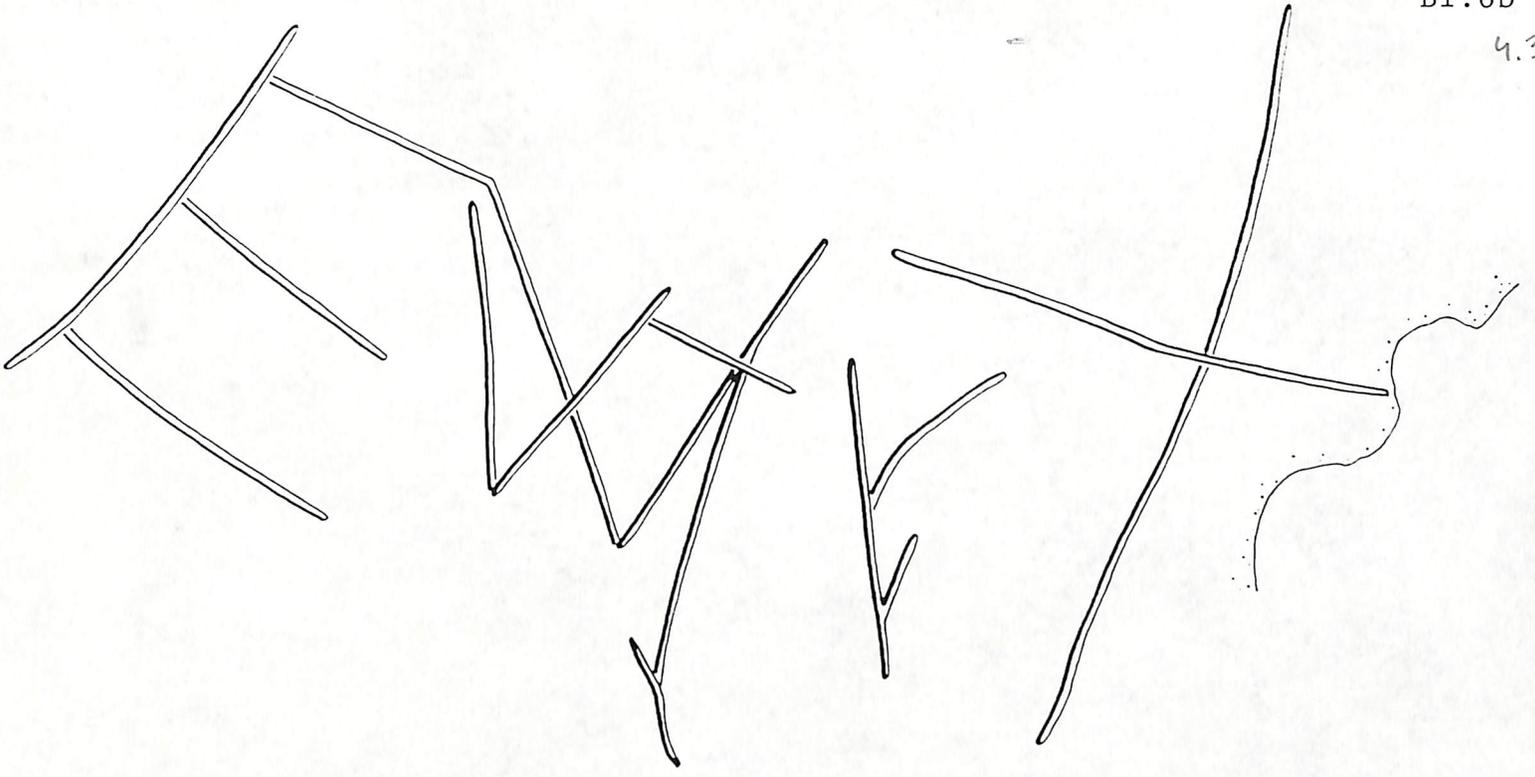




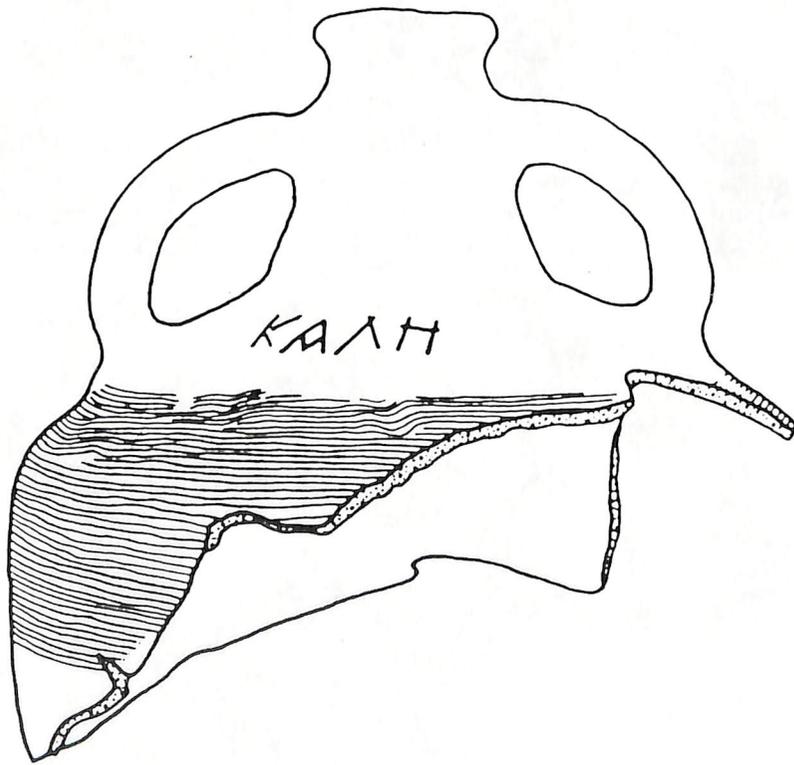


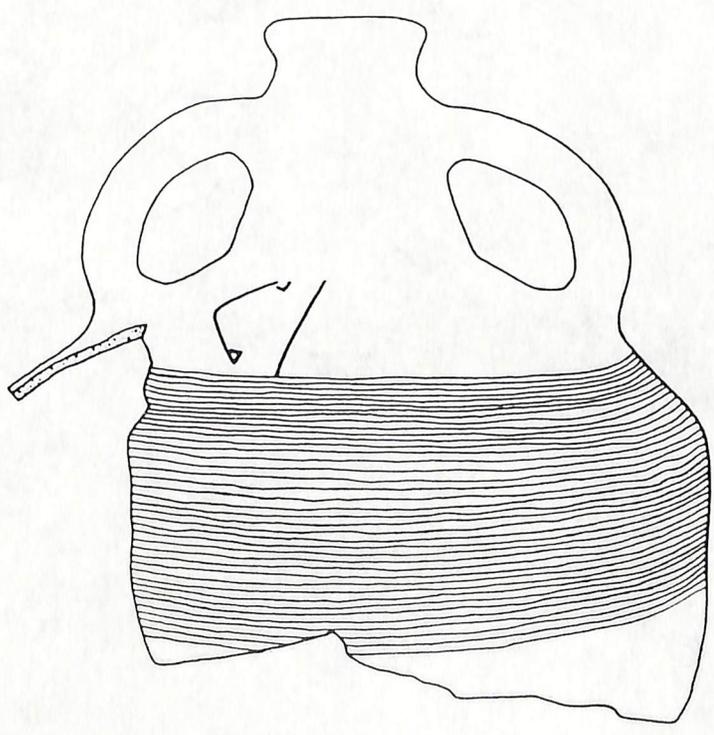
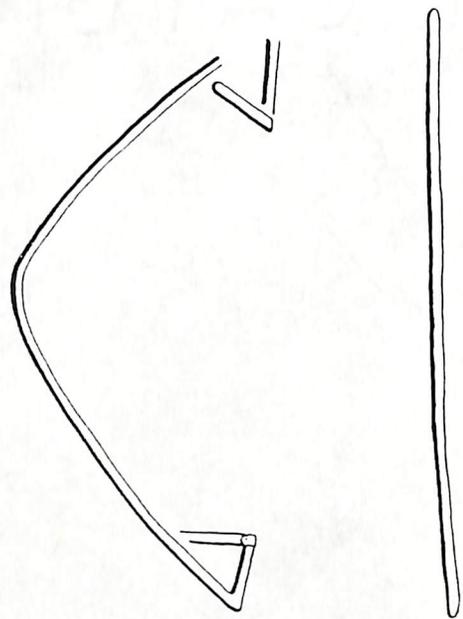


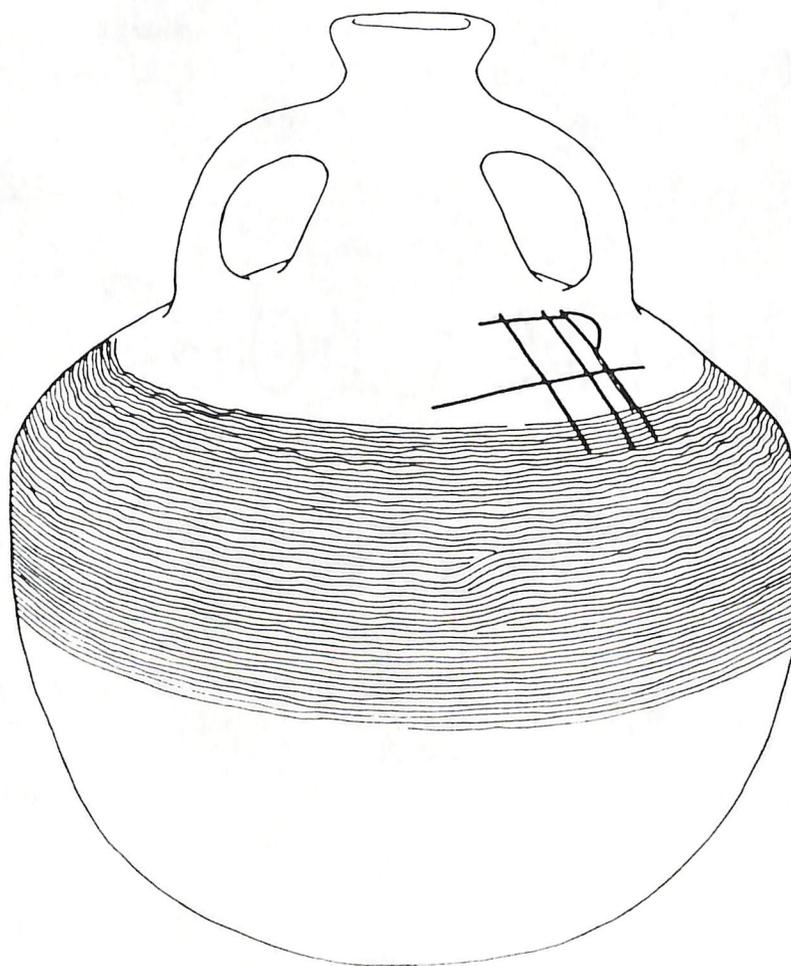
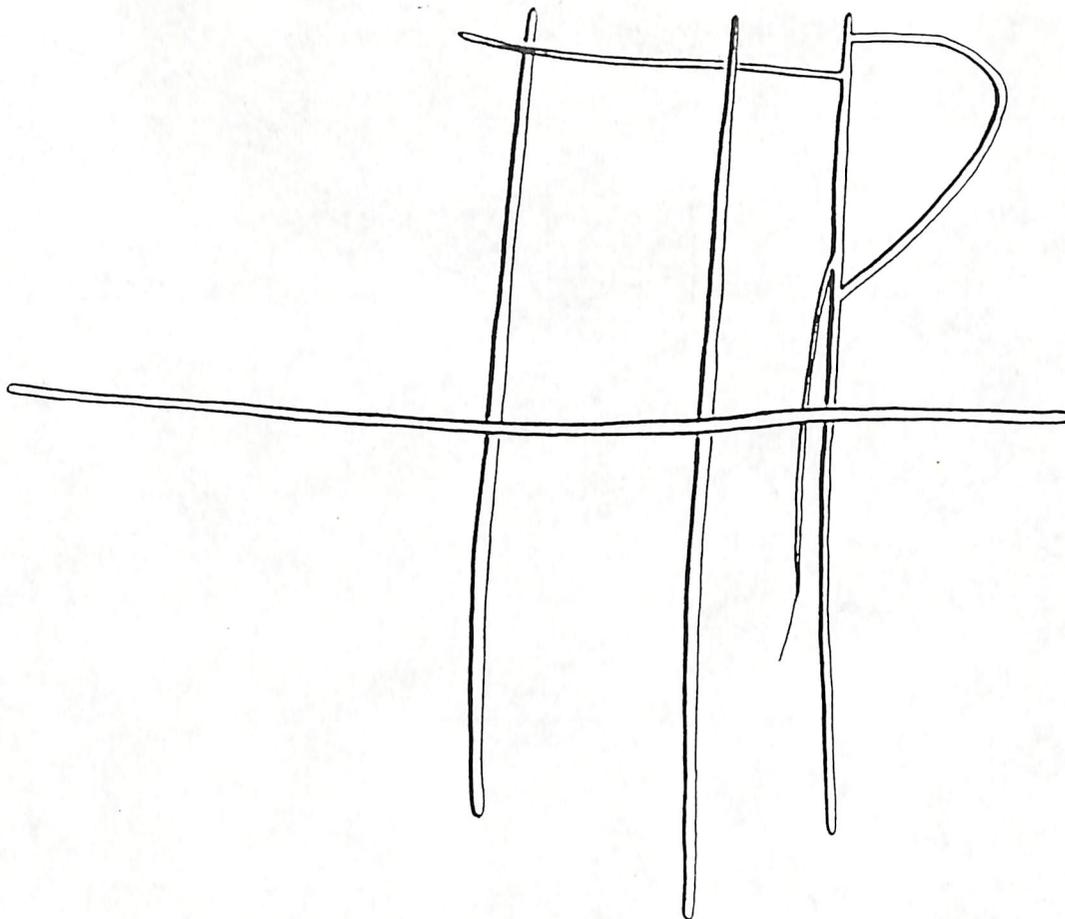


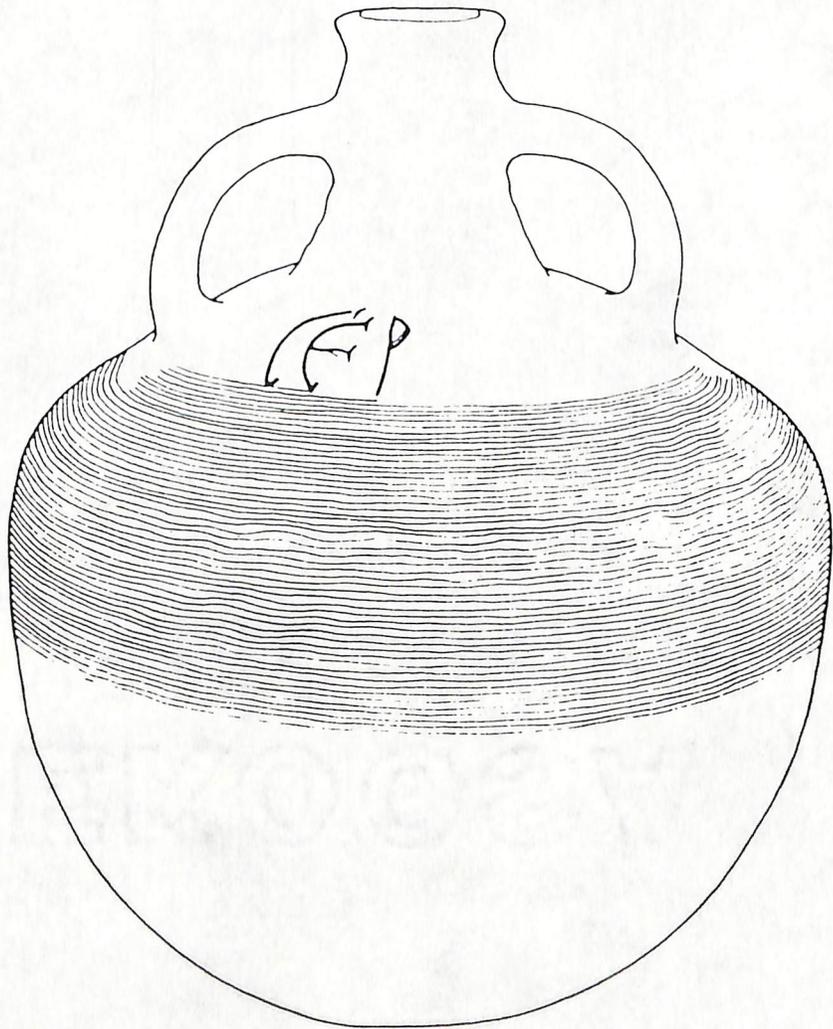
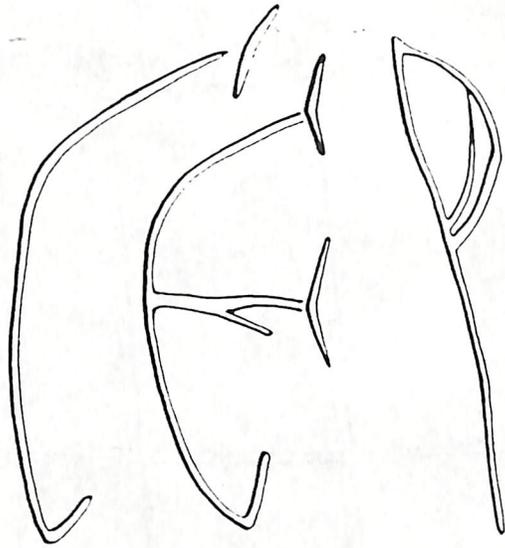


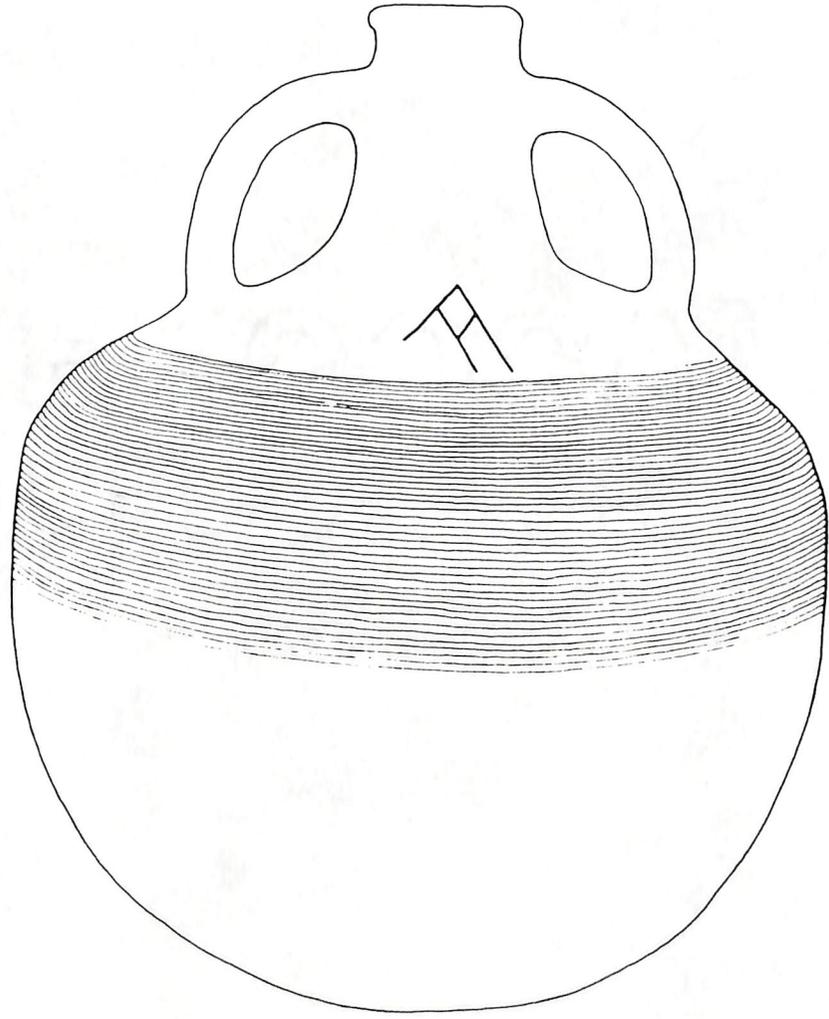
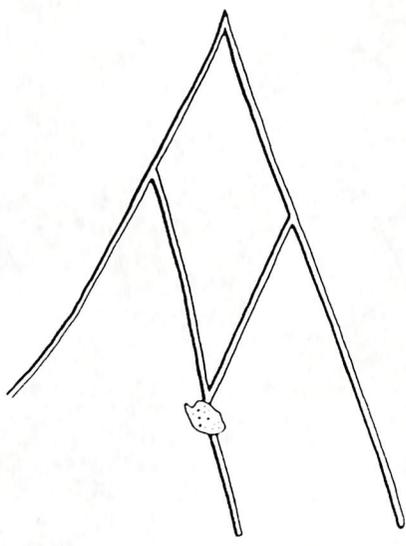
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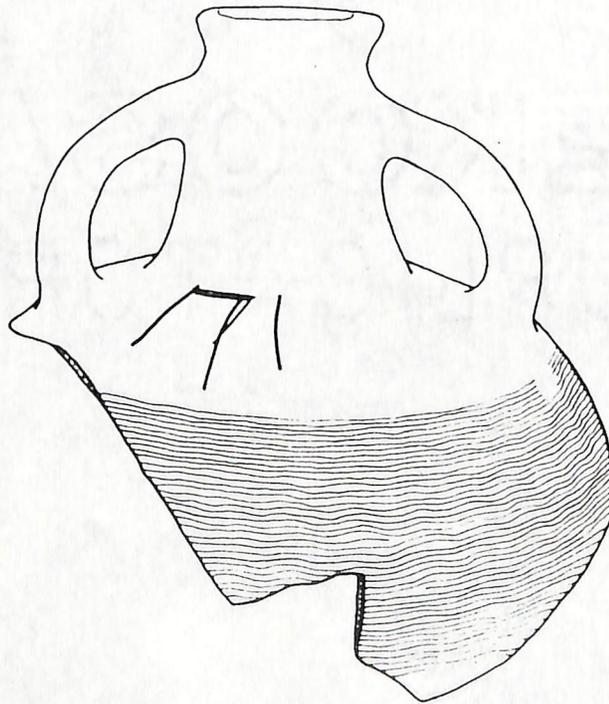
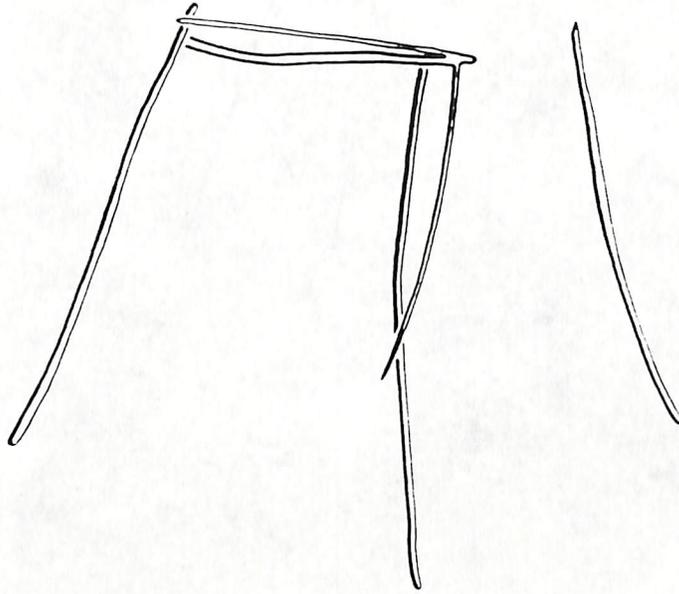


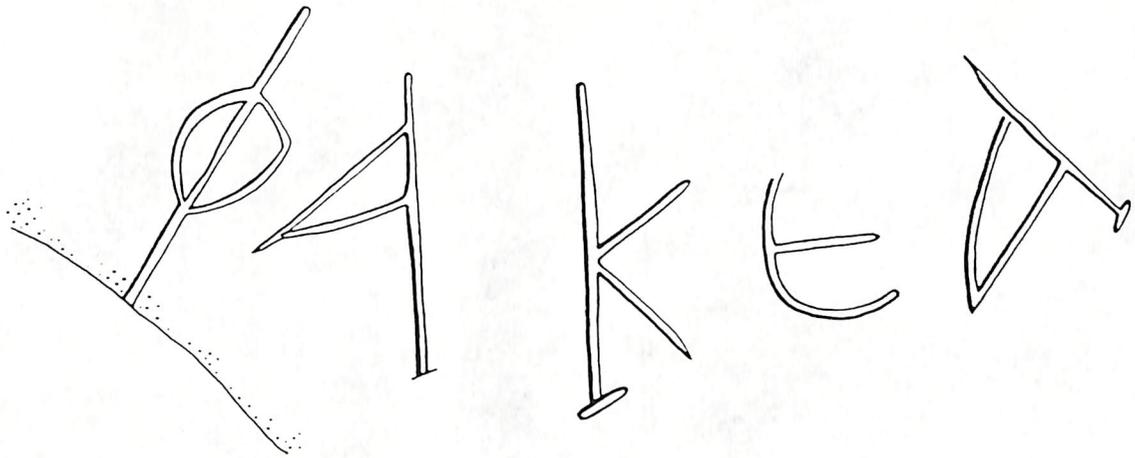




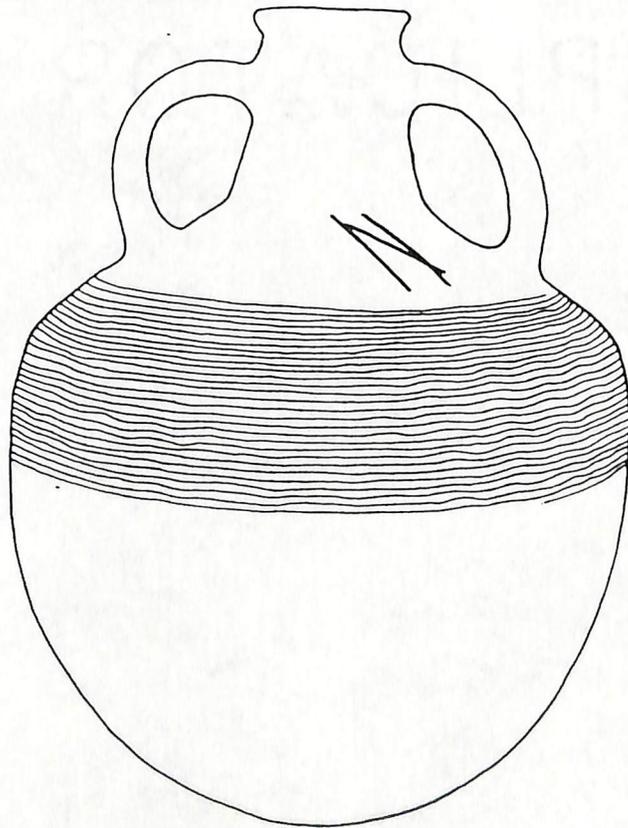




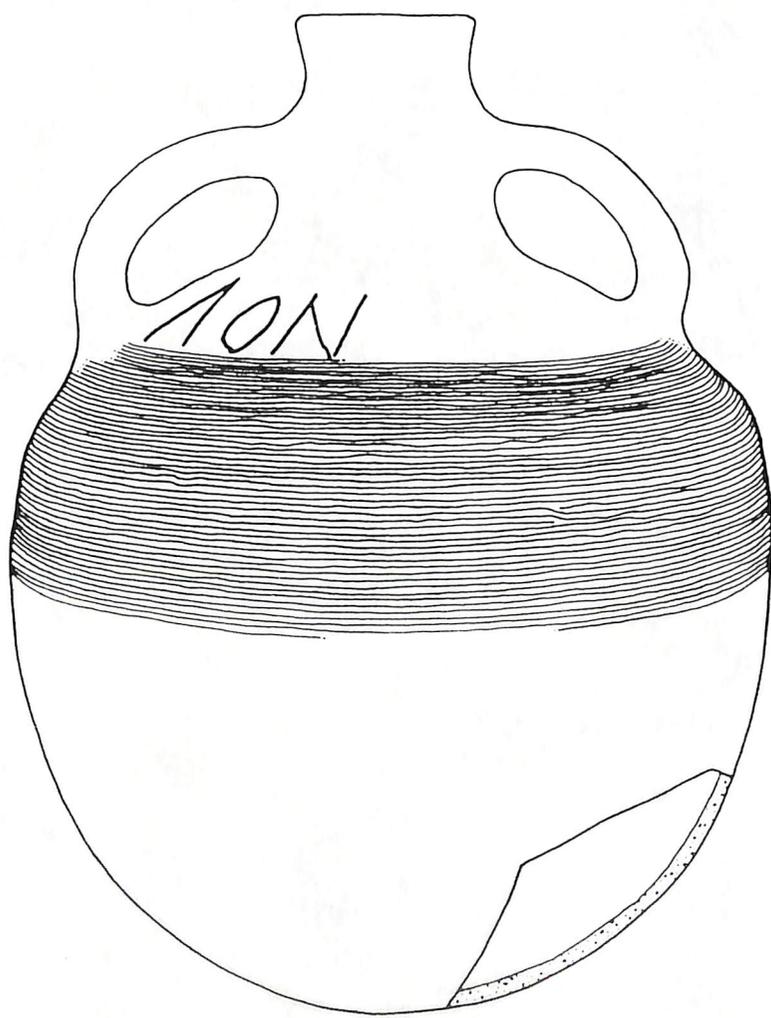


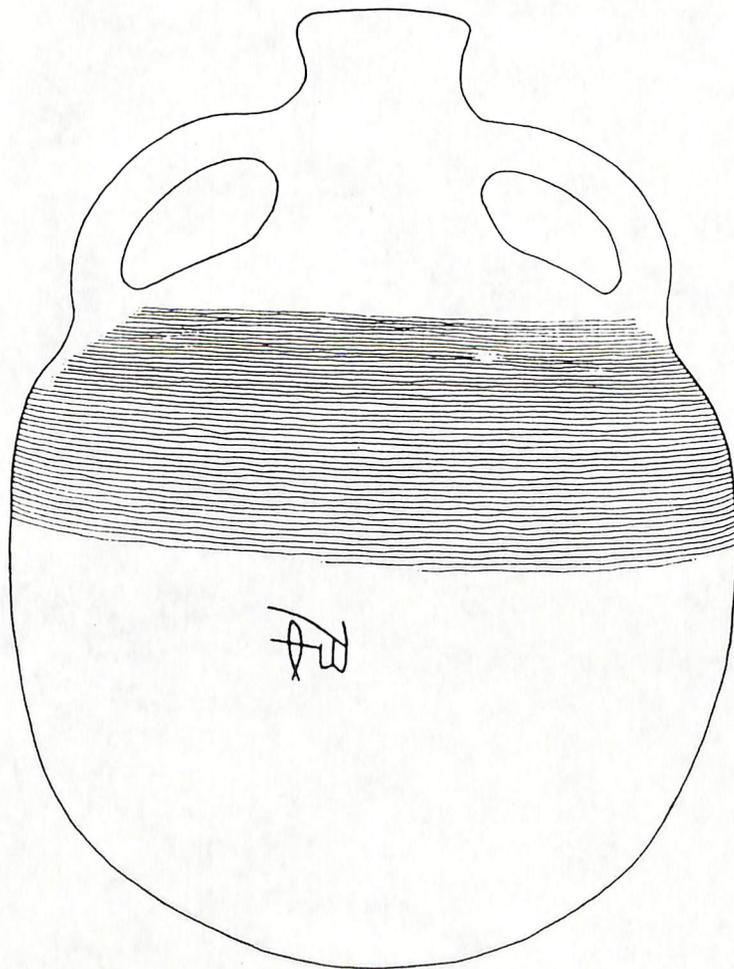
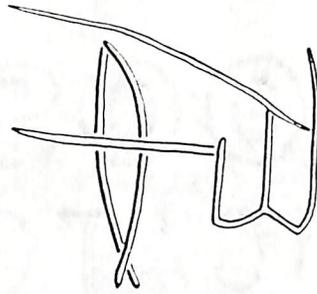


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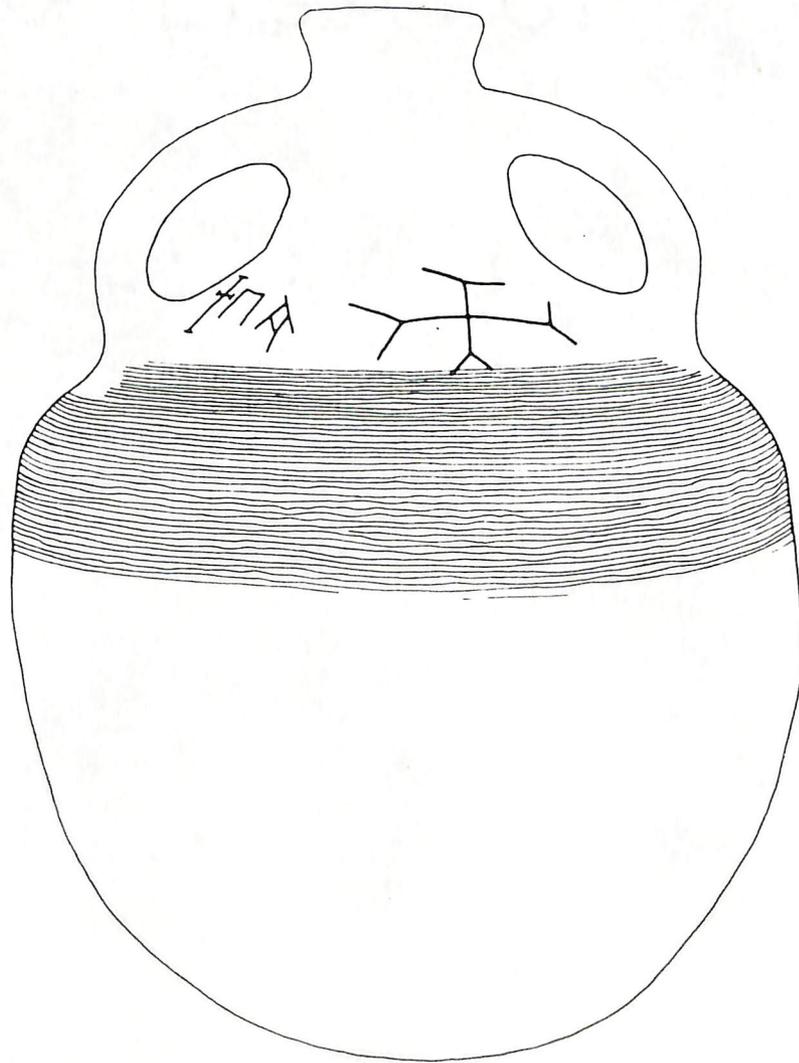
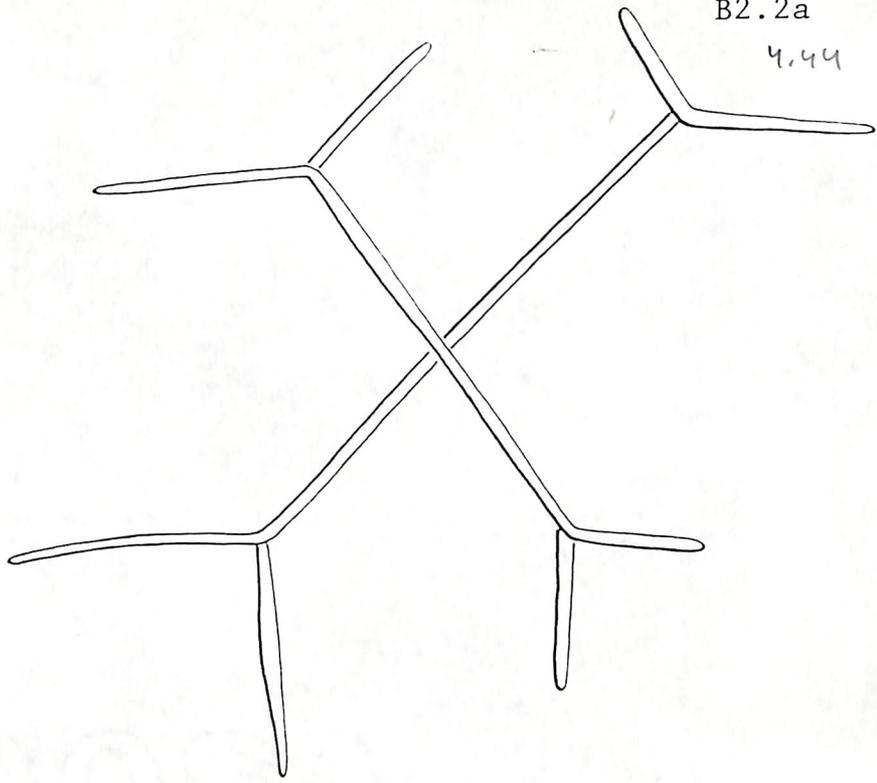
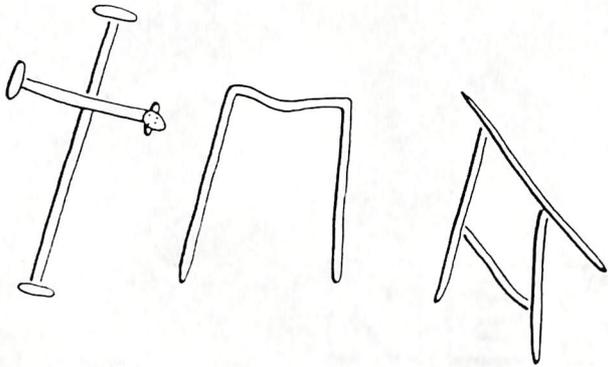
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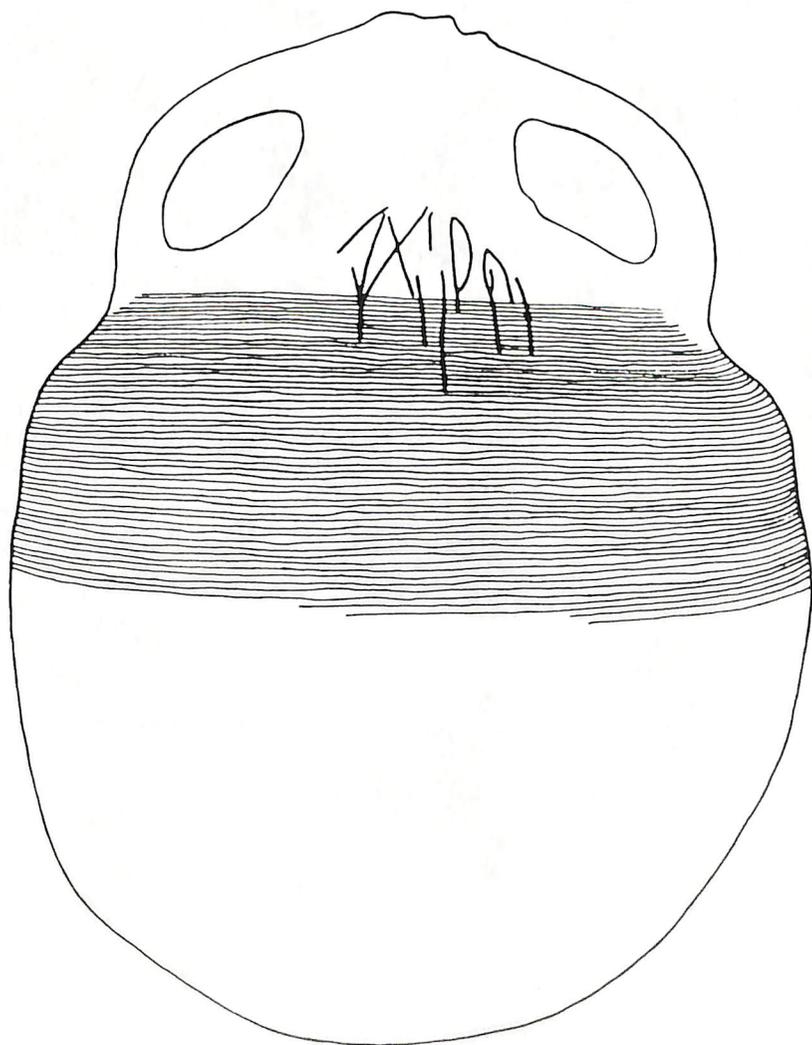
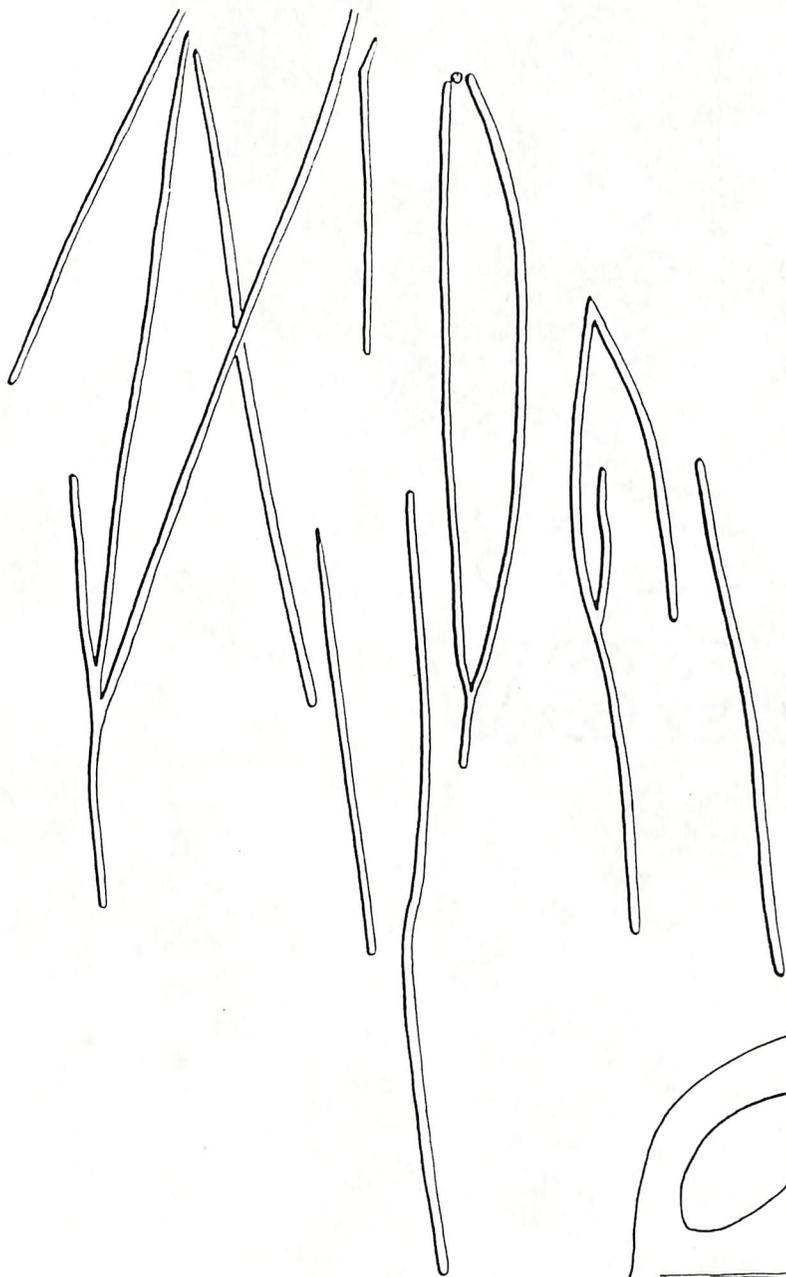


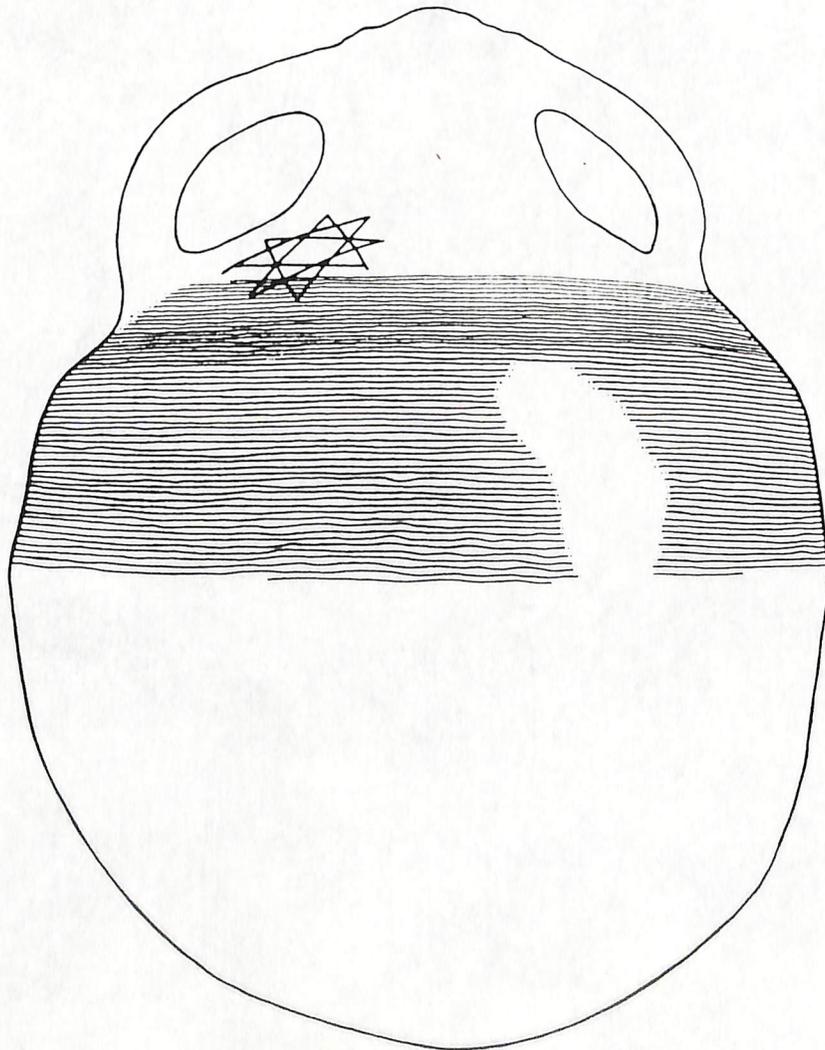
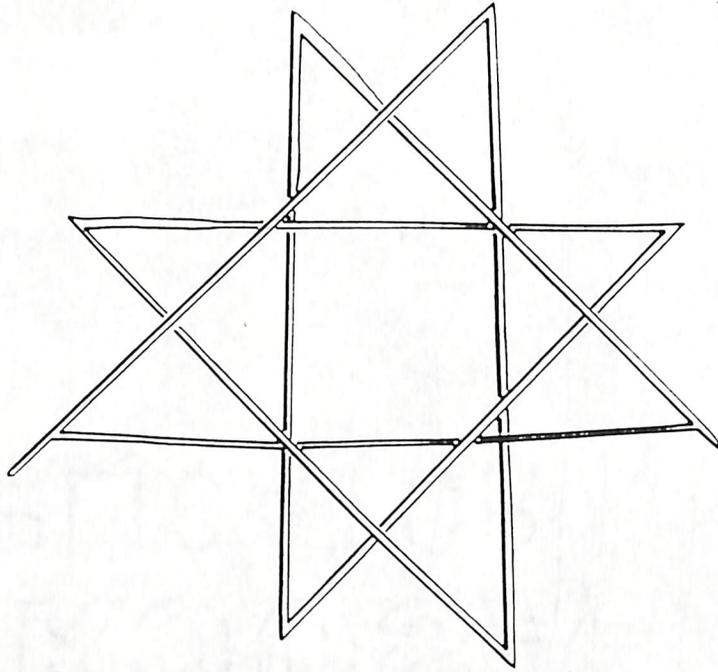


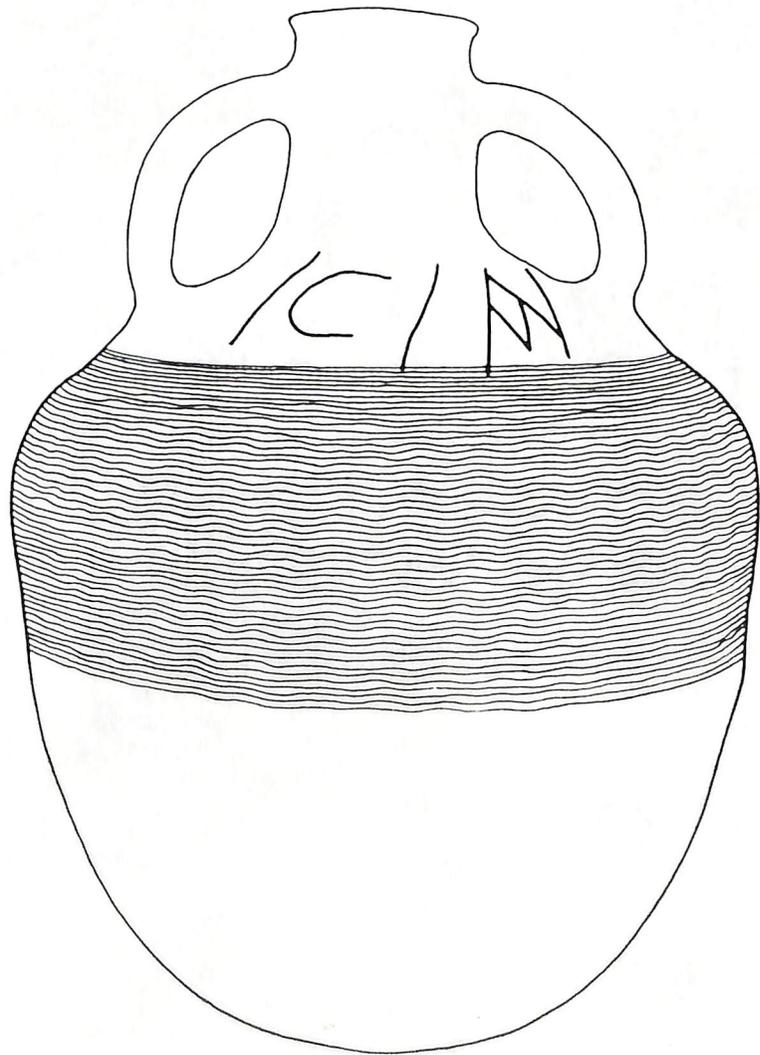
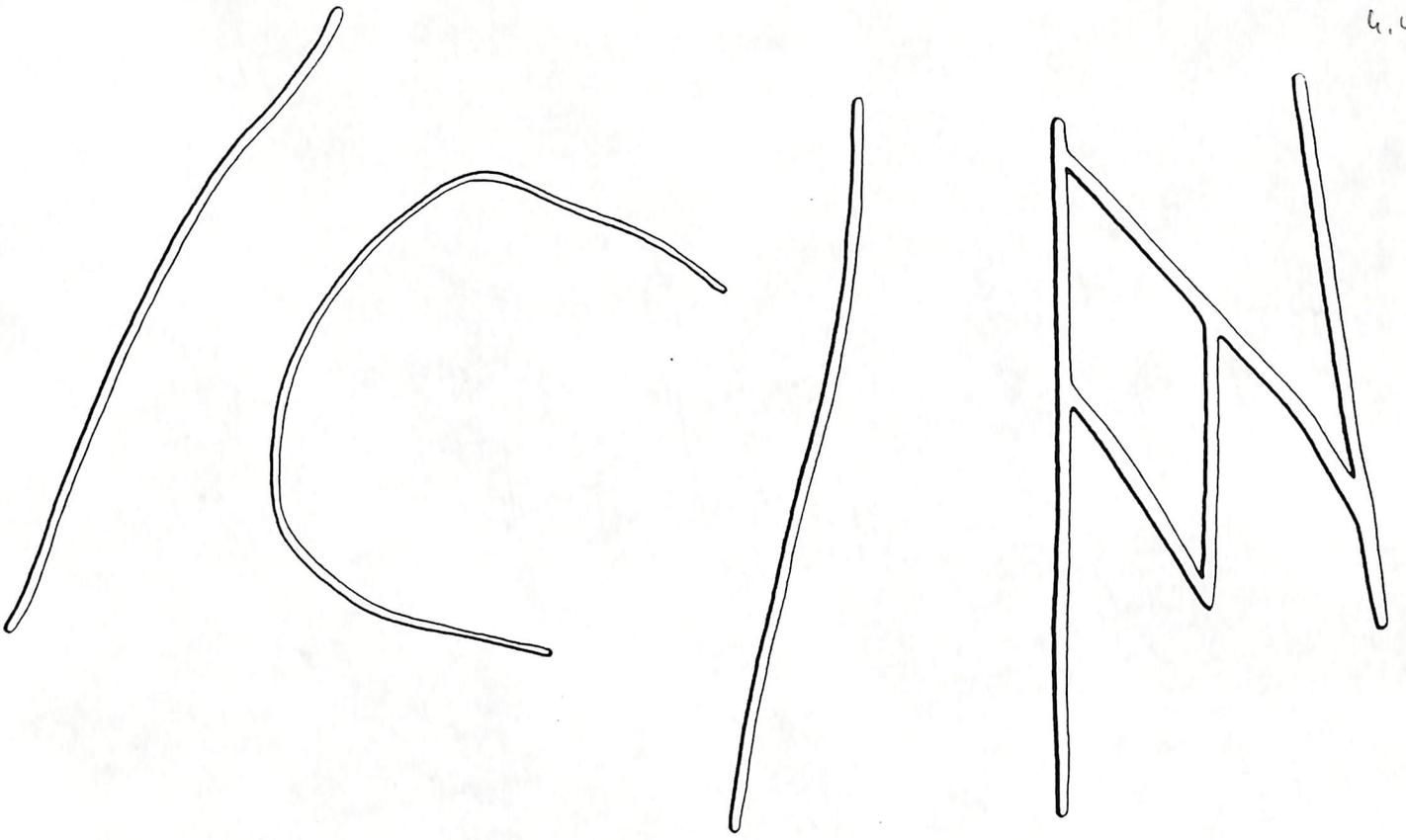
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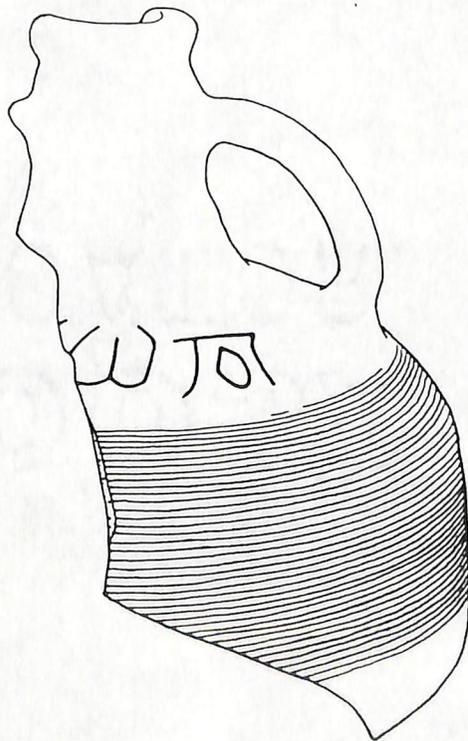
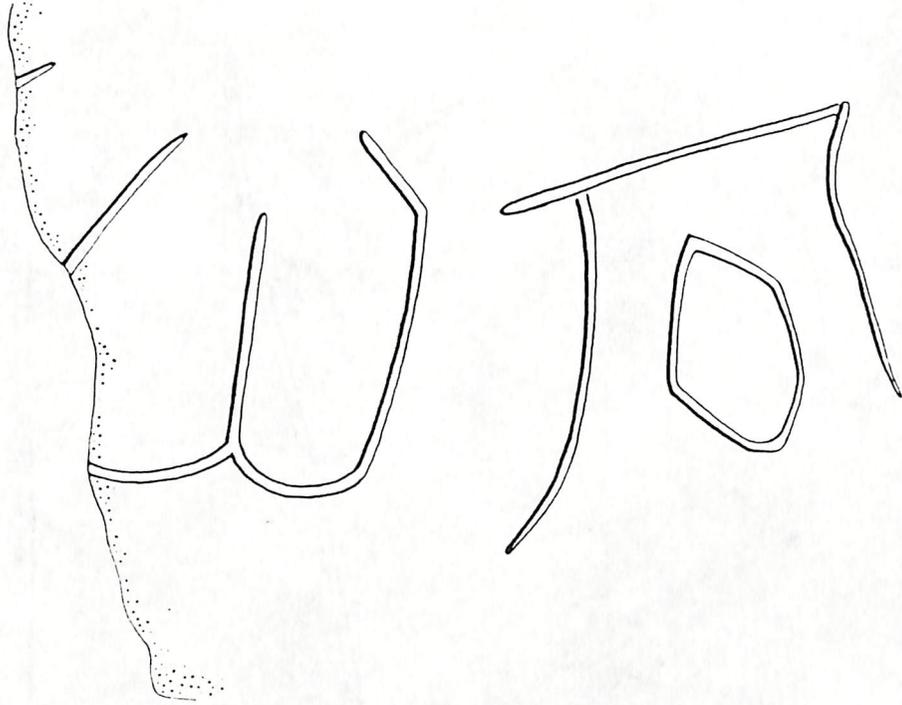
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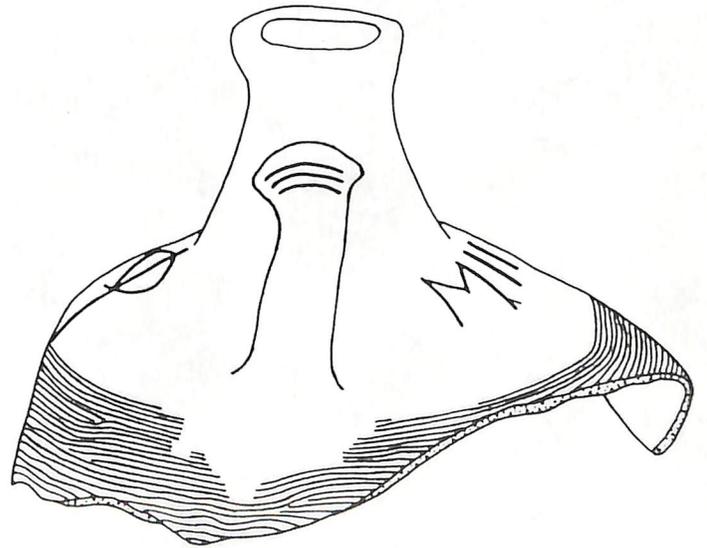
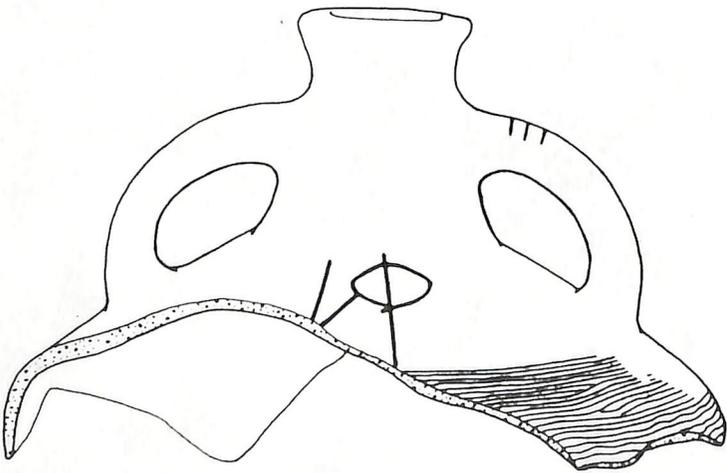
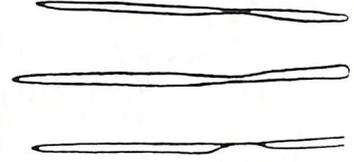
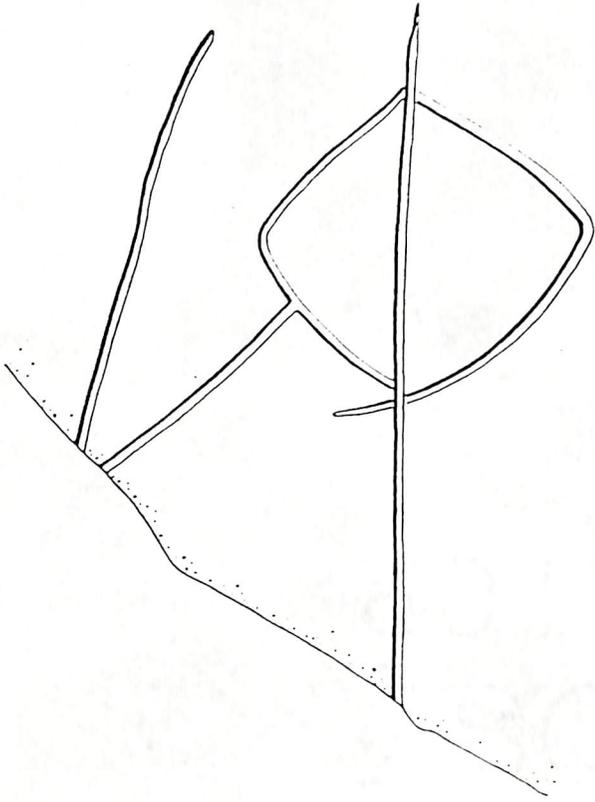


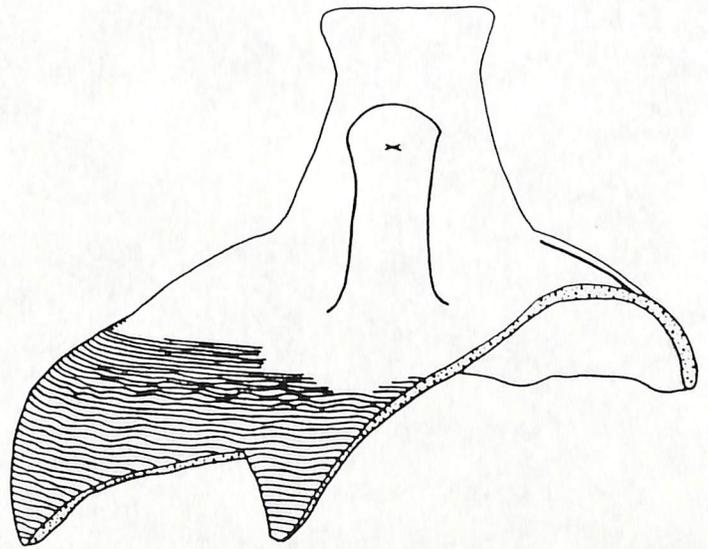
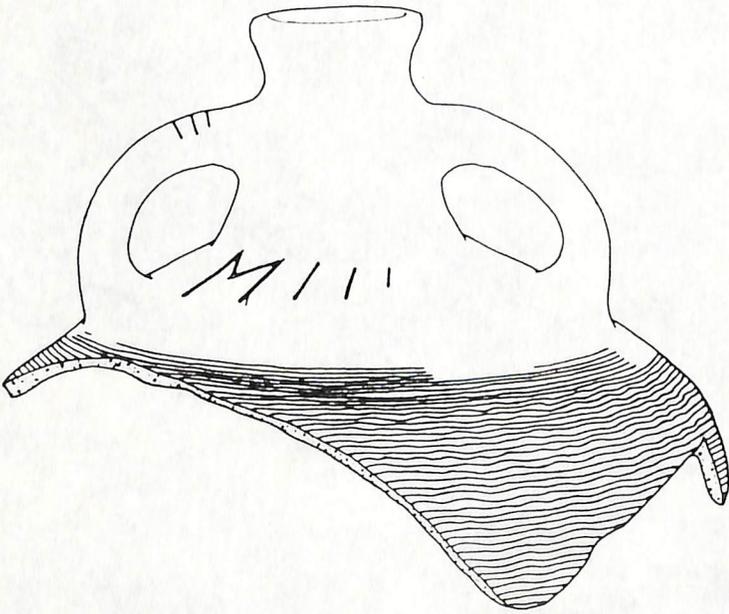
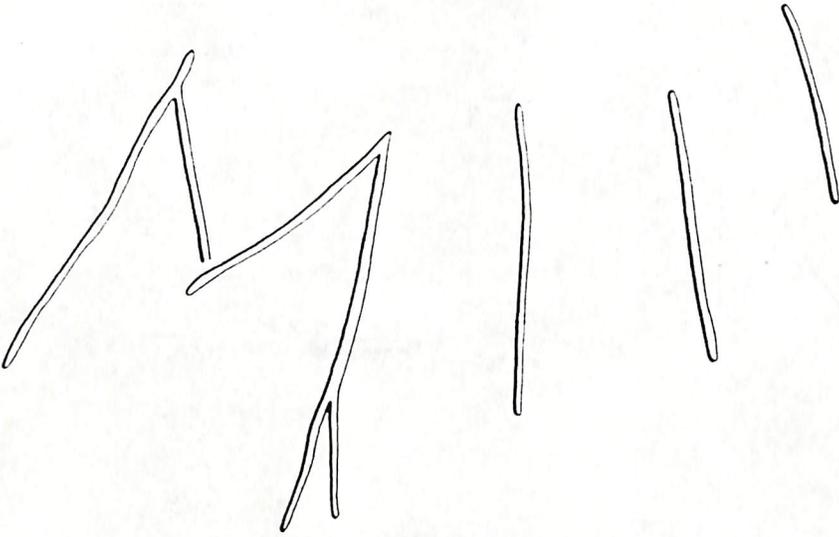


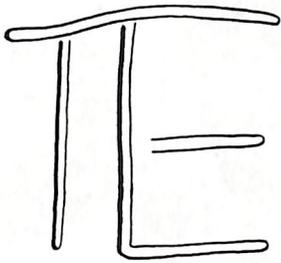




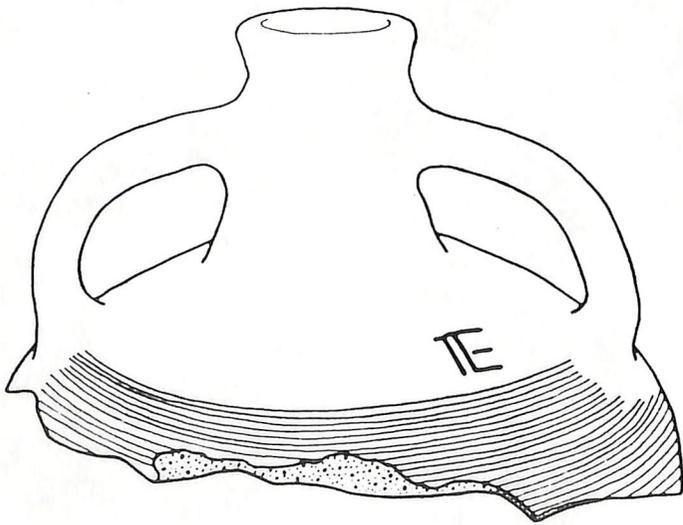
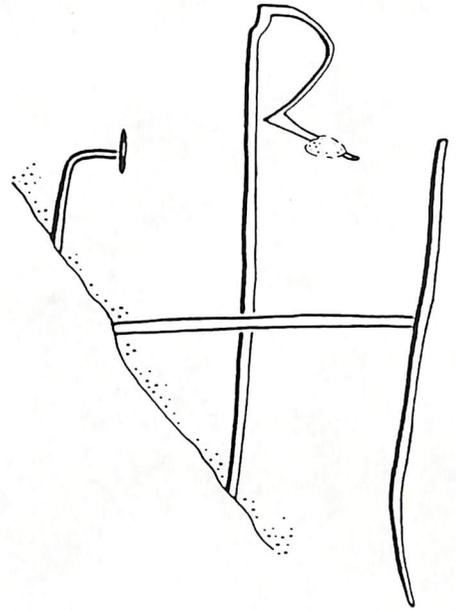








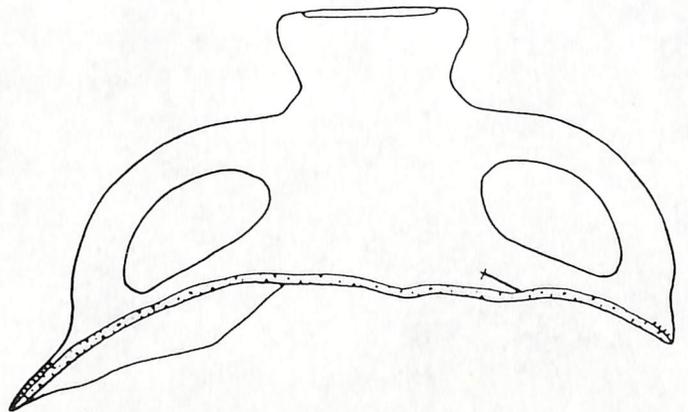
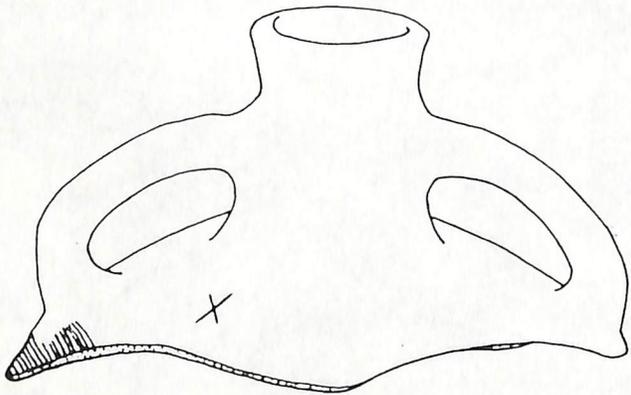
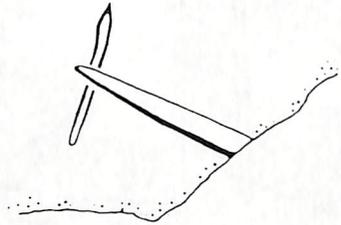
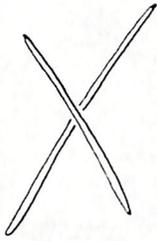
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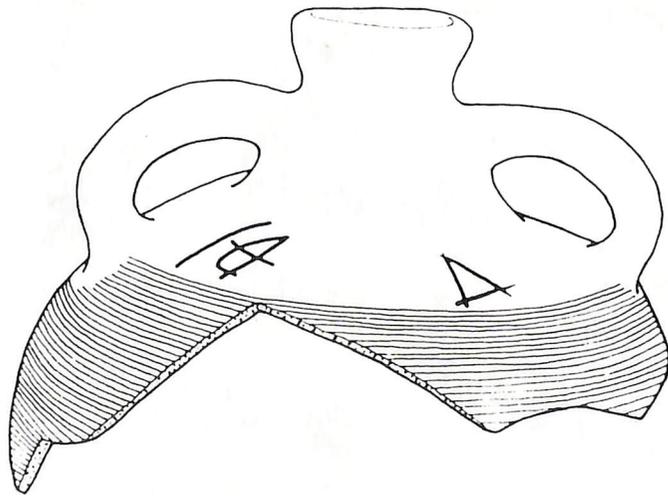
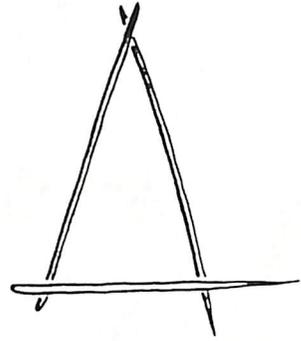
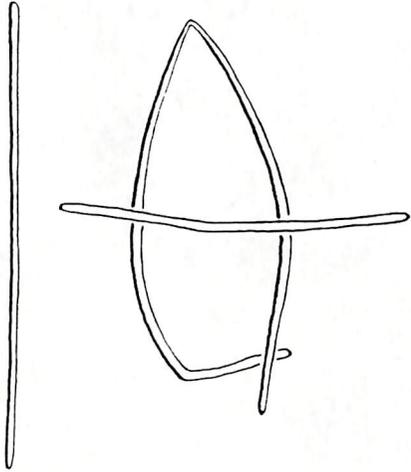


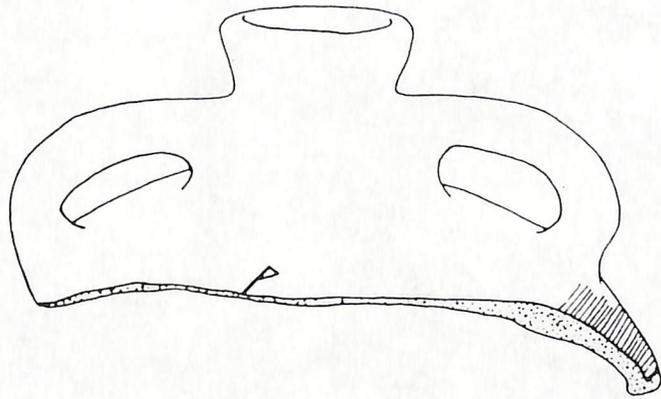
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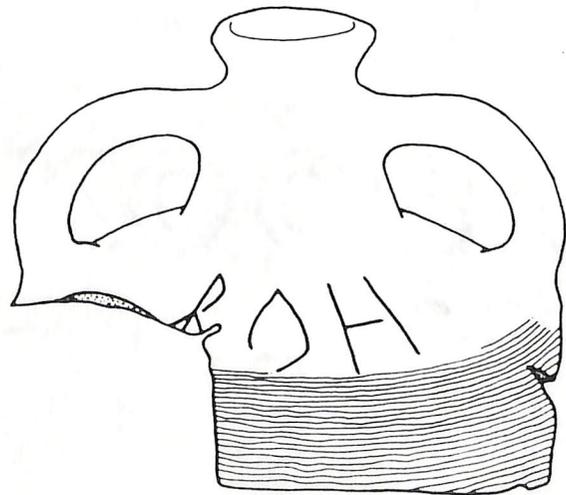
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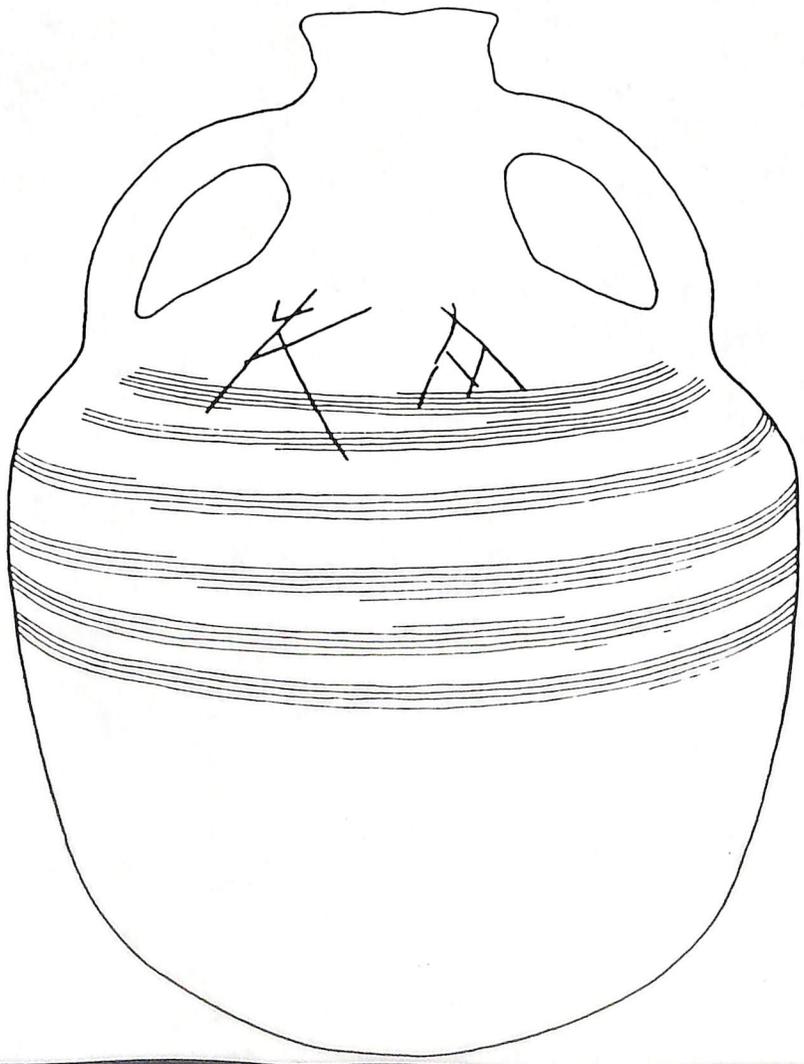
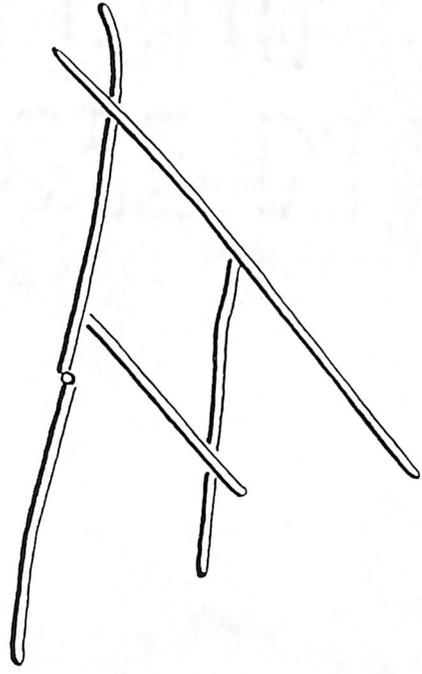
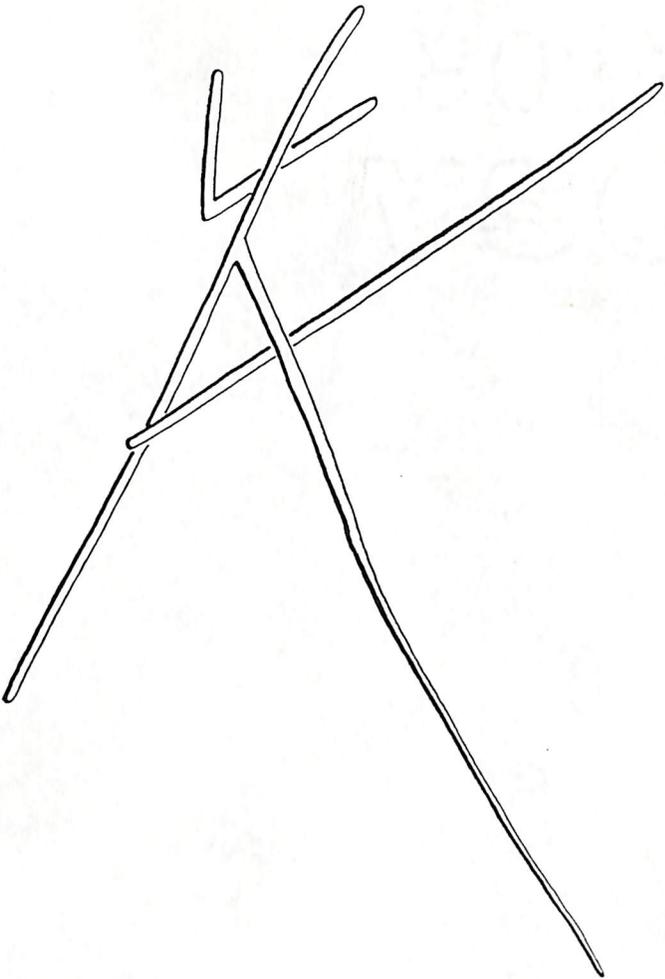


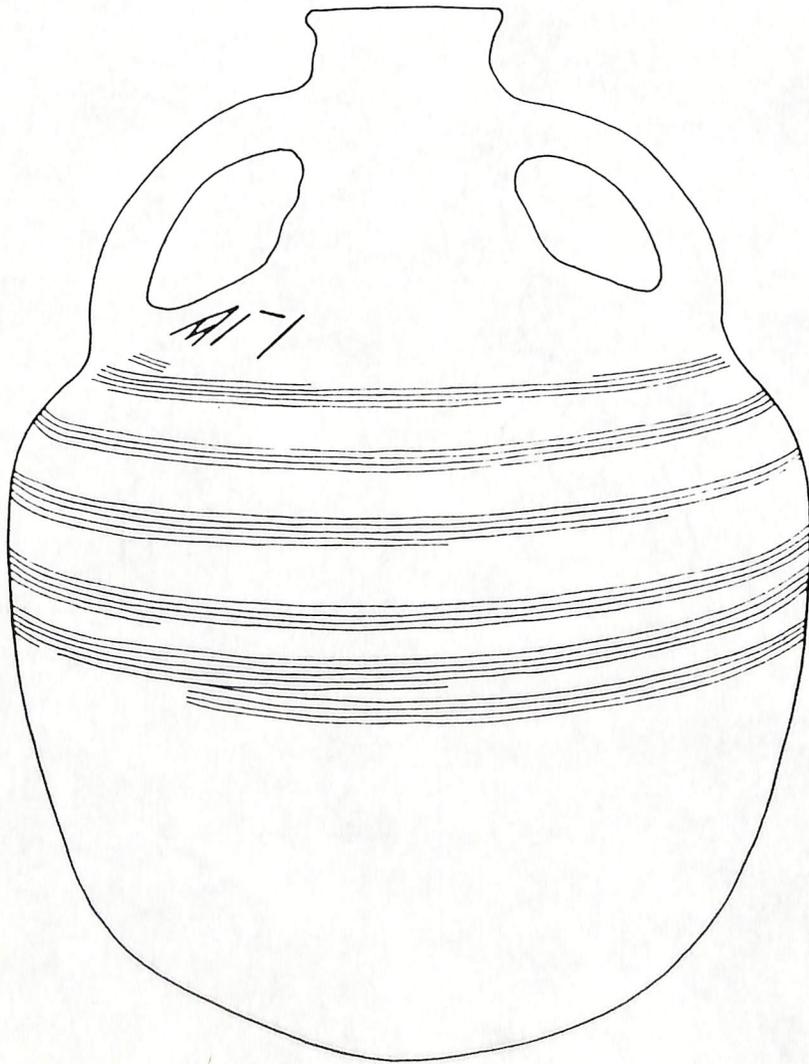


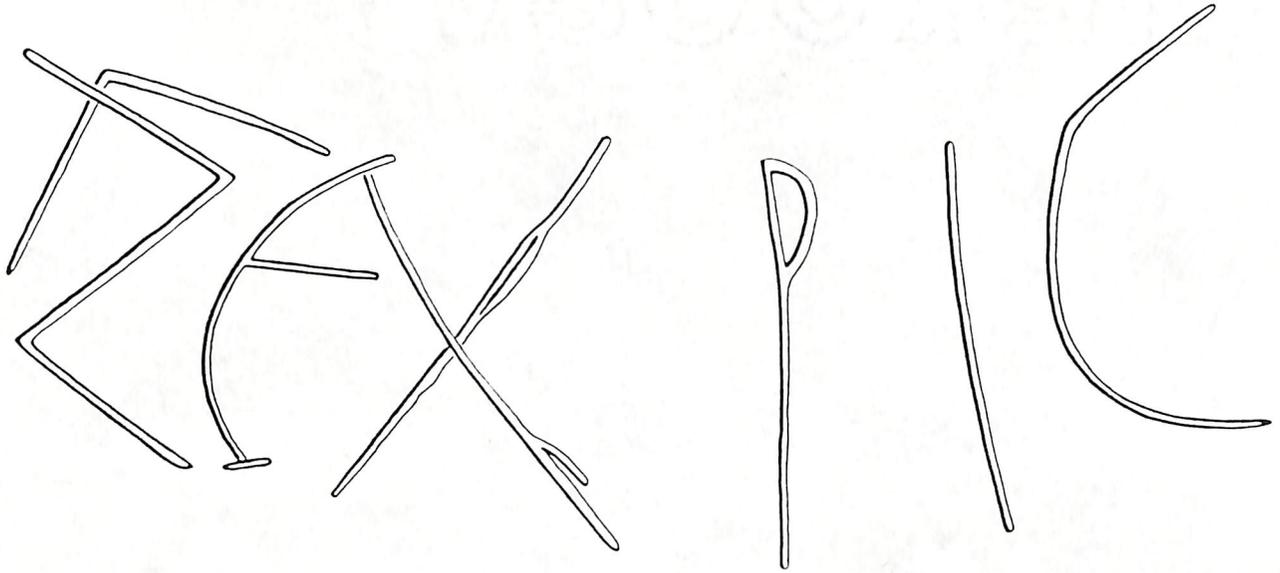


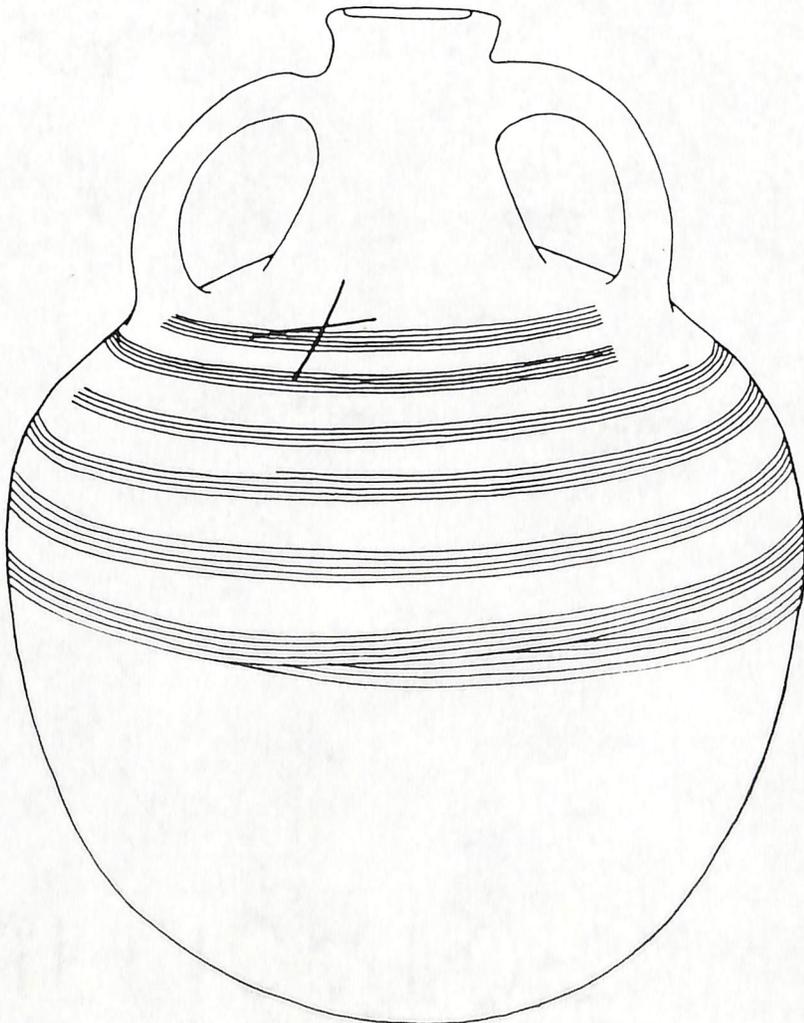
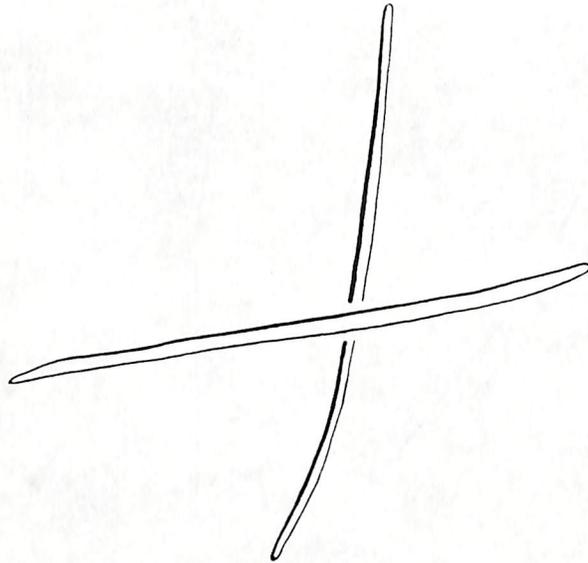


GROUP C:
Globular Amphoras Decorated with Spiral Band of Combing

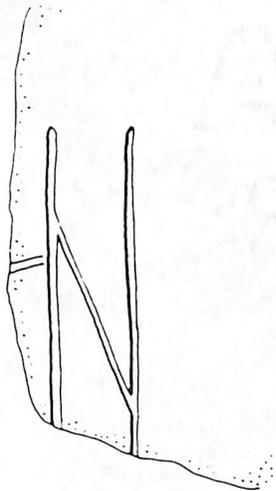






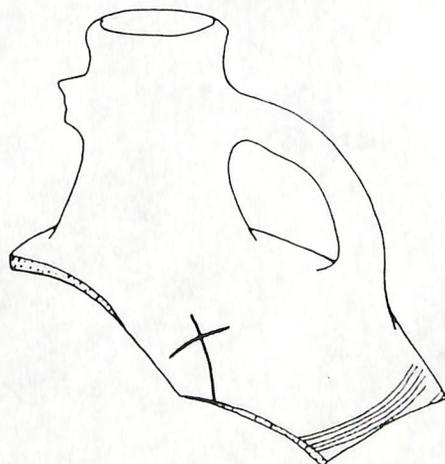
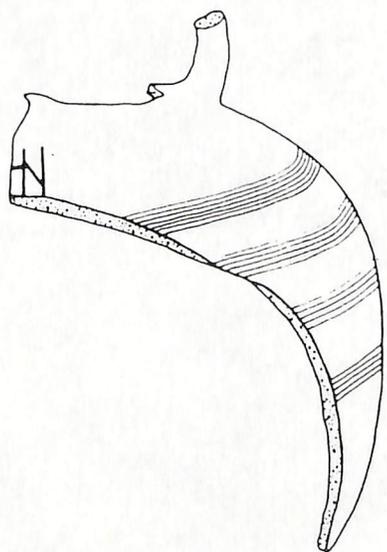
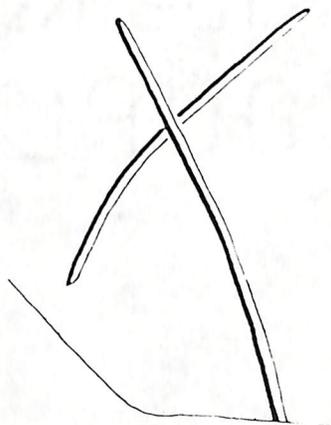


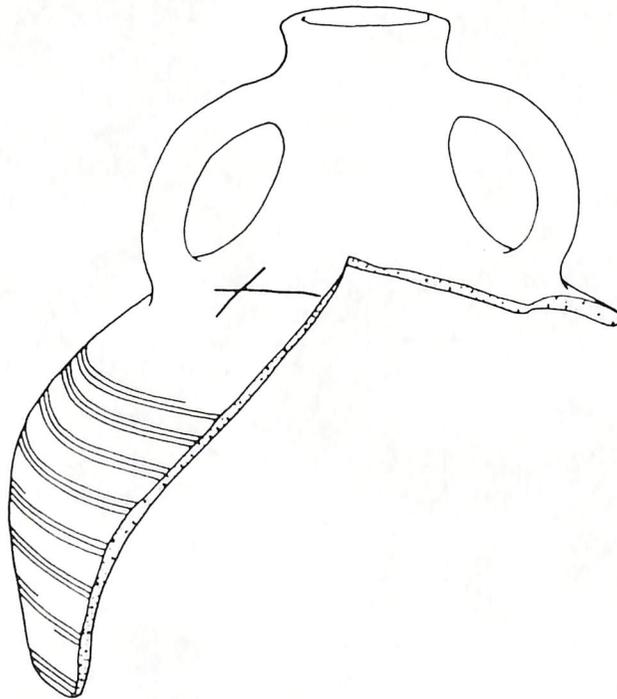
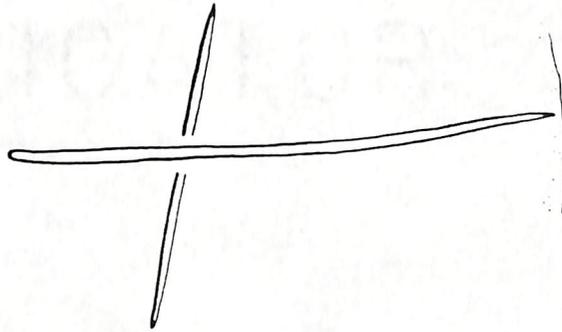
C1.4



C1.5

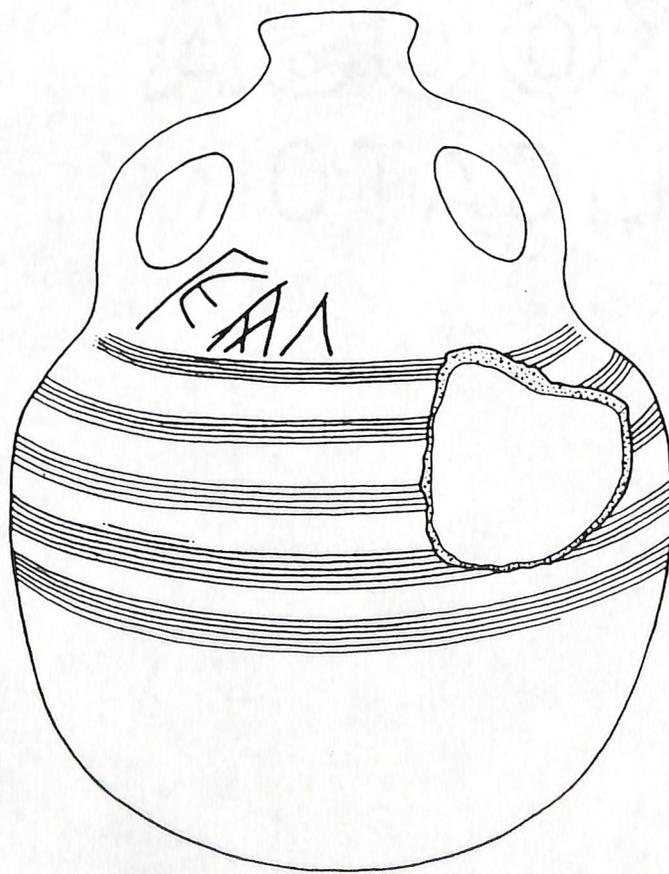
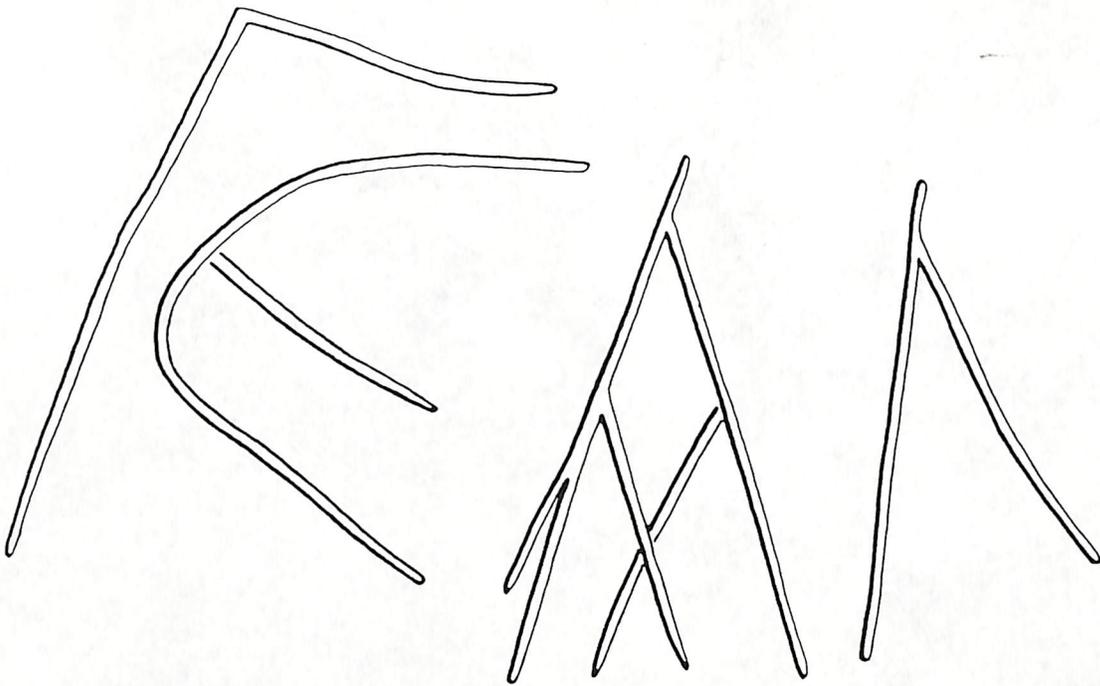
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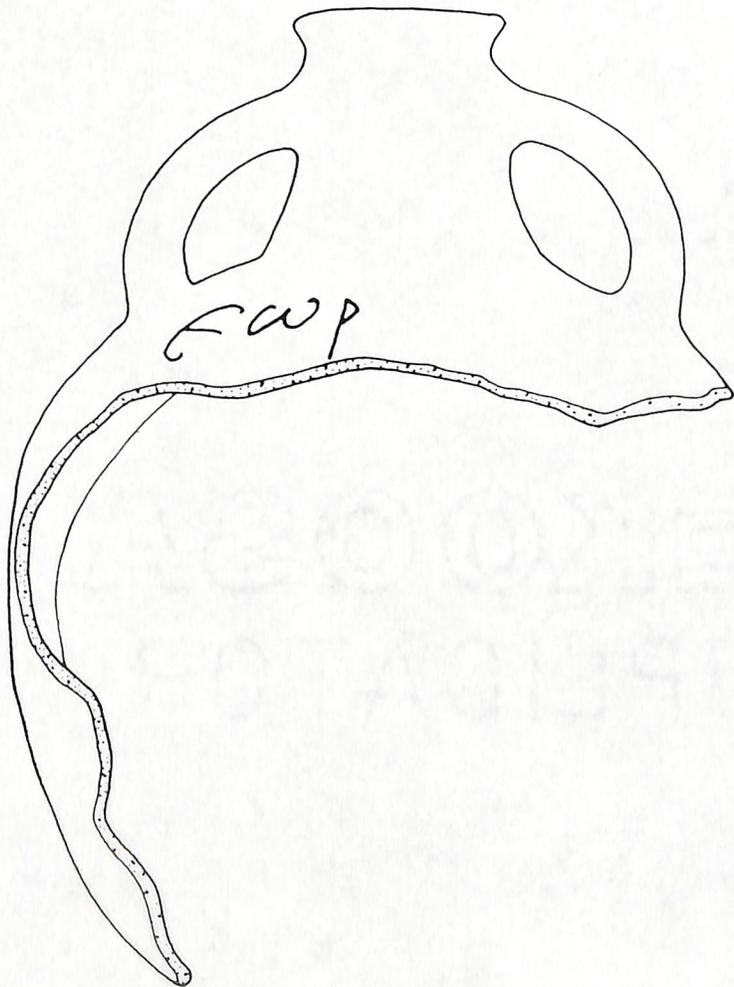


C1.7
(Small)

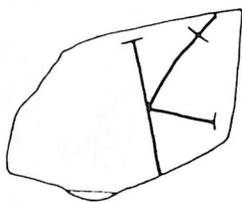
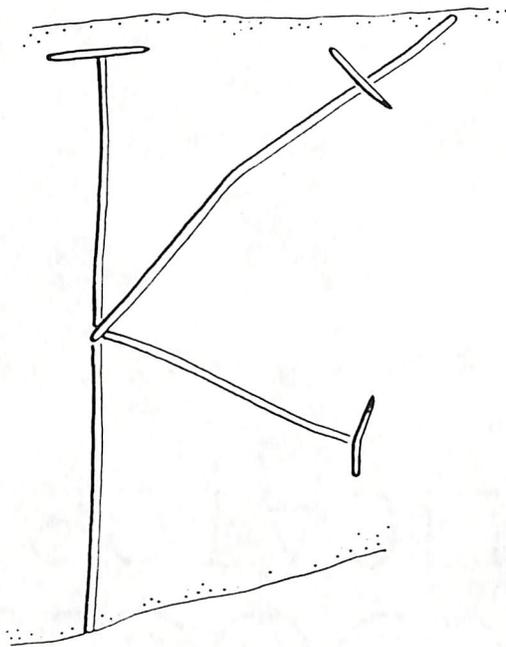
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GROUP D:
Globular Amphoras without Decoration



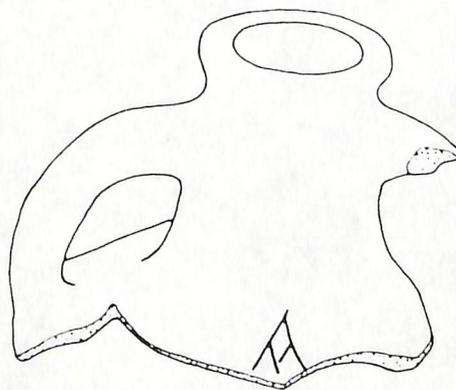
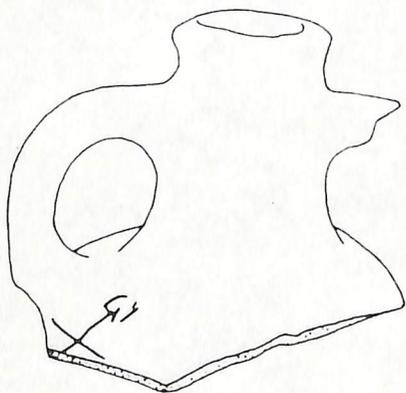
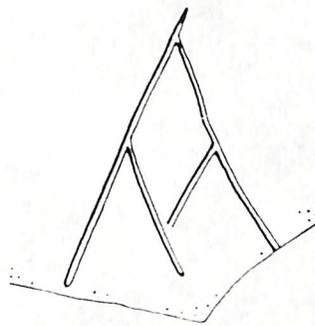
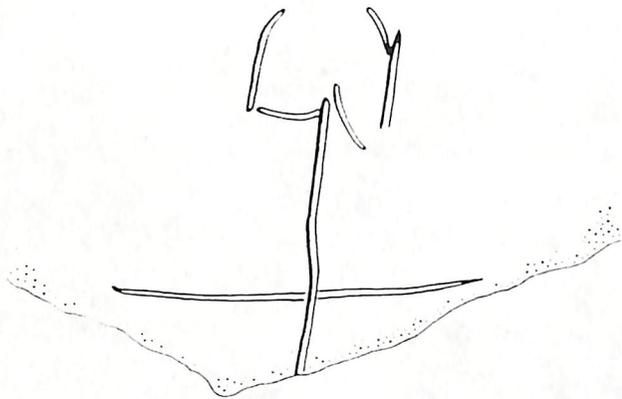
GROUP E:
Globular Amphoras of Uncertain Type

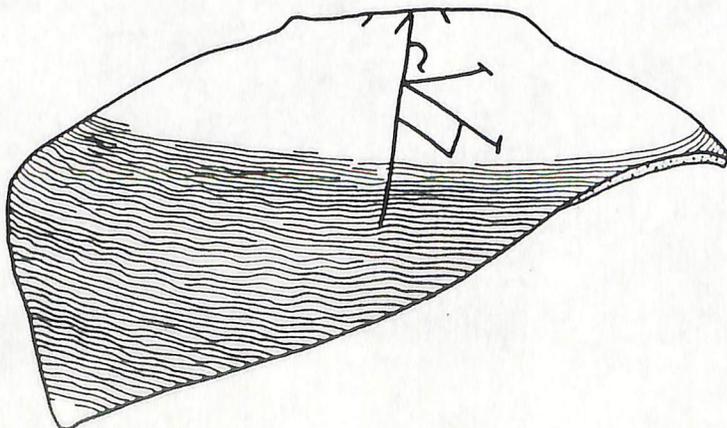
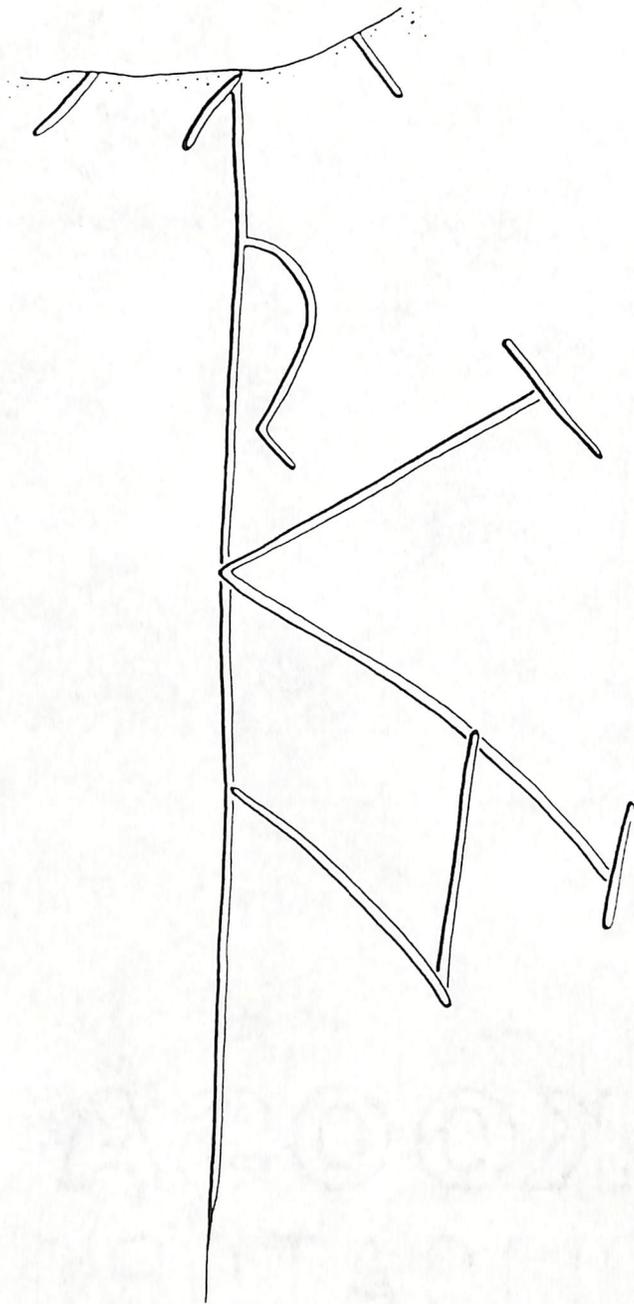


E2

E3

4.69

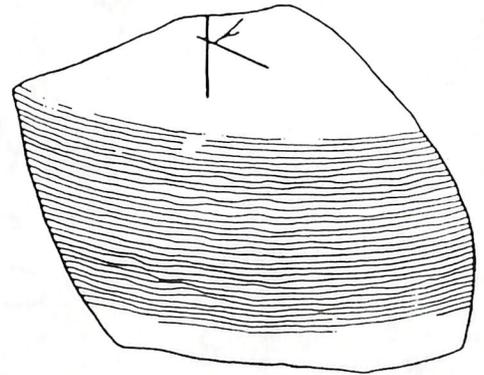
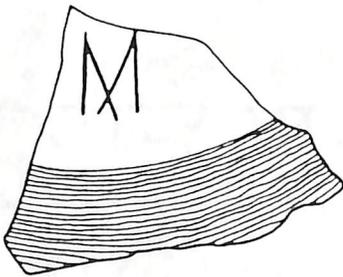
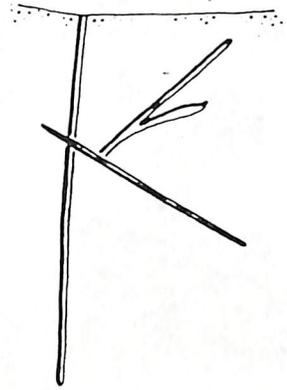
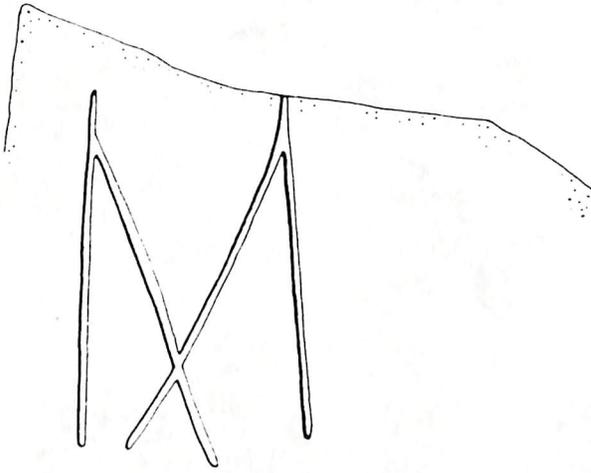




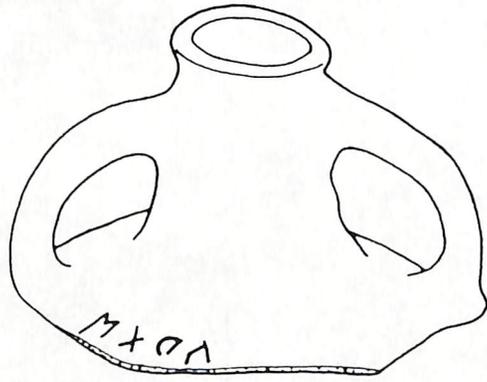
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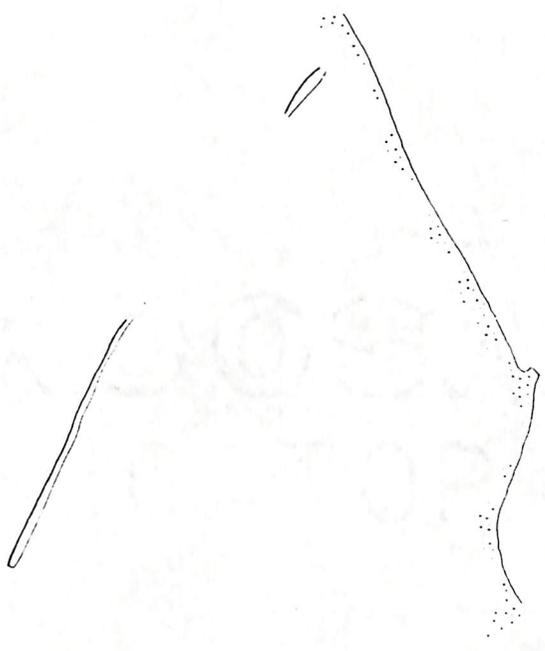
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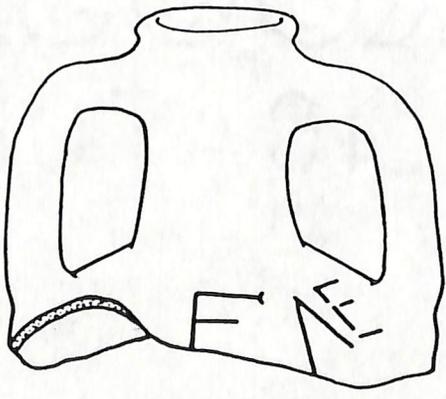
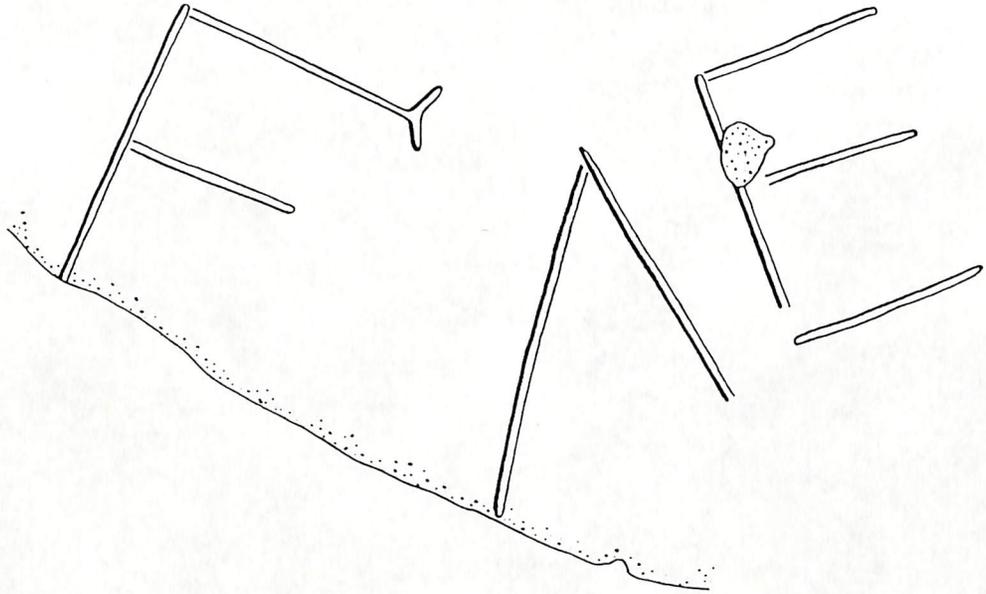


M X O A





GROUP F:
"Hourglass" Amphoras



BASS

VS
[5]

George F. Bass

UNDERWATER EXCAVATIONS AT YASSI ADA:
A BYZANTINE SHIPWRECK

Handwritten notes on the right edge: "YASSI ADA SHIPWRECK" and "B"

Sonderdruck von

ARCHÄOLOGISCHER ANZEIGER 1962

VERLAG WALTER DE GRUYTER & CO · BERLIN

UNDERWATER EXCAVATIONS AT
YASSI ADA: A BYZANTINE
SHIPWRECK

The University Museum of the University of Pennsylvania in the summer of 1961 continued its underwater excavations off the Turkish coast¹. The wreck chosen for study lies about one hundred meters south of Yassı Ada (Lodo), an island between Kalimnos and the Turkish mainland; it was designated as Yassı Ada Wreck III by Peter Throckmorton in his earlier exploration², and is one of a number of ships which had run onto a treacherous, hidden reef extending from the island. Virginia Grace had dated the wreck to the seventh century on the basis of amphoras raised for dating purposes.

The method of excavation has been discussed in detail elsewhere³, and a brief summary of the technical improvements over the 1960 season will suffice here. An 80-ton flat barge was anchored directly over the site to provide a working platform which held four air-compressors, for filling diving tanks and for running the suction hose; an electric generator, to provide power for underwater floodlights used in photography; and a portable decompression chamber. The darkroom for printing daily enlargements of underwater photographs, a necessity in submarine archaeology, and the drafting room were at the expedition headquarters in Bodrum, a two hour sail away.

It was decided that the methods used in excavating a ship should coincide as closely as possible with those used on land excavations. For this reason, for the first time, the staff consisted of archaeologists, draftsmen,

¹ G. F. Bass, *The Cape Gelidonya Wreck: Preliminary Report*, *AJA* 65, 1961, 267-276. This year's work was sponsored by the National Geographic Society, the Catherwood Foundation, the American Philosophical Society, the Littauer Foundation with a grant through Colgate University, Bauer Kompressoren of München, the Main Line Diving Club of Philadelphia, and individual donors.

² Bass, *op. cit.*, 267 n. 3.

³ E. J. Ryan and G. F. Bass, *A Technique for Underwater Surveying and Draughting*, in a forthcoming volume of *Antiquity*.

photographers, and an architect who had learned to dive for this work. There is no longer any reason for actual excavation to be done by divers untrained in archaeology, with supervision on the surface only.

The wreck lies on a slope with its bow at a depth of 31 meters and its stern at 36 meters. Because of the time limitations in working at this depth, each excavator having but 45 minutes to work each day in two dives, mechanical aids were needed by the architect⁴. After cleaning the sea growth from the remains, all visible objects were labeled with lettered plastic tags. A pair of plane tables (Fig. 1, a), one on either side of the site, then allowed two divers to record vectors and elevations on a surveying rod (Fig. 1, b) held over any object by a third diver. Often the water was clouded by excavation in progress on other parts of the wreck, making sightings impossible, and the plane tables were used mainly for overall measurements.

For work on specific areas, a five-meter square mapping frame, designed by Frederic Dumas, was positioned and leveled on the wreck by means of the plane tables. Two sides of the frame (Fig. 1, c), a horizontal beam (d) riding over them, and a vertical pole (e) yoked to this beam were all calibrated in centimeters. By positioning the movable parts so that the vertical pole rested on any object, it was possible to record coordinates and an elevation for that point. Notes and drawings were made with graphite pencils on sheets of Dupont Cronaflex drafting film.

In order to speed the drafting still more, a series of wire grids (f), with frames one, two, and three meters square, were laid over the wreck. Draftsmen hovered directly over these grids and made accurate drawings of the areas beneath, using the grid lines as guide lines (Fig. 2); vertical measurements

⁴ The seriousness of the time limit was demonstrated when a diver, following standard navy diving tables — with an added safety margin — was stricken with decompression sickness and was paralyzed from the waist down. Luckily he was able to receive treatment in a large recompression chamber in Istanbul in time to relieve the paralysis, but complete recovery may take a year or more.

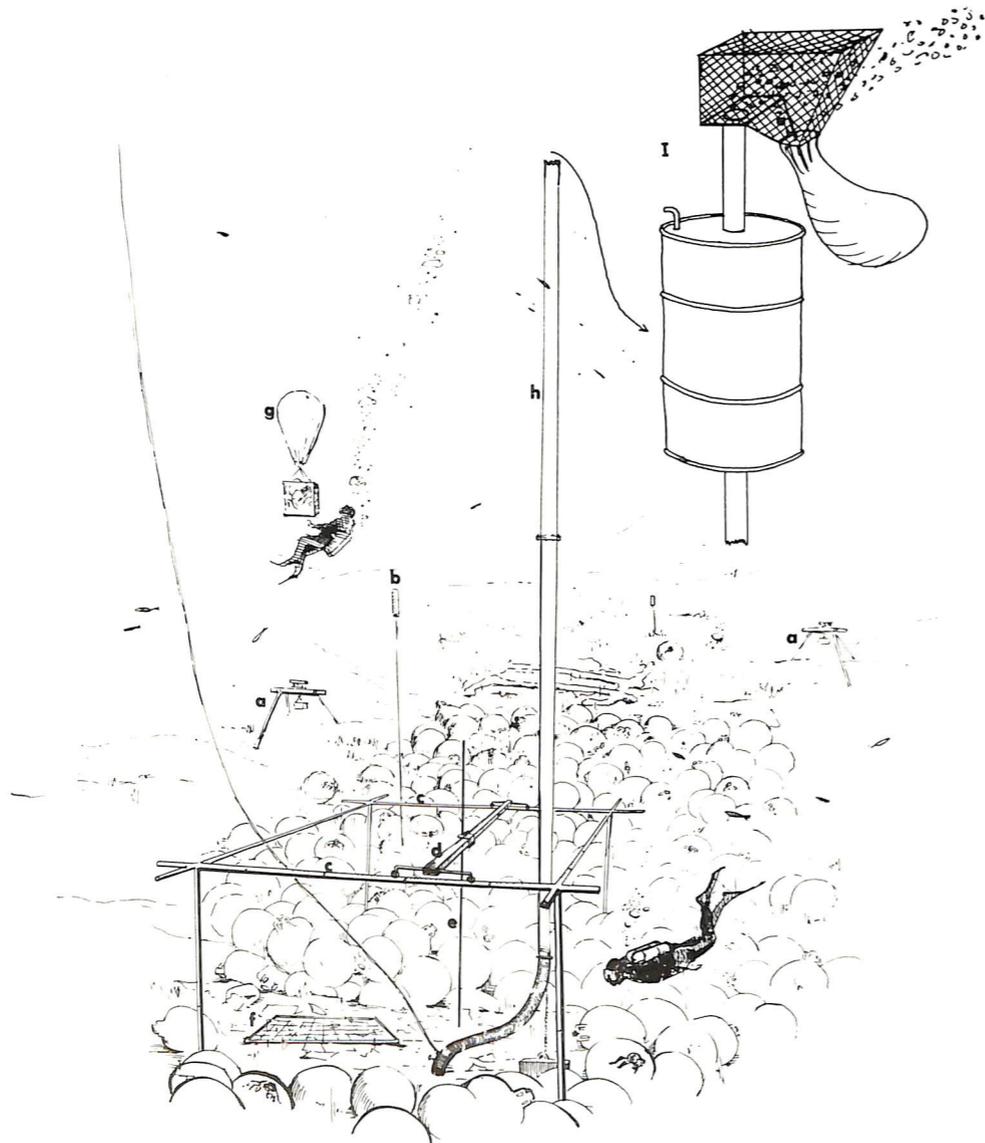


Fig. 1. Scheme of working under water

were taken with a meter stick between the wires and the objects drawn. For each position of a grid, therefore, only the four corners of its frame required measurements from the large mapping frame. In order to save diving time, the grids were never leveled with great care, and it was the task of the architect to correct for the slope while calculating elevations for his sections; it is

better to spend extra time on land with such calculations, for time is not there a limiting factor. The grids were also an aid in the 'aerial photography,' for corrections against lens distortion could be made by measuring distances between grid lines on enlarged photographs.

After objects had been tagged, plotted, and photographed in situ, they were raised



Fig. 2. Working under water

in a steel basket with a large, plastic-coated cloth balloon (Fig. 1, g). The balloon was inflated on the bottom from a diver's mouth-piece. When all visible objects had been removed, lower levels of the wreck were cleared with an air-lift, a large suction hose (Fig. 1, h). Air is pumped to a point near the mouth of the flexible pipe; as this air rises toward the surface, it sucks sand and mud with it. The pipe rose vertically to a height of 17 meters. On its top a wire basket (i) was fashioned which allowed fine sand to be carried off by the current, while heavier sand

and bits of shell fell into a cloth bag tied to the bottom of the basket. The bag was raised daily and its contents searched for any tiny object which might have been overlooked on the seabed. Few objects entered the pipe inadvertently, and these arrived in the bag unharmed.

The visible parts of the ship and its cargo cover a length of 16 meters, but the dimensions of the hull itself cannot yet be determined (Fig. 3). Across the bow lie six large iron anchors, badly corroded together. Their lengths average 2.5 meters, and the spread



Fig. 8. Four gold coins of Heraclius

one curved cover tile surely were used for roofing, but a number of small, flat tiles, square in shape (average dimensions 23 x 2.5 cm.; Fig. 4) more probably were used for flooring. Not all of the tiles have been plotted and raised, but even if two additional square tiles are found, the area covered would be less than one meter on a side; that these tiles are coarser and more poorly baked than the roof tiles suggests that they were made to withstand heat, and it is possible that they served as some sort of hearth in the galley. Tiles have been found on almost

all Classical wrecks⁸ and seem to have continued in use as the normal roofing for cabins in Byzantine times. Seven fragments

⁸ N. Lamboglia, *La Nave Romana di Albenga*. RivStudLig. 18, 1952, 209, 223; A. Merlin, *Recherches sous-marines de Mahdia*, CRAIInscr. 1908, 253; 1909, 655; *Τὰ Εὐρήματα τοῦ Ναυαγίου τῶν Ἀντικυθήρων*, Εφη Αρχ. 1902, 168-170; F. Benoit, *L'épave du Grand Conglué a Marseille*, Gallia suppl. 14 (Paris 1961) 120, 156 with n. 2, which gives bibliography for still other wrecks. In addition there are numerous tiles in the Bodrum Museum which have been brought up by sponge divers, and Mr. Throckmorton has reported tiles on several other wrecks on the Turkish coast.

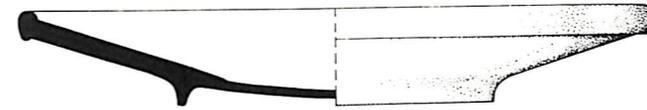


Fig. 9. Roman red ware plate, 1/4 nat. size

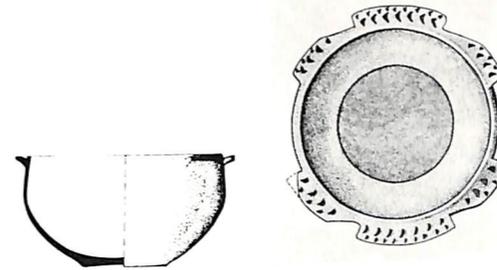


Fig. 10. Bowl with scalloped rim, 1/4 nat. size

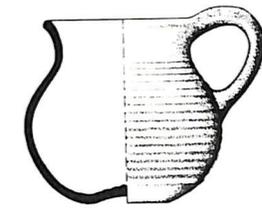


Fig. 11. Cup with handle, 1/4 nat. size

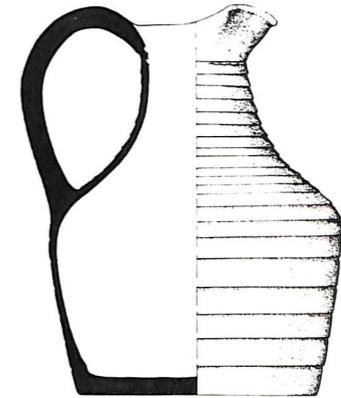


Fig. 13. Jug with trefoil mouth, ca. 1/5 nat. size



Fig. 12. Amphora, 1/4 nat. size



Fig. 14. Spouted jug with lid

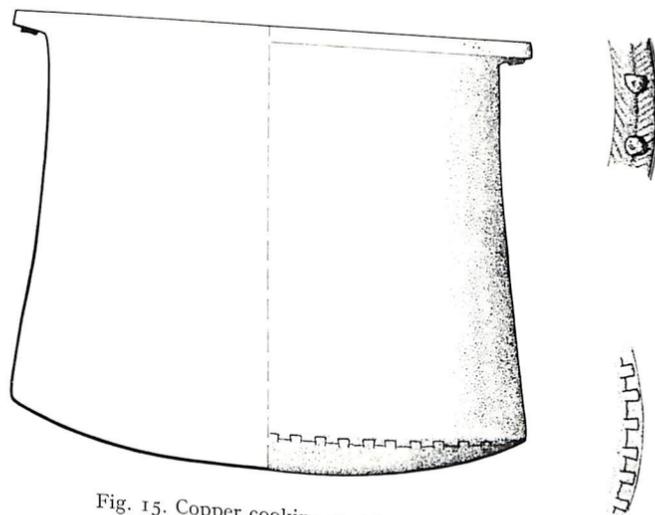


Fig. 15. Copper cooking cauldron, ca. $\frac{1}{5}$ nat. size

of iron bars, rectangular in section (3.2×0.7 cm.) and up to 75 cm. in length, were found in conjunction with the Wreck III tiles and must have served as supports; their exact relationships have not yet been determined, but in at least one instance a bar seemed to support a mass of clay in which a tile was imbedded.

The wooden parts of the hull are in a fair state of preservation, but only a small area of planking was uncovered this season. Although it is premature to speculate as to the positions of these planks in the hull, it can be said that they were fastened directly to beams with plain iron nails, round-headed and square in section, driven directly through the wood. The nails have disappeared completely, but a study of the interiors of iron oxide shells which have remained has given dimensions for a variety of sizes. Only one wooden dowel, 1.5 cm. in diameter, and a dowel hole of the same size have been found.

Just aft of the cabin lay the ship's large water pithos (H. 71 cm., max. diam. 58.5 cm., th. 1.1 cm.) (Figs. 3 and 5); the contemporary Rhodian Sea-Law mentions the strict rationing of water on board ships⁹. Nearby, and possibly from the cabin, were a number of lead objects including five conical weights quite similar to the net weights of the Grand

⁹ Walter Ashburner, *The Rhodian Sea-Law* (Oxford 1909) cli, 2, 61.

Conglué wreck¹⁰, a sheet of unused lead (56 cm. long, 20 cm. wide, and 4 to 5 mm. thick) folded in thirds, and a pair of small, curved sheets of lead (approx. 1.5 cm. in diameter, 7 cm. long, and 3 mm. thick) identical to lead sinkers found on the Bronze Age ship at Cape Gelidonya and to those still used in Greece¹¹.

The cargo consisted of perhaps 1000 amphoras; during the 1961 season nearly 500 were plotted and raised from the upper layers of the wreck. A trial trench near the anchors showed that they were stacked at least three deep and were in no apparent order. The globular shape of most of the amphoras would not have lent itself to the orderly stacking found on shipwrecks of earlier periods¹², which carried knobbed or pointed types, but it should be noted that most of the amphoras have moved and may have spilled over the starboard side of the ship.

Two main types of amphoras are found (Fig. 6, a + b). The majority are globular,

¹⁰ Benoit, *Grand Conglué*, (supra, n. 8) 179, with pl. XXXI, 4-15.
¹¹ Gladys R. Davidson, *Corinth XII, The Minor Objects* (Princeton 1952) 190, with pl. 88, 1449-168; Ph. Tailliez, *Travaux de l'été 1958 sur l'épave du 'Titan'*, *Atti del II Congresso Internazionale di Archeologia Sottomarina* (Museo Bicknell-Bordighera 1961) 176.



Fig. 16. Lamps of various types

quite similar to almost contemporary examples from the seventh century destruction level at Emporio on Chios¹³. The lack of knobs on their bottoms, useful in pouring¹⁴, may be explained by the presence of a 'wine-thief' or syringe-like dipper (KW on plan, near stern) used for drawing wine from large containers (Fig. 7). The long tube on

¹³ John Boardman has kindly supplied me with photographs of objects from the site.

¹⁴ J. D. Beazley, *Greek Vases in Poland* (Oxford 1928) pl. 24.

the bottom of the dipper would have been inserted into the mouth of an amphora and a thumb placed over the small mouth of the dipper when it was raised. The resultant suction would have held liquid in the dipper until it could be held over another container where the thumb would have been removed. The second major type of amphora, somewhat smaller, also lacked the knobbed bottom, but these may be handled quite easily. Stoppers, made of roughly rounded sherds of broken amphoras, were found in

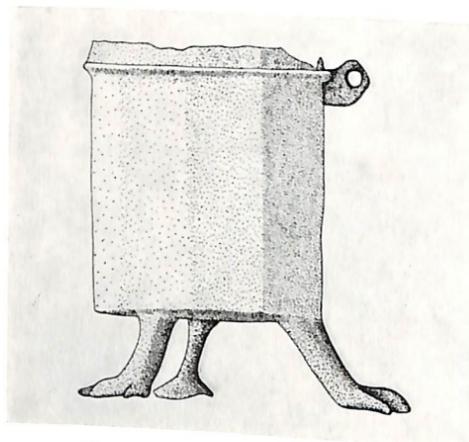


Fig. 17. Bronze censer, 1/2 nat. size

and around the smaller amphoras, but no stoppers were found for the globular examples; the latter may have been corked with wood or some other perishable material over which clay was laid. At this time, in Egypt at least, amphoras were sometimes sealed with a mixture of earth and chopped straw¹⁵ which would have left no trace underwater.

During this first season, after studying the lading arrangement of the ship, we concentrated on the area of the cabin. Under and around the roof-tiles, but usually at a lower level, were the objects which had been inside the cabin. Four gold coins, three *semisses* and one *tremissis*, of the Emperor Heraclius (610—641) indicate a date in the first half of the seventh century for the sinking of the ship (Fig. 8). All of the *semisses* differ slightly, but the obverse of each presents an unbearded, diademed bust of Heraclius, facing right. On one, the legend reads: $\Delta\text{NH}\epsilon\text{RA}\kappa\lambda\iota\ \text{Y}\text{SPPA}\text{V}\zeta$. The reverse presents a globe surmounted by a cross, surrounded by a wreath, and a legend reading: $\text{VICTOR}\text{IA}\text{AV}\zeta\text{UE}$ ¹⁶. The *tremissis* is similar, but lacks the globe beneath the cross, and bears the Constantinople mint

¹⁵ H. E. Winlock, *The Monastery of Epiphanius at Thebes I* (New York 1926) 79.

¹⁶ cf. Warwick Wroth, *Catalogue of the Imperial Byzantine Coins in the British Museum I* (London 1908) 193.

mark, CO [NO] B¹⁷, which may be only a mark of metal quality¹⁸. A number of bronze coins were so worn that no inscriptions were visible, which might have been expected for this period.

In the cabin was found the table ware used by the captain and, perhaps, part of the crew or passengers. Two complete late Roman red ware plates were found (Fig. 9), as well as fragments of one or, perhaps, two others. Only one piece of glazed pottery appeared, a small bowl with scalloped rim incised with nail impressions; the mottled green-yellow-brown lead glaze is found only on the interior of the bowl and on the tops of the scallops (Fig. 10). The other table wares were plain, including a deep, ribbed cup with one handle (Fig. 11); three small amphoras, unlike each other and unlike the larger amphoras found outside the cabin for carrying cargo (Fig. 12); two round mouthed, tube spouted jugs¹⁹ with traces of vertical handles, and a lid which fits one (Fig. 14); and several jugs, including one with a round mouth and four with trefoil mouths. One of these latter examples (Fig. 13)²⁰ was completely coated on its interior surface with a smooth layer of resin, and was surely used for wine; a coarse, two-handled cooking pot was more than a quarter full of congealed resin, which indicates that resin was heated on board in order to smear such vessels. The interiors of some of the large, globular amphoras were also coated with resin, but this was not the rule. Five other two-handled cooking pots appeared, as well as one without handles.

Near the stern of the ship was a copper cooking cauldron (Fig. 15, KL on plan) (H. 29.5 cm., max. body diam. 34.5 cm., rim diam. 37.5 cm.) identical in shape to those

¹⁷ *Ibid.*, 194 and xcix.

¹⁸ Howard L. Adelson, *Light Weight Solidi and Byzantine Trade during the Sixth and Seventh Centuries* (Numismatic Notes and Monographs No. 138) (New York 1957) 65—66.

¹⁹ cf. silver cup, cat. no. 421, Walter B. Emery, *The Royal Tombs of Ballana and Qustul* (Cairo 1938) I, 277; II, pl. 64 E.

²⁰ cf. Henry S. Robinson, *The Athenian Agora V, Pottery of the Roman Period* (Princeton 1959) 122, N 7, with pl. 35.

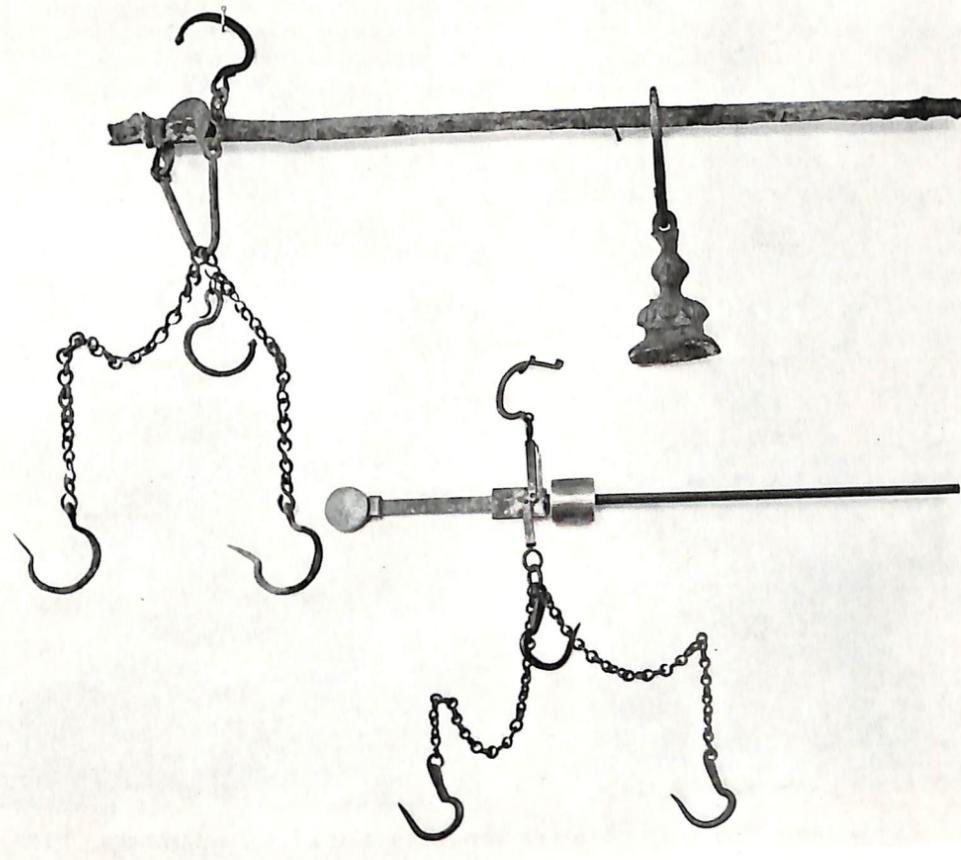


Fig. 18. Steelyard from the wreck compared with 20th century example

now used in Bodrum. Rivets for handle attachments are found on opposite sides of the cauldron, on the under side of the flanged rim, and we may suppose that one large bucket handle originally ran across the cauldron. The bottom of the vessel was of a separate sheet of copper, tongued into the body before being fixed in place, possibly by brazing. A rectangular copper tray with a raised, outcurving rim, also appeared.

A large, flat stone was found with the cooking utensils and was probably used for grinding. A crude stone mortar, partially disintegrated for unknown reasons, was surely for this purpose; two of a probable four lugs are preserved, one with a palmette

incised on its top and the other with a lotus pattern. Two bones from a sheep or goat are the only traces of food yet found; there were no human bones.

With the eating, drinking, and cooking wares were ten terra-cotta lamps, eight complete and two fragmentary. There is an obvious variety of shapes, loop-, knob-, and palmette-handles all being present, but the lamps may be grouped conveniently together (Fig. 16). All have relatively small pour-holes, none has an 'air-hole', and all but one (not figured here) have channels between their wick holes and discs. There can be no doubt that these lamps were produced somewhere along the western coast of Asia Minor. Somewhat similar lamps



Fig. 19 and 20. Lead-filled bronze counterweight in bust form, ca. $\frac{2}{5}$ nat. size

appear at Pergamon²¹, Sardis²², and Lindos²³, but the closest parallels are found in the Cemetery of the Seven Sleepers at Ephesus²⁴. Similar lamps also appear in the seventh century destruction level of Emporio, and the slight differences may be explained by their somewhat later date in

²¹ Alexander Conze, *Altertümer von Pergamon* I, 2 (Berlin 1913) 295, with Pl. 59, 1.

²² G. M. A. Hanfmann has kindly shown me pictures of the lamps which are found in a destruction level which seems to date from the time of Heraclius.

²³ Chr. Blinkenberg, *Lindos, Fouilles de l'Acropole 1902-1914* I (Berlin 1931) 745, with pl. 151, 3205, 3207.

²⁴ F. Miltner, *Forschungen in Ephesus IV* 2, *Das Coemeterium der Sieben Schläfer* (Baden 1937) 96 ff. A detailed study of the mass of comparative material must await the final publication of the wreck finds.

that century²⁵. Almost exact duplicates of three lamps, in Berlin, are reportedly from Constantinople and the Fayûm, but their dates of fifth or sixth century have been certainly set too early²⁶. The excellent context of the Yassi Ada lamps should allow a firmer dating for such examples, and it is possible that more lamps will appear in other parts of the cabin. The large number of lamps on one ship is not unusual; a Bodrum sponge-dragger presented us with five second century lamps which he had brought up in his net. It is possible that these were items of trade, however, for they were neatly stacked inside a large terra-cotta pot.

²⁵ *Supra*, n. 13.

²⁶ O. Wulff, *Königliche Museen zu Berlin III. Altchristliche und Mittelalterliche Byzantinische und Italienische Bildwerke* (Berlin 1909) 251-2, nos. 1267, 1270, 1272, with pl. LXII.

An octagonal bronze censer, with three feet ending in the triple paws of a beast, was found near a bronze cross attachment which was pierced at its top. The censer has a hinge on one side, and a small hole to receive a hook on the other, but the lid itself is still missing (Fig. 17). If the lid was openwork as might be expected, it is possible that it has completely disintegrated, but it is probable that the cross was attached to its top. Hexagonal censers with three legs are common at this time²⁷, but the rather clumsy octagonal shape seems unusual.

Weighing implements were necessary on merchant ships (several sets of haematite weights appeared on the 13th century B.C. wreck at Cape Gelidonya²⁸) and both balances and steelyards seem to have been used. Although a balance has not yet been found, six bronze discs have appeared. Four of these still bear traces of silver-inlaid letters which give the unit of weight for each. The marks are those commonly found on such weights²⁹, often in silver³⁰, and give weights of †A (one pound), Γ S (six ounces), ΓΓ (three ounces), and, perhaps, Γ Β (two ounces). A cross lies above and between each pair of letters. Until all weights have been recovered from the wreck, it would be unwise to speculate as to the relationships of the various weights, for sets of more than one standard may be involved; relationships in actual weight do not follow the marks found on the discs. The pound weight (284 gr., but missing a few grams of silver) seems to equal 14 ounces if a standard ounce is taken from the six ounce weight.

²⁷ George M. A. Hanfmann, *Sardis und Lydien* (Akademie der Wissenschaften und der Literatur in Mainz, 1960) 534-535, with pl. 16; G. M. Fitzgerald, *Beth-Shan Excavations 1921-1923* III (Philadelphia 1931) 42, with pl. XXXVIII, 24; W. Deonna, *Delos 18, Le mobilier* (Paris 1938) 391, B 1215-6063, with pl. CXIII, 1007.

²⁸ Bass, *op. cit.* (supra, n. 1) 274.

²⁹ Daremberg and Saglio IV a, 557 s. v. *Pondus*. The values of the letters may be found in F. Hultsch, *Metrologicon Scriptorum Reliquiae I* (Lipsiae 1864) 170 f., 175.

³⁰ O. M. Dalton, *A Guide to the Early Christian and Byzantine Antiquities*, British Museum (Oxford 1903) 68.

Two steelyards were also found³¹. The smaller (L. 27.8 cm.) bears scale indications on two faces of its quadrilateral bar; its piriform lead counterweight has a bronze loop at its top formed by a rod which runs through the body of the weight. The bar is quite similar to Roman examples, but how little steelyards change is shown by the comparison of the larger steelyard from the wreck with a 20th century example currently used in Bodrum (Fig. 18). The larger steelyard (L. 1.46 m.) terminates at one end with a boar's head³² and at the other with the head of a lioness or panther. Scale indications, also on two sides of the bar, are inscribed in dotted lines and figures. The counterweight in this case is a lead-filled bronze bust of Athena (H. 25 cm., weight 7.970 kg.) (Figs. 19 and 20). Counterweights in bust form are common³³, and even a number of Athena weights from early Christian times have come previously to light³⁴. The bust in this case is quite stylized; the tiny mouth is little more than an extenuation of the nose, the eyes lack pupils, the long hair is represented only by folds around the bottom of the helmet, and the Gorgon head is merely a crude mask.

³¹ For use and bibliography see D. K. Hill, *When Romans Went Shopping*, *Archaeology* 5, 1952, 51-55; G. R. Davidson, *op. cit.* (supra, n. 11) 207, 214-16, with pl. 98.

³² cf. H. B. Walters, *Catalogue of the Bronzes, Greek, Roman, and Etruscan in the British Museum* (London 1899) 359, no. 2986.

³³ Daremberg and Saglio III 2, 1229. There are more than ten such weights in the Archaeological Museum of Istanbul alone: Nez. Firatli, *A Short Guide to the Archaeological Museum of Istanbul* (Istanbul 1955) 49. For bibliography see F. O. Waage, *Bronze Objects from Old Corinth*, *AJA* 39, 1935, 81, n. 1; Marvin C. Ross, *A Byzantine Bronze Weight*, *AJA* 50, 1946, 368-9.

³⁴ S. and A. Abdul-Hak, *Catalogue Illustré du Département des Antiquités Greco-Romaines au Musée de Damas* (Damascus 1951) 145, nos. 11, 979 and 6, 668; S. Ferri, *Arte Roraana sul Danubio* and 6, 668; S. Ferri, *Arte Roraana sul Danubio* (Milan 1933) 356, with figs. 482-483; A. Garcia y Bellido, *Esculturas Romanas de España y Portugal* (Madrid 1949) 452 f., with pl. 337; T. P. F. Hoving brought my attention to this last reference and also kindly supplied me with photographs of a similar, unpublished piece in the Metropolitan Museum of Art.



Fig. 21. Glass pendant with monogram, $\frac{3}{4}$ nat. size

The steelyard bears the name of its owner, undoubtedly the captain of the ship, in punctured letters near the boar's head³⁵:

+ ΓΕΟΡΓΙΩ ΠΡΕΣΒΥ
ΤΕΡΘΝΑΥΚΛΕΡΩ +

The use of *presbyteros*, in an ecclesiastical sense, would seem odd here, but a possible meaning has been suggested by Martin Harrison. Mr. Harrison has discovered a baptismal basin, in a 6th century church at Karabel in central Lycia, which bears an inscription referring to a Nicholas ΝΑΥΚΛΗΡΟΣ ΜΕΣΑΤΟΣ³⁶. If μέστος, the superlative of μέσος, here indicates rank, we are dealing with a 'middling captain', or some kind of mate. In that case, the Γεώργιος of the Yassi Ada wreck would be simply the 'senior' or chief captain of his ship. That there were more than one *naukleros* on board ships of this period is attested, and some of these were probably petty officers³⁷; some modification of the title must have been necessary to distinguish these.

The name of another member of the crew, or perhaps of a passenger, may be found in the cruciform monogram of a small pendant of yellow, molded glass. The pendant (diam. 2.2 cm.) is pierced at its top, flat on the reverse, and with the raised monogram framed by a ridge (Fig. 21). The monogram gives the name, Θεοδόρου, in a form similar to that found on lead seals, but with a slightly different arrangement of the letters³⁸.

³⁵ Daremberg and Saglio III 2, 1228, gives a list of similar inscriptions.

³⁶ R. M. Harrison, ILN 20th August 1960; AnatSt. 10, 1960, 26-28; 11, 1961, 6. The inscription is copied from a letter from Mr. Harrison.

³⁷ Ashburner, op. cit. (supra, n. 9) cxxxii, cxxxvi.

³⁸ Michel Rostovtsew and Maurice Prou, Catalogue des Plombs de L'Antiquité... de la Bibliothèque Nationale (Paris 1900) 284, no. 849, with pl. VIII, 9; 285, Pl. IX, 7.

One or more seasons' work remain to be done before the ship is completely uncovered, but it is reasonable to say that few sites offer the variety of material, in closed deposits, as do ancient wrecks. If carefully excavated, they should reveal some of the best evidence for dating unstratified finds from all periods*.

Philadelphia George F. Bass

* All of the material concerning the ship, its tile and anchors, was provided by Frederick van Doorninck, assistant director. Object drawings by Susan Womer, underwater drawing by Eric J. Ryan; object photographs by Waldemar Illing underwater photograph by Herb Greer.

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