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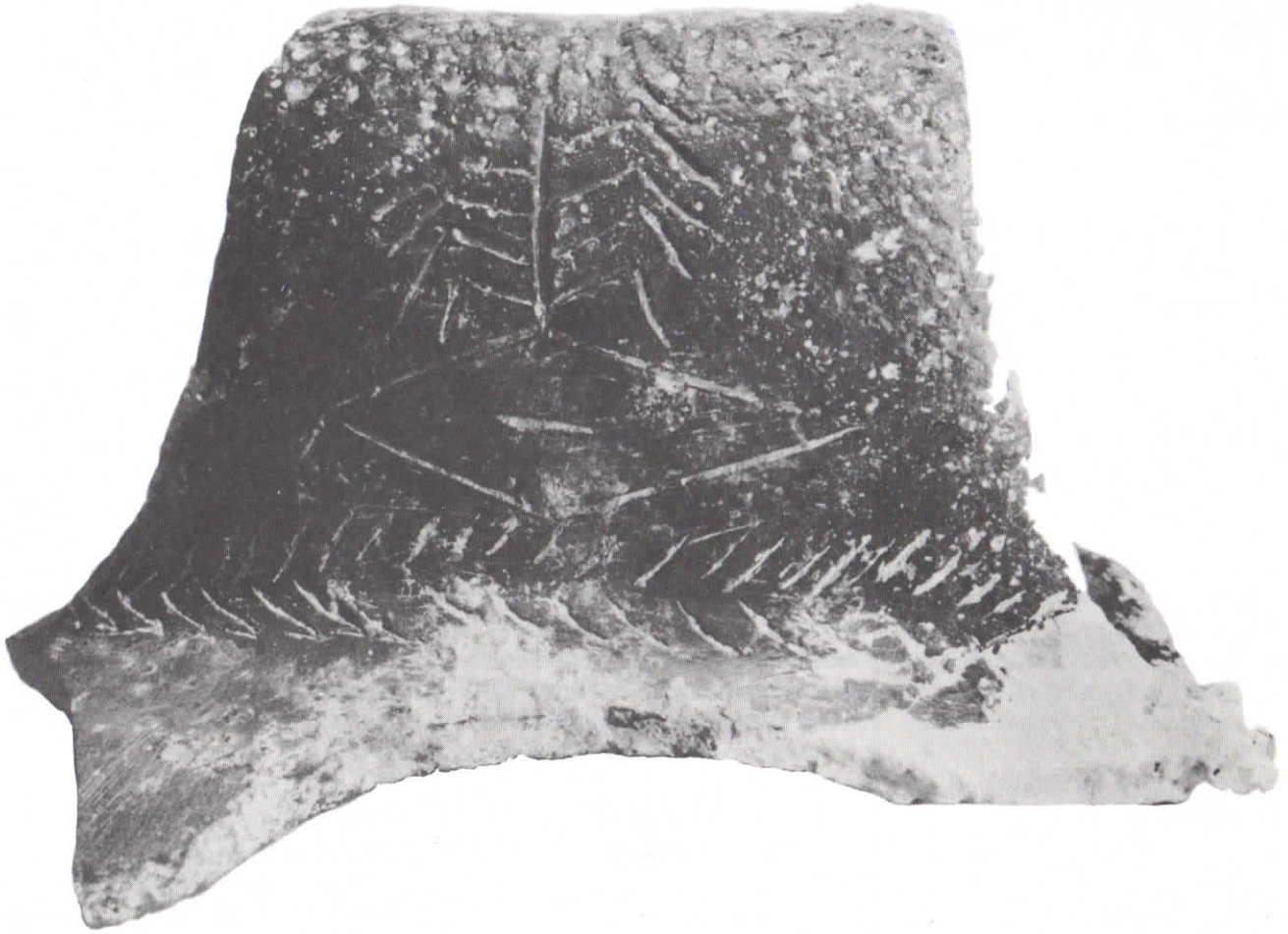

ENALIA

ANNUAL ENGLISH EDITION OF THE HELLENIC INSTITUTE OF MARINE ARCHAEOLOGY

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PROSPECTS AND PREREQUISITES

Summer of 1990 saw the completion of the second season of excavation at Dokos. This year has again proved rich in finds both under the sea and on the land. The site becomes ever more familiar and our acquaintance with it ever closer. Data continue to accumulate, encompassing more than just the small bight of Myti Kommeni. The sea on the outer side of the headland and Ledeza bay, a little further along the coast, have yielded further evidence and we are beginning to form a fuller picture of the area. But as our knowledge grows, so the questions become more complex. More information is needed, more evidence and more knowledge. Our experience is also growing, however, and the importance of the site is becoming clearer as we are better able to interpret the facts that emerge. Our study of the finds recovered so far is becoming more intensive and organized. In the Spetses Museum the treatment and classification of the material is continuing and the problems are finding answers.

In time the bulk of our effort will be transferred more and more to the hospitable building of the Museum and the study of the finds. This phase of the work will continue for a considerable time after the conclusion of the actual excavation. It is undoubtedly the most difficult and demanding part of the task; it may not be as exciting as the excavation itself, but it is every bit as important, and unless it is properly carried out all the previous work will have been in vain. In addition to our own efforts and dedication, we shall continue to need the material and moral support of all those who have helped us hitherto as well as the solid and unfettered co-operation of the representatives of the state. We have all agreed to undertake and keep up the work, and if we have the full support of everyone, we shall be able to bring the Dokos enterprise to a successful finish.

A few years ago the Institute entered on a new phase. It underwent a process of renewal and enthusiastically embarked on a number of pro-

CONTENTS

Cover page:
Handle of Early Helladic II amphora (A79) from the wreck site at Dokos. (Photo: Nikos Tsouchlos)

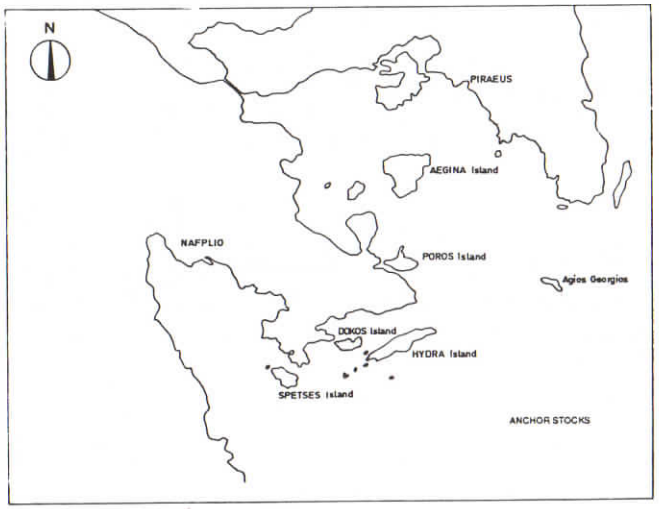
jects. Its first excavations were the large campaign at Dokos and the smaller but also important one at Point Iria, near Tolo. At the same time H.I.M.A. made an effort to reorganize itself on a more realistic footing, and it further sought to acquire for itself the necessary miscellaneous equipment that would enable it to pursue a more independent and effectual course.

H.I.M.A. has also successfully entered the field of publishing, producing the ΕΝΑΛΙΑ Annual in English and a series of ΕΝΑΛΙΑ Supplements devoted to special studies and monographs.

Many people have given us significant help and support in our efforts, realizing that they will lead to the opening up of new prospects in the field of underwater archaeology in Greece and to a change in the climate of apathy and indifference that has hitherto prevailed. Our responsibilities are now greatly enlarged, and in order to make further progress we shall have to call on every possible source of collaboration inside and outside the Institute. For this to happen there are two prerequisites: the guarantee of a permanent minimum annual funding for the Institute that will cover its fixed working expenses, and the acquirement of a permanent headquarters.

The existence of such a base will enable more members of the Institute to take an active part in meeting the Institute's increased needs, which is not possible under the present "refugee" conditions. The burden of these two issues on the one hand prevents us from making the most of our potential and on the other absorbs a large part of our energies and time, which should be devoted to our chief purpose, underwater archaeological research.

Nikos Tsouchlos
Athens, April, 1991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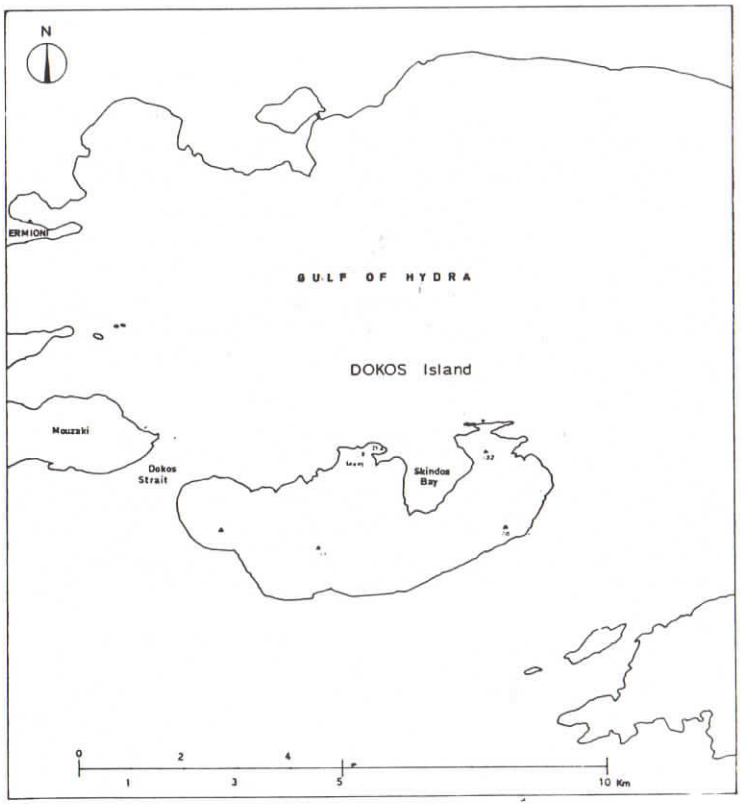
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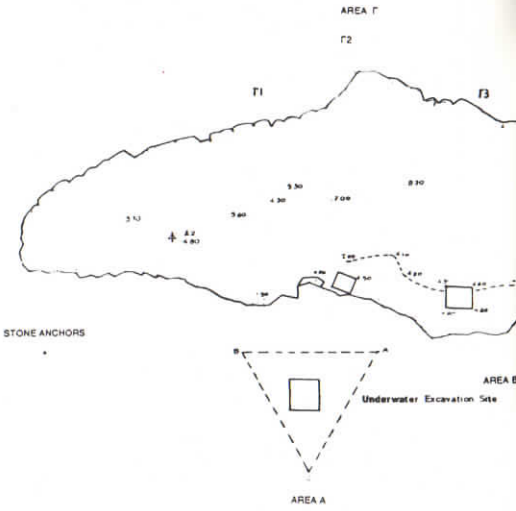
AREA Γ
Γ2
Γ1
Γ3
STONE ANCHORS
AREA B
Underwater Excavation Site
AREA A

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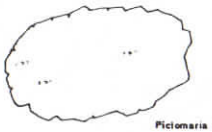

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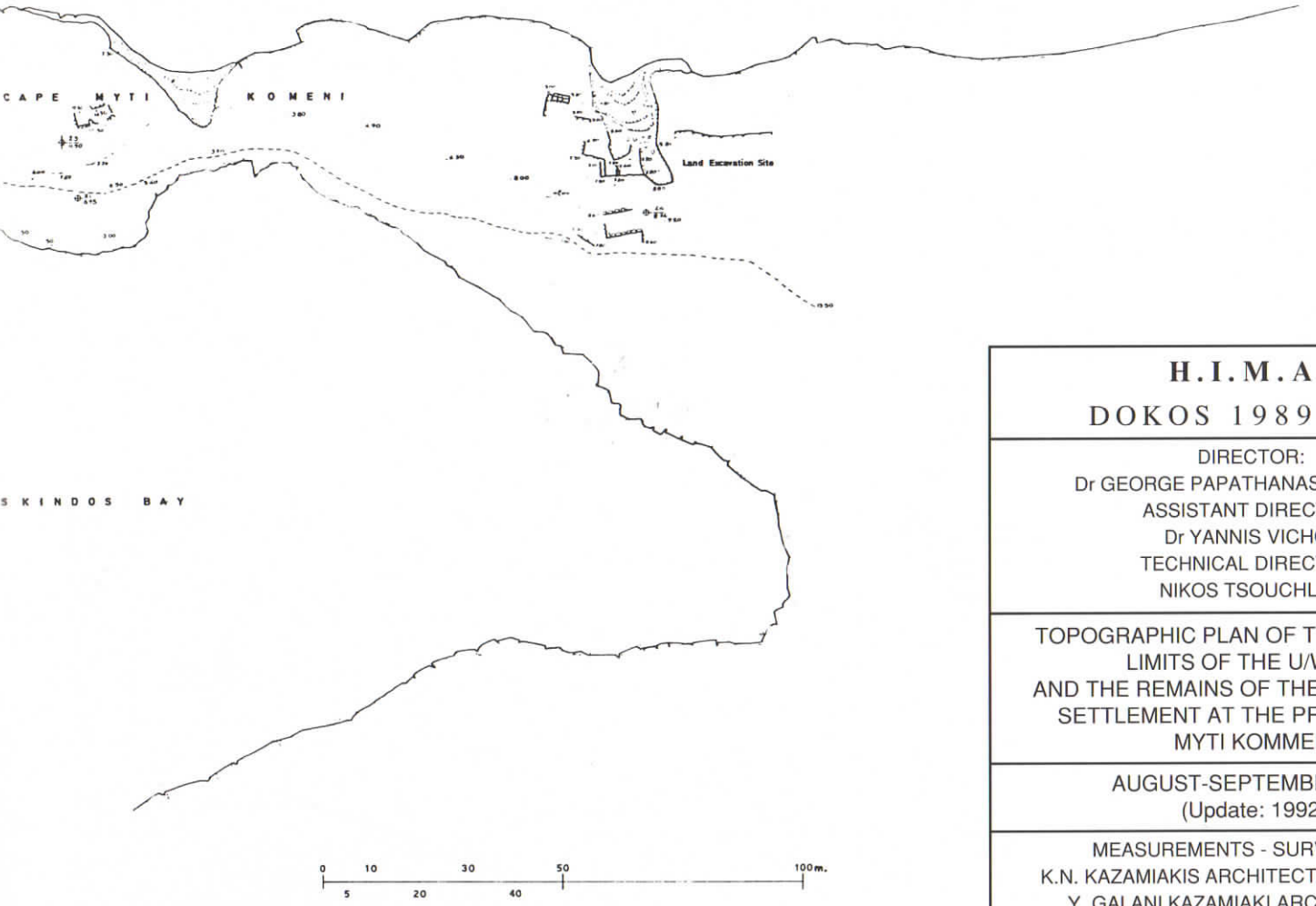

H.I.M.A.

DOKOS 1989-1991

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TOPOGRAPHIC PLAN OF THE SURVEYED LIMITS OF THE U/W SITE AND THE REMAINS OF THE PREHISTORIC SETTLEMENT AT THE PROMONTORY MYTI KOMMENI

AUGUST-SEPTEMBER 1989
(Update: 1992)

MEASUREMENTS - SURVEY - PLAN
K.N. KAZAMIAKIS ARCHITECT/TOPOGRAPHER
Y. GALANI KAZAMIAKI ARCHAEOLOGIST

DOKOS: 1990 CAMPAIGN

by George Papathanassopoulos
Yannis Vichos
Elpida Hadzidaki
Yannos Lolos

UNDERWATER EXCAVATION

Methodology

The 1990 campaign on the Early Helladic wreck at Dokos began on the 27th of July and ended on the 14th of September. 33 members of H.I.M.A. and 7 divers from the Underwater Demolition Unit of the Greek Navy took part.

Both of the surveying methods employed in the 1989 campaign were again used, namely the SHARPS and stereophotography. An air lift was used to excavate the Trenches.

Before the archaeological work began, the necessary land installations were set up and the floating platform was positioned over the underwater site.

The two primary aims of the 1990 campaign at Dokos were:

1. To establish the extent of the ancient remains, and

2. To discover the extent of the wreck beneath the seabed.

The first archaeological tasks were to define the area of the site and to mark out the perimeter line approximately where it had been in 1989. Next, the position of the first trial Trench (T1) was chosen, in a place where there was a thick deposit of sand.

The place was chosen as being relatively easy to excavate because of the depth of sand and

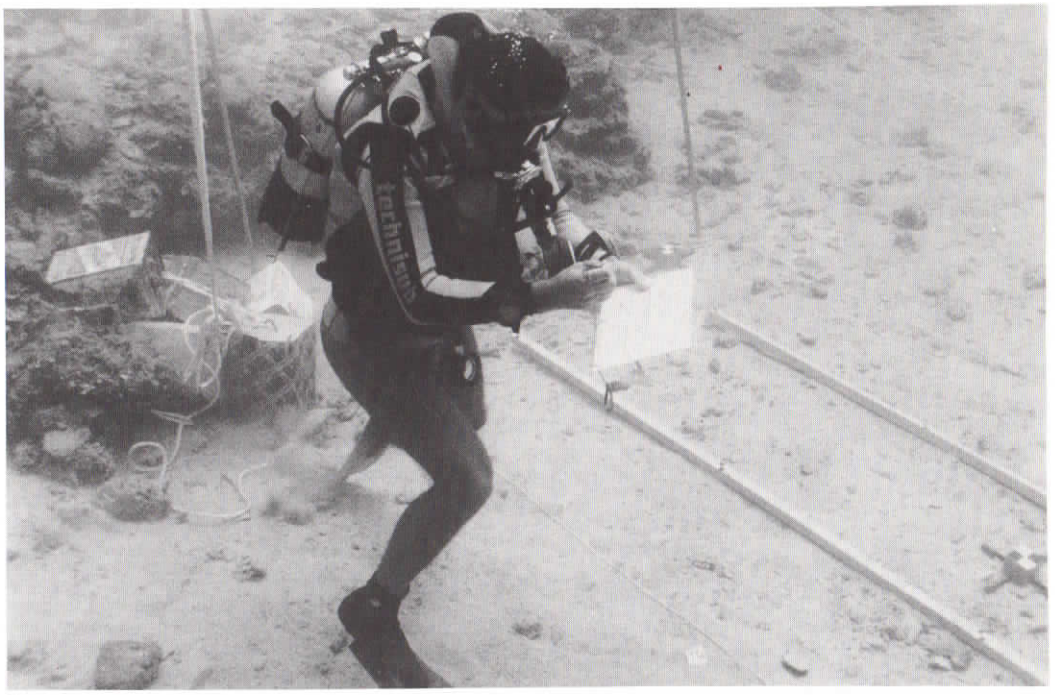


Photo: K. Gkatzinis

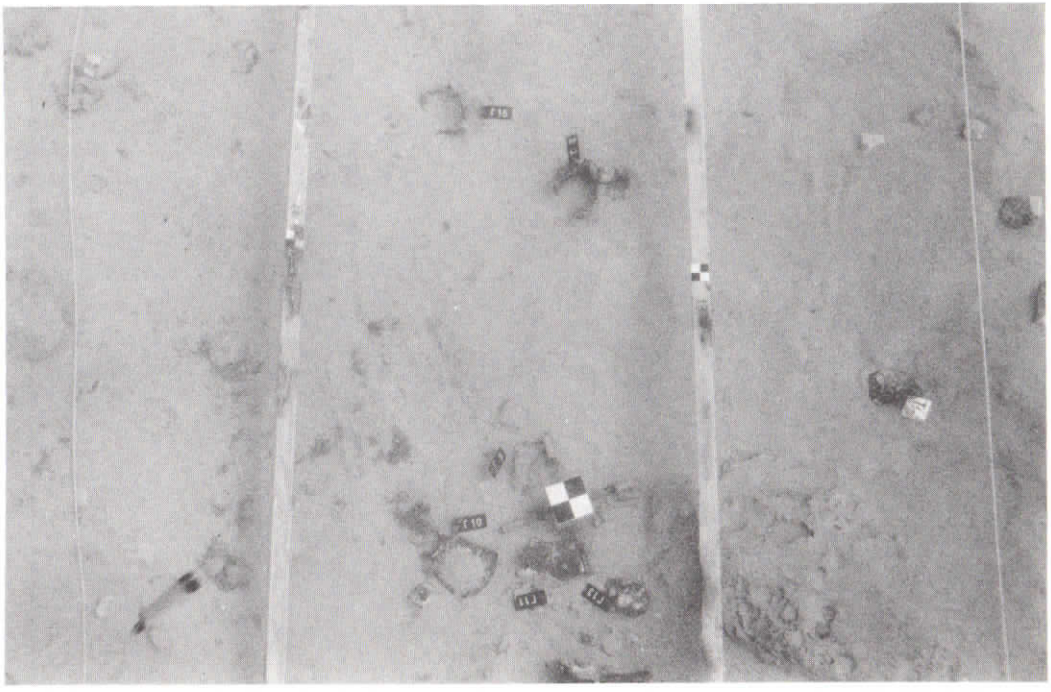


Photo: N. Tsoumanis

Fig. 1. *Placing photographic scales under the stereophotographic grid.*

Fig. 2. *Shooting from the stereophotographic grid: photographic scales and find-groups in Layer Γ, Trench 1.*

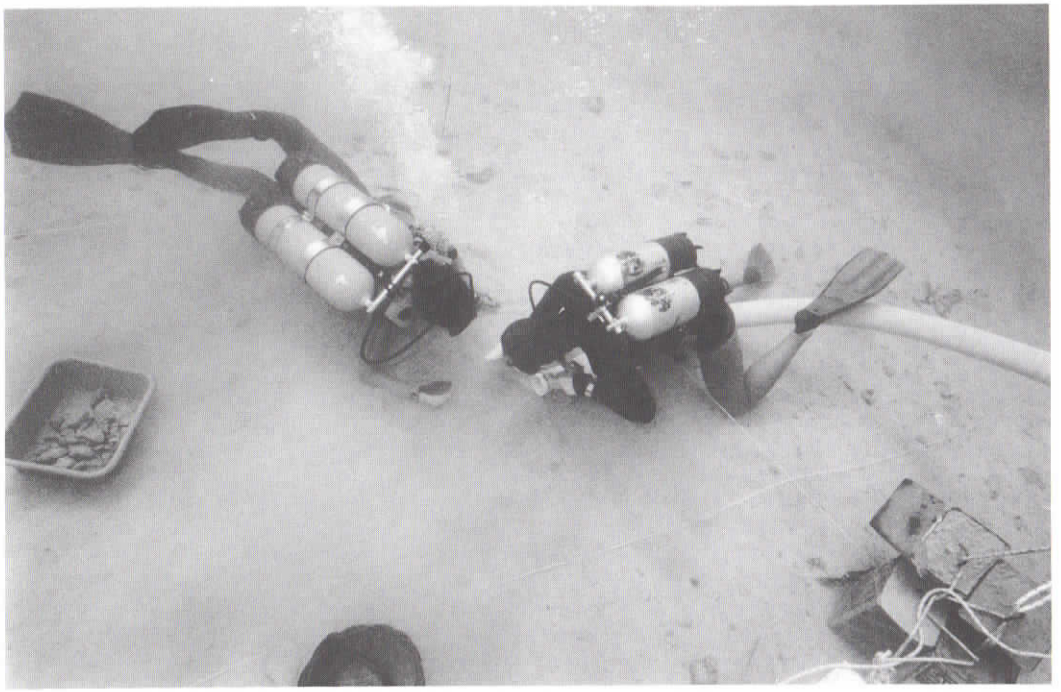


Photo: K. Jachnes

Photo: K. [illegible]

the absence of concreted pottery fragments on the seabed, and because it was close to and outside the deepest limits of the perimeter line, which had been established on the basis of the scatter of surface finds. This trial Trench made it possible to check the actual limits of the wreck in the lowest level below the surface of the sand.

It was decided to make the first trial Trench 18x2m. It began where the pottery concretions ended, in about the middle of Sector B2, ran the whole length of Sectors B2 and Γ2 and continued some 4 m beyond the perimeter line as an extension of Sector Γ2. The first trial Trench (T1) was marked out with ropes and subdivided into six smaller rectangles of 2 x 3 m. The Trench and its subdivisions (T1a - ζ) were then plotted with the SHARPS (see plans in pages 27, 29, 30 and 31).

The next step was to mark the surface finds in Trench T1 singly or in groups with numbered tags and record their positions with the SHARPS, after which Trench T1 was stereophotographed, using the metal photographic grid, which measured 3 x 5 m. A total of 60 stereophotographic shots were taken from each position on the grid, which was moved four times along the Trench *(fig. 1, 2)* in order to cover the whole area. The surface objects were then collected and raised.

After this the actual digging began, using the airlift *(fig. 3, 4)*. The Trench was dug in three levels: A, B and Γ. Each level was assigned an arbitrary depth of about 50 cm, since no stratigraphic levels could be distinguished; in fact the upper part of a Roman amphora was found in the lowest Level Γ.

The Trench was taken down to a depth of 1.50 m below the surface and reached bedrock. In every level Early Helladic sherds and large sections of pots were found together with many pieces of obsidian, teeth and small fragments of animal bones, two seeds and other food remains.
The finds in levels B and Γ were labelled with

Fig. 3. *Excavating with the air lift in Trench 1.*

Fig. 4. *Excavating with the air lift in Trench 1. Layer Γ, with parts of bedrock.*

numbered tags identified by the letter B or Γ. Their positions were recorded with the SHARPS and a stereophotographic plan was made. After being plotted all the finds in levels B and Γ were raised.

The three excavated levels had the following composition:

Level A: fine drifting sand, shells, EH sherds and obsidian flakes.

Level B: coarser sand, more shells, including some that had become fossilized, EH sherds, obsidian flakes, small fragments of animal bones and food remains.

Level Γ: harder coarse sand, shells, including small fossilized ones, EH sherds, part of a Late Roman amphora, obsidian flakes, small fragments of animal bones and food remains.

While the excavation was proceeding, the work of marking, recording and recovering surface finds from all over the defined area of the site continued; these objects had not been visible in the previous campaign as they had evidently been covered by the sand. They were exposed by the shifting of the sand during the winter.

At the same time, the second trial Trench (T2) was laid out at a point below where the rocks ended in the centre of the wreck area (Sector B2). This Trench (T2) was 5.85 x 3 m; it was in Sector B2 and between Sectors A3 and B3 (see plans in pages 27, 29, 30 and 31).

The sides of the Trench were marked out with ropes and it was divided into three smaller areas, two measuring 3 x 2 m (T2a, T2b) and one 3x1.85 m (T2γ). The Trench and its subdivisions were then plotted by the SHARPS.

During the 1990 campaign only the surface level of this second Trench was surveyed and the surface finds plotted and raised.

Further exploration

While the above work was in progress at the site, exploratory dives were carried out over a wider area around the wreck, as a result of which two Classical or Hellenistic lead anchor stocks were located 81 m west of the Myti Kommeni promontory and outside the limits of Skindos bay (see map in pages 4 and 5).

They were found at a depth of 55 m cemented to the rocks. After they had been raised with the aid of balloons and roughly cleaned of marine growths, they were photographed and drawn on the spot *(fig. 37)*.

EH sherds were found some 20 m east of the site and were plotted and raised (Area B: see map in pages 4 and 5).

More EH sherds and querns were found in Area Γ *(fig. 5, 6)* on the northern side of Myti Kommeni point (see map in pages 4 and 5).
They belong to three concentrations of finds about 20 m from the shore (Γ1, Γ2, Γ3) in depths of between 5 and 10 m; nine fragments of pottery and a broken quern were collected as samples.

The general impression is that the number of visible finds in this area is considerably less than that of the surface finds at the main site inside the bay (Area A). The three concentrations of pottery lie in almost a straight line parallel to the shore *(fig. 6)*.

Photo: Y. Vichos

Fig. 5. Concentration of Early Helladic II potsherds and querns in Area Γ, on the outer side of the promontory of Myti Kommeni.

Results and conclusions

During the first two campaigns at Dokos over 4000 objects were recovered, chiefly large and small sherds of Early Helladic pots and utensils, two fragments of a lead bar, two stone anchors,

Photo Y. Vichos

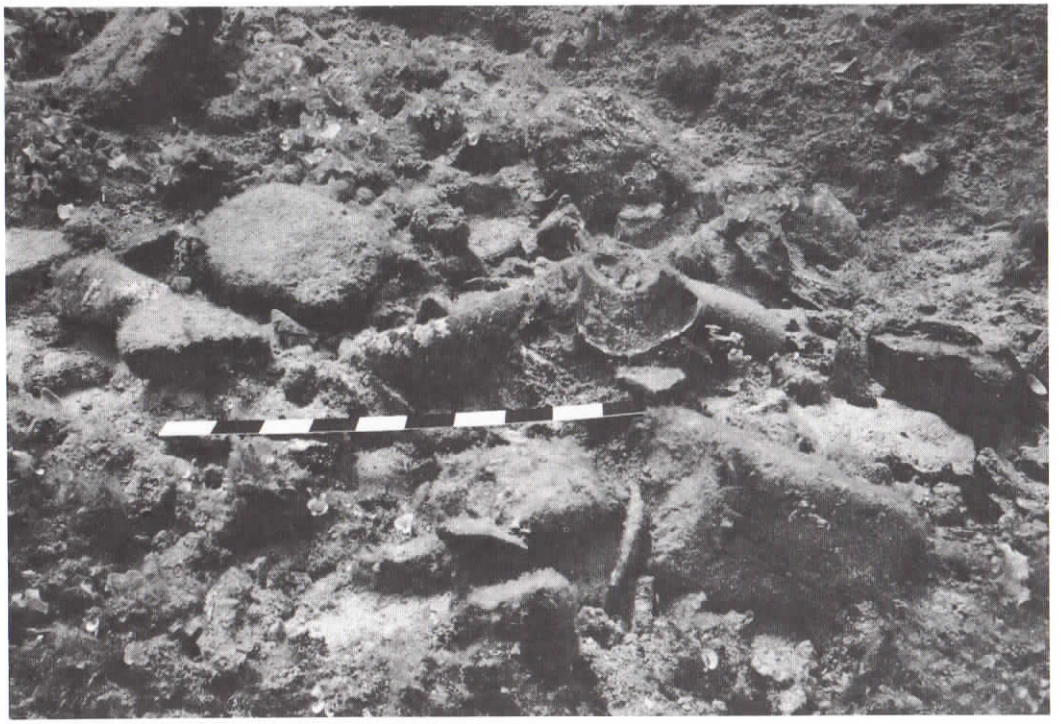


Fig. 6. *Concentration of Early Helladic II potsherds and querns in Area Γ, on the outer side of the promontory of Myti Kommeni.*

many querns, a large number of obsidian blades and flakes, and animal teeth and small bone fragments.

The great quantity of Early Helladic II pottery from the Dokos site is important not only for the variety of the types and sizes, but especially since it constitutes the only possible closed find of this nature with EH II pottery hitherto known in the Aegean.

The teeth and bone fragments were chiefly found together with the EH sherds in the lower levels of the first trial Trench. They cannot, however, be regarded as a part of the large find of EH II pottery, which for the most part came from the surface level of the site, but rather as refuse dumped from the land; this is only to be expected in a place that has been used as a natural harbour from prehistoric times to the present day.

All the finds recovered are in the process of being cleaned and studied. The study of the finds is being carried out as part of a large program which involves the use of a computer to draw them and to record all their details as well as all relevant comparable material. This program will speed up the processing of the material and facilitate its final publication. A further aim of the program is the publication of the results of the excavation for both scientific and popular consumption using electronic media, such as the Compact Disc ROM, which are going to become widely used for the promotion and diffusion of research projects and other kinds of knowledge in the very near future.

THE FINDS

Pottery

The pottery from the Dokos wreck, which all appears to belong to a late phase of EH II, includes all the basic EH II types known from numerous land sites as well as various kinds of household utensils. We think, however, that the range of shapes will prove to be even wider when the cleaning and study of the thousands of sherds so far recovered have been completed.

The commonest shapes are bowls, sauceboats, basins, wide-mouthed jars with plastic bands, and amphoras; the utensils include spit-supports, braziers, and clay hearths.

An interesting feature of the pottery so far studied from the 1989 and 1990 campaigns was the presence of Cycladic elements; this confirms the initial impression formed of the pottery at the time of the discovery of the wreck in 1975.

Although the excavation of the site is not yet finished and the objects in the Spetses Museum are still at the stage of being cleaned and studied, we decided that the importance of the site justified the presentation here of the principal findings and conclusions from our study of the material so far.

Pottery types

The three commonest shapes are bowls, sauceboats and amphoras, and they are represented by many dozens of sherds (see statistics in Table I, p. 22); the first two are the commonest EH II types in southern and central Greece and on the islands of the Saronic and Argolic gulfs (for a good summary of EH II pottery, see Caskey 1960, 290-292, fig. 1; 1968, 315, Lerna III).
The *sauceboats* occur in different sizes and variations (e.g. A154, *fig. 7,* and Papathanassopou-

Fig. 7.

Fig. 9.

Fig. 10.

Fig. 8.

Fig. 11.

CAPTIONS

Fig. 7.

E.H. II sauceboat A154. Pres. H. 9 cm

Fig. 8.

E.H. II sauceboat of large size (A99). Pres. H. 26,5 cm.

Fig. 9.

Shallow bowl A25 (E.H. II). H. 5,7 cm.

Fig. 10.

Deep bowl A25 (E.H. II). H. 9,4 cm.

Fig. 11.

Shallow spouted bowl Γ17 (H.E. II). H. 6,2 cm.

Photos: Nikos Tsouchlos

los 1990, 34, fig. 1). There is at least one unusually large specimen (A99, *fig. 8*), which has no parallels among the published sauceboats from EH sites on the Greek mainland, and which gives a new dimension to the question of the function of these vessels.

The *bowls,* like the sauceboats, come in a variety of sizes and shapes, and some of them are remarkably large; they generally have more or less inverted rims, and flat, ring or slightly raised bases (eg A25 and A53, *figs. 9 and 10*).

The large bowls and other open shapes frequently have long horizontal ledge lugs on the rim or just below it, and some of them also are very large. Ledge lugs of this type are well known from other EH sites and in the Cyclades are often found on marble vessels (Preziosi 1977, figs. 85-86).

There is only one example of a *shallowspouted bowl* (Γ17, *fig. 11*) and it is still being cleaned. This shape is hard to parallel among the late EH II published material on the mainland, but it is known from the Cyclades in both marble and clay (Παπαθανασόπουλος 1961/62, 121, pl. 53α; Getz-Preziosi 1977, 104, fig. 85: 3-4, 86: 3 and 4-6 (with a foot); Ντούμας 1984, 115, no. 130; Fitton 1989, 34, fig. 30; Δεβετζή 1990, 123, no. 119 (Κ.Δ.), 120).
Many sherds come from very open shapes, either *basins* or large *plates*. They are often slightly carinated (A41/1, *fig. 12*), like the complete basin from Askitario in Attica exhibited in the Neolithic-Prehistoric Room of the National Archaeological Museum.

Among the complete or nearly complete open pots that have been cleaned so far is a small *cup* with a large raised handle and angular body (A310, *fig. 13*). The shape bears a general, though not exact similarity to some one- and two-handled cups from Lerna IV (Rutter 1980, fig. 4:2, fig. 5, EH III period), Manika in Euboea (Σάμψων 1988, fig. 78:157.5726, fig. 91:58, fig. 127 right) and Naxos (Ζαφειροπούλου 1988, 63, fig. 1, EC III period, Kastri group).

A large number of sherds are from *wide-mouthed vessels* with horizontal or vertical handles on the upper part of the body, which has single or double horizontal plastic bands around the rim or just below it (A151/1, *fig. 14*). These relief bands, which are common on EH wide-mouthed jars of medium or large size, vary in width and usually carry finger-impressed or rope decoration.

There are many sherds from *amphoras* of the EH II type, with two or more broad vertical strap handles on the widest part of the belly. Amphoras evidently formed a large part of the cargo. They have two types of neck: one with a concave flaring rim and the other with a more or less straight cylindrical collar (e.g. A21/3, *fig. 15*).

Three of the surviving large strap handles from amphoras are decorated. One (A79, see cover page and *fig. 16*) has a curious and unique incised decoration made up of individual motifs that occur on incised Cycladic pottery. The composition, which is rather naturalistic, seems

Photo: N. Tsouchlos

Fig. 12.
Wall fragment of E.H. II basin A41/1, with suspension holes. Pres. H. 11,2 cm.

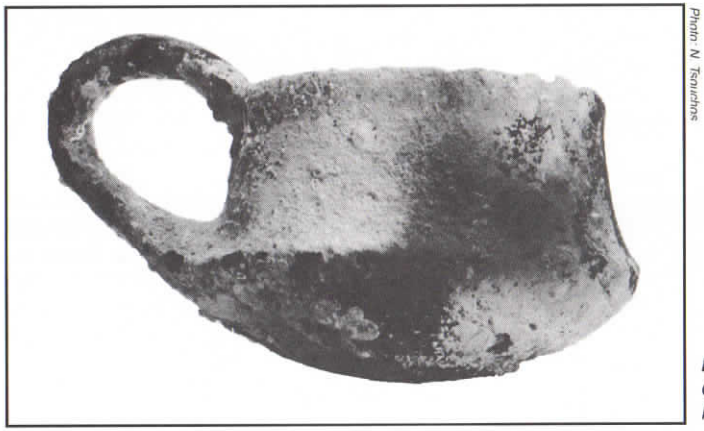


Fig. 13.
One-handled cup A310. H., with handle 6,6 cm.

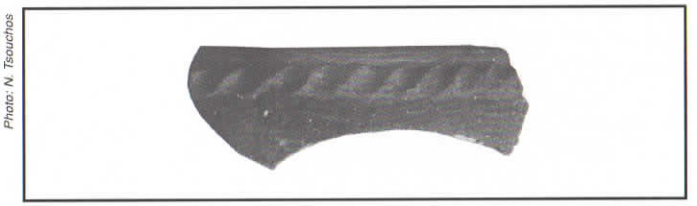


Fig. 14. *Rim fragment of H.E. II open vase, with relief band (A151/1) Pres. H. 6 cm.*

to be more than simply ornamental and may have had a symbolic significance.

One of the other two handles is decorated with two impressed concentric circles (A21/4, *fig. 17*), and the other with a pair of similar concentric circles placed symmetrically. They are particularly important because it has been suggested that this motive may be symbolic rather than decorative (for impressed or incised concentric circles on Cycladic pottery and mainland pottery of Cycladic type, see Thimme 1977, 533, No. 405; Otto 1977, 137, fig. 124:9 (Asine), 139, fig. 128:5 (Syros); Τζαβέλλα-Evjen 1984, fig. 17, pl. 46 from Lithares, Thebes). A pair of similar concentric impressed circles occurs on the handle of an EH II amphora (now in the Spetses Museum) from the EH II settlement of Bali on Hydra, a site first identified by Mr Adonis Kyrou.

Among the *cutaway* and *beak-spouted jugs* that have so far been cleaned (e.g. A95, *fig. 18*; and see the illustration on the cover of *ΕΝΑΛΙΑ* vol.I, No 2, 1989), one is of special interest because of the clay imitation of a metal rivet-head on the base of the handle (A215, *figs. 19a, 19b*). This is one of the earliest appearances of an imitation rivet-head on Aegean pottery, although clay imitations of metal rivet-heads as a decoration on the base or, more usually, on the top of a vertical handle are common on open shapes generally at the end of the Middle Bronze Age and in the early phases of the Late Bronze Age.

Another example of an EH II jug from the wreck with a cutaway mouth and a clay rivet-head on the top of the handle has already been published in the report on the results of the 1989 campaign at Dokos (Papathanassopoulos 1990, 35, fig. 2, No. A142).

Among the sherds from EH II *askoi*, a large fragment of the upper part of a body (A159, *fig. 20 and 21a*) bears an incised rhomboid motif (symbol?). The closest parallel is to be found on a Late Cycladic beaked jug (EC II/EC III) from Panormos on Naxos (at present exhibited in the Apeiranthos Museum: Inv. no 357). The incised motif on the Apeiranthos jug (here *fig. 21b*) is thought to represent an apotropaic eye by Professor V. Lambrinoudakis, who describes the jug as a ritual vessel (Λαμπρινουδάκης, in Μαραγκού 1990, 109, No. 108).

A lid, most of which has been preserved (A167, *figs. 22a and 22b*), with a handle on the top and single opposed perforations in its upper edge, would have come from a large cylindrical *pyxis* with vertical walls of EC II type. This shape is not included in the basic repertoire of contemporary EH pottery described by Caskey (1968, 315, EH

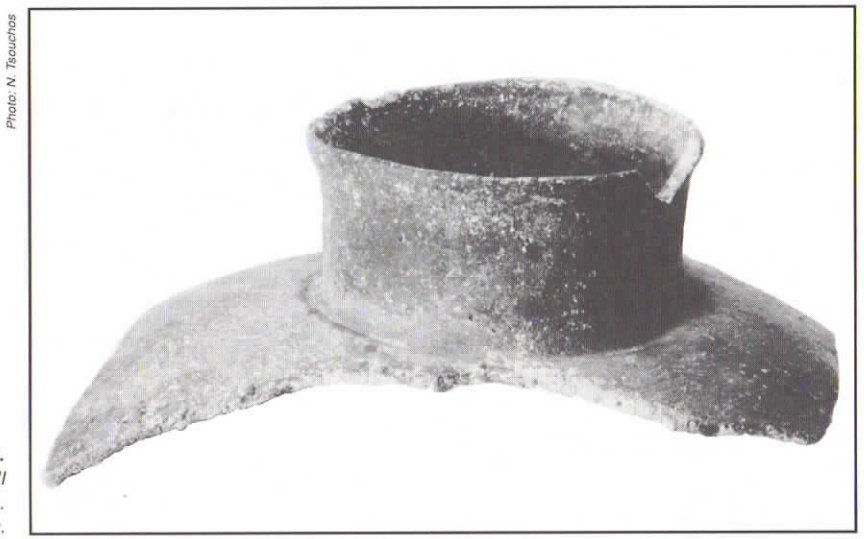


Fig. 15.
Fragment of E.H. II amhora A21/3. Pres. H. 7,2 cm.

II), but it has close parallels in lids with double perforations from Asine and Tiryns (displayed in Cases 51 and 57 in the Prehistoric Room of the Nauplion Museum). A lid from a pyxis also comes from the EHII underwater site of Ledeza, Dokos (now in the Spetses Museum).

Another interesting sherd is from a squat pyxis with a vertical double-perforated knob (A338); this type of stone or clay pyxis with two or more vertical, single or double, perforated knobs is a pure Cycladic type and especially popular in the EC II period (Renfrew 1977, 25, fig. 3: 3; Getz-Preziosi 1977, fig. 85: 18, 20; fig. 87: 6, 7; Σάμψων 1988, fig. 78: 168.5798, fig. 92: 1, 14).

There are also many sherds from coarse *pithoi,* including bases, rims and bodies. The rims are generally thick and flat (e.g. A151/2, *fig, 23*).

Clay utensils

The clay utensils include parts of two *spit supports* (A2, *fig. 24*; also Papathanassopoulos 1990,35, fig. 3), which like the braziers may have been used by the crew of the boat.

Clay spit supports are found in various shapes and have been interpreted in different ways. Generally they are thought to have been used to support spits for roasting meat, but it has also been suggested that they were supports for the heads of the dead, stands for pithoi and even potters' implements (for EH spit supports, see Τζαβέλλα-Evjen 1984, 172-174 [with bibliography], 214, pls. 88-89; also Σαπουνά-Σακελλαράκη 1990, 11 fig. 5: a recent find from Manika in Euboea; and an almost complete example, unpublished, in the Museum of Cycladic Art, coll. no. 537).

There are also large fragments of 3 *braziers,* which each had four cylindrical button-shaped knob handles (e.g. A254, *fig. 25*; Papathanassopoulos 1990, 36, fig.4). Part of a similar brazier in the Spetses Museum comes from Ledeza on Dokos, and an identical handle occurs on an EH pot fragment (possibly a spit support) from Tiryns, at present on display in the Prehistoric Room of the Nauplion Museum (Case 57, inv. no. 4120).
Among the clay utensils some fragments of *hearths* have also been identified; a large exam-

Photos: N. Tsouchlos

Fig. 16. *Handle of E.H. II amphora with incised pattern (A79). Medium W. of handle: 5,6 cm.*

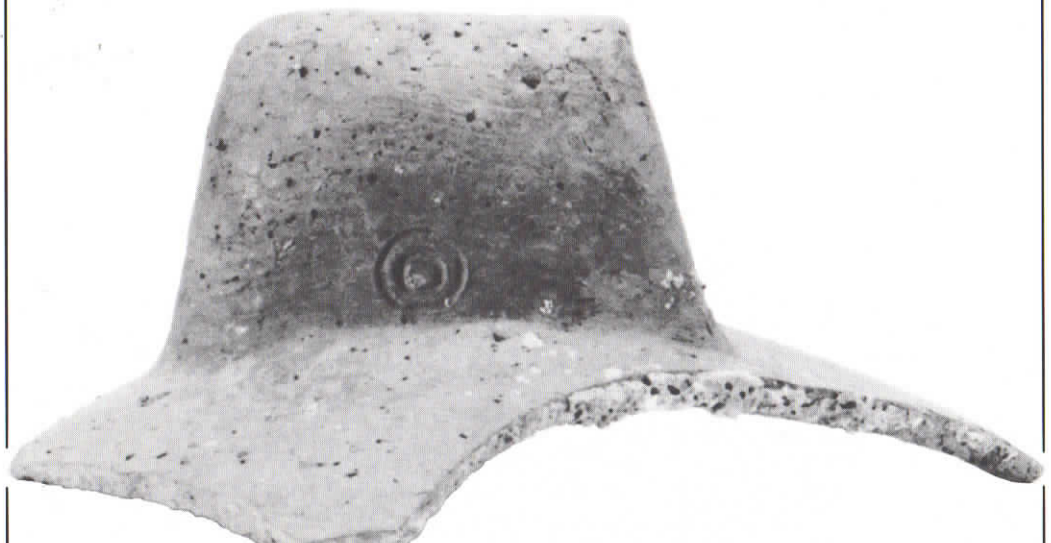


Fig. 17. *Stamped handle of E.H. II amphora (A21/4). Medium W. of handle: 5,7 cm.*

Photos: N. Tsouchlos

Fig. 18. *Fragment of E.H. II jug (A95). Pres. H. 12,5 cm.*

Fig. 19a. *Fragment of E.H. II jug A215, with clay 'rivet' at base of handle. Pres. H. 12,5 cm.*

Fig. 19b. *Fragment of E.H. II jug A215. Pres. H. 12,5 cm.*

Fig. 20. *Fragment of E.H. II askos A159, with incised sign (as seen from above). Pres. H. 10 cm.*

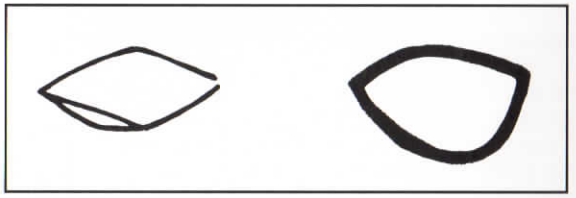


Fig. 21. *Incised paterns (symbols) on askos A159 from Dokos (left) and on jug No. 357 in the Apeiranthos Museum, Naxos (right) Scale: 1:1.*

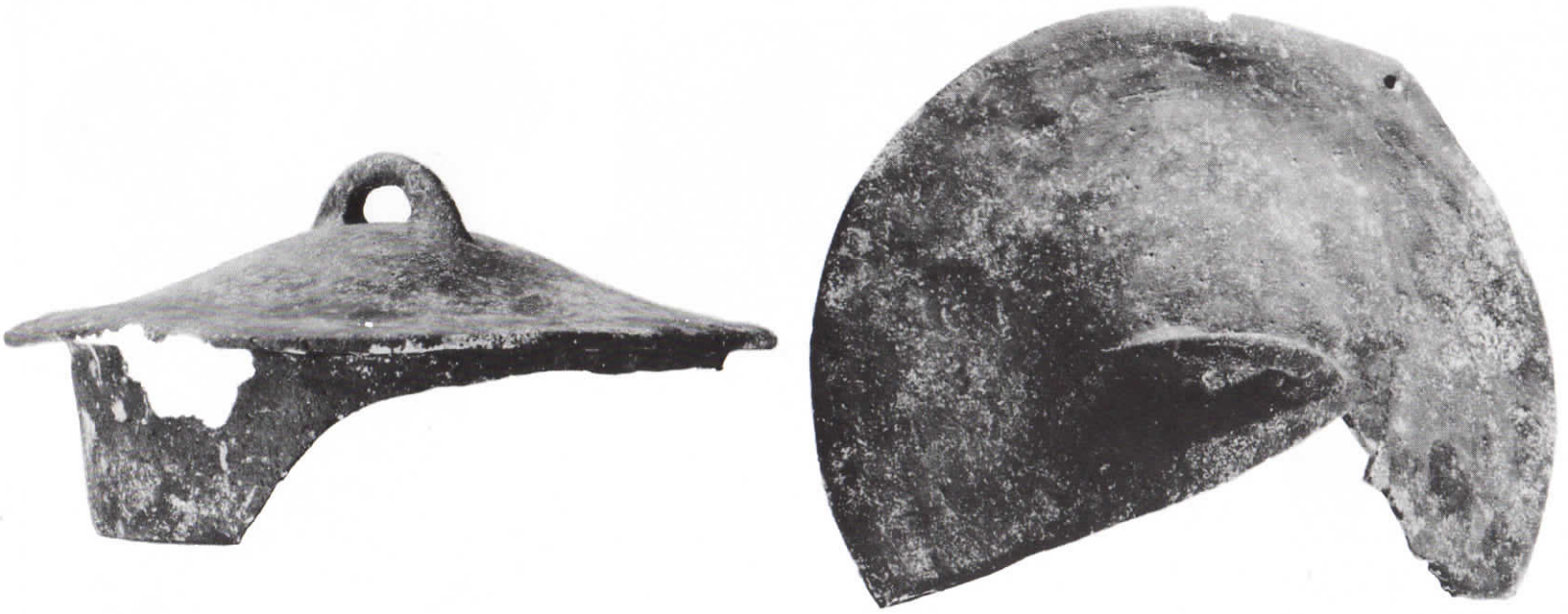


Fig. 22. *Part of lid of E.H. II pyxis A167. Pres. H. 11,2 cm. Left, as seen from the side. Right, as seen from above (Photos: N. Tsouchlos).*

ple of such a hearth in the National Archaeological Museum came from the excavation at Askitario in Attica carried out by the late Demetrios Theocharis. These objects, which are also known from EH centres in Corinthia and Argolida, usually have stamped decoration on their broad flat rims. At least three of the Dokos examples are decorated in this way with consecutive zigzags or wavy lines (e.g. A151/3, *fig. 26*).

Lastly, we have the fragment of a curious utensil or vessel, which we called the "candlestick" (A207, *fig. 27*). It has features in common with a tubular object from the acropolis at Tiryns, which may have been a bronzesmith's tool or a lamp, but which belongs to a later period (V. Rontiri, in Demakopoulou 1990, 369, no. 355 (h. 22 cm); LH III period); see also the "magic" vase (the excavator's own term) in the Late Minoan IA style from Akrotiri on Thera (Marinatos 1974, pl. 70).

The two stone Early Helladic anchors

In the course of reconnaissance dives made in 1989 west of the main site two stone slabs were found, each with a perforation near its edge.

The first (A144), which is roughly triangular in shape, was at a depth of 34 m and some 33 m west of point 8 on the perimeter of the wreck (*fig. 28*). It lay relatively close to the shore on a rocky bottom with patches of sand.

The second (A155), nearly circular in shape, was found at a depth of 38 m, 46 m west of point 8 on the wreck perimeter and 14 m southwest of the first slab and on a similar bottom

Fig. 23. *Rim and wall fragment of E.H. II pithos A151/2. Pres. H. 15,3 cm.*

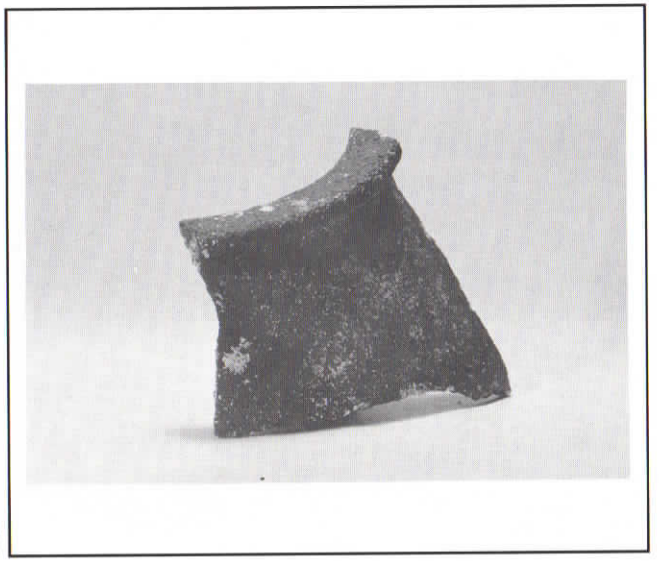


Photo: N. Tsouchos

(*fig. 29*).

When they were found, both slabs were wedged among the rocks with their perforations uppermost and pointing eastward in the direction of the wreck.

Both slabs were photographed *in situ* and their positions fixed by measuring their distances from different points on the perimeter of the wreck and from each other.

Before they were raised, we tried an experiment: ropes were fastened to the holes and two people standing on the diving raft that is stationed over the middle of the wreck attempted to haul in the slabs. We found that it required a great effort by the two people merely to shift the slabs from their position. Next we tried to heave them up, and the two team members stationed a boat directly over the two slabs and hauled first on one and then on the other of the ropes. This time it took less exertion to move the slabs, but still called for a considerable effort.

The initial observations made at the time the slabs were found and the subsequent examination of them after they were raised both suggest that they are in all probability Early Age Bronze stone anchors and directly associated with the Dokos wreck.

Description of the stone anchors

The first anchor (A144) has the shape of an irregular triangle with rounded corners and edges and a hole at the upper edge. Its greatest length is 45 cm, greatest width 34 cm and greatest thickness 8 cm *(figs. 30, 32)*. The right side and lower right edge are broken (1st view), evidently from use.

The perforation is slightly oval and has a biconical section *(fig. 32)*. The diameter at the middle of the section is 1.9 cm and at the surface about 4.6 cm.

The side of the anchor that had been in contact with the sand (2nd view) is smooth and without marine growths; the other (1st view) is rough and encrusted *(fig. 30)*.

It weighs 18.5 kilos, but its original weight before

Fig. 24. *E.H. II cooking support A2. Pres. H. 14,6 cm.*

Fig. 25. *E.H. II brazier A254. H. 20 cm.*

Fig. 26. *Part of E.H. II baking tray A151/3. H. 9,6 cm.*

Fig. 27. *Fragment of E.H. II 'candlestick' og 'magic' vase A207. Pres. H. 8,4 cm.*

Photos: N. Tsouchlos

it was broken is estimated to have been 22 or 23 kilos.

The second anchor (A155) is almost circular with a perforation near the edge. It measures 46.6 by 44.7 cm with a greatest thickness of 7.2 cm *(fig. 31, 33)*. The edge is chipped in many places, also due to use. The perforation is slightly oval and has a biconical section *(fig. 33)*. The diameter at the middle of the section is 12.5 cm and at the surface about 5.6 cm.

The side of the anchor that was buried in the sand (1st view) is smooth and without marine growths; the other side (2nd view) is rough and encrusted *(fig. 31)*.

It weighs 21.5 kilos, but its original weight is estimated at 22 or 23 kilos.

A preliminary petrological examination indicates that they were both made of a hard grey-green limestone.

The biconical form of the perforation on both anchors is due to the method of drilling and the implement used for this purpose. The Dokos excavators and Gerhard Kapitän, a specialist in ancient anchors, are of the opinion that they used a tool made from a stone harder than that of the anchor itself. Honor Frost, on the other hand, believes that a different technique was used to make the holes in Bronze Age anchors, similar to that used for perforating stone axes and mace heads throughout Europe in the Neolithic and Bronze Age periods.[1] Both views agree that the implement employed had a conical point and that the hole was started first from one side and then from the other.

Preliminary results of a study of the anchors

1. The shapes of the stone slabs, their weight, the location of the holes and the technique used to drill them are all characteristic features of Bronze Age anchors. The fact that they each have only one hole for the anchor rope, as well as their relatively slight weight, the nature of the bottom where they were found and their positions on the seabed are all indications that they were anchors intended for use on rocky bottoms; they are in fact typical Early Bronze Age anchors according to Honor Frost's classification.[2] All these facts, in addition to the breaks and edge damage which are clear evidence of their repeated use, rule out the likelihood that they were weights used by divers, although Honor Frost does not exclude that possibility. Stones used as diving weights are usually left on the bottom after the dive, and in any case do not suffer the kind of wear and tear that would cause this kind of damage.

2. Bearing in mind their distances from the site of the wreck and their positions to the west of it, it is not unreasonable to suggest that they probably belonged to the EH II ship. For if the vessel were anchored in approximately the position of the present wreck site and were caught by a strong westerly wind, which is the only one that seriously agitates the sea in the little bay of Skindos, and if it then broke up on the rocky shore and sank, its anchors would have been in just about the same positions as our two: that is, approximately 40 metres west of the wreck site and with the holes for the anchor ropes orientated in its direction.

Gerhard Kapitän agrees with these conclusions on the basis of the information that we sent him.

3. The number, size and especially the weight of the anchors suggest that they belonged to a relatively small vessel of perhaps 5 to 10 tons and 12 to 15 m in length. This supersedes our earlier estimate of the vessel's size, which was based on the relatively large cargo it seems to have been carrying.

This estimate, of course, hangs on the fact that

Photo N. Lianos

Fig. 28. *Triangular stone anchor A144 in situ.*

Photo N. Lianos

Fig. 29. *Circular stone anchor A155 in situ.*

Photo: Y. Vichos

Fig. 30. *1st view (left) and 2nd view (right) of stone anchor A144 from the Early Helladic II wreck site at Dokos.*

only two rather small anchors have so far been found. The excavation must first be completed and the surrounding area thoroughly explored before we can say for sure whether or not the the ship carried more than two anchors, and if so, whether they were larger than these two.[3] (However, we can not exclude the possibility that stone anchors belonging to the EH ship were raised by some amateur diver).

Much larger Bronze Age anchors have been found in the eastern Mediterranean[4], and the ships there usually carried a number of them[5], but even if we do not find any more anchors at Dokos, this does not necessarily mean that our vessel was a small one, because in fact relatively nothing is known about EH ship types, sailing techniques or methods of anchoring. They were probably long light craft propelled by oars, like those depicted on the EC II "frying pans" from Syros, on the EH sherd from Orchomenos or the EM clay model from Palaikastro. Such vessels or anchored in some sheltered cove, with lines made fast to rocks ashore. Also, EH ships may not have possessed the necessary superstrutures and gear for huling up the large heavy anchors that the Late Bronze Age ships of the eastern Mediterranean carried.[6] The Dokos ship may have carried rather small and light stone anchors compared to its size and this was probably the cause of its sinking.

Photo: Y. Vichos

Fig. 31. *1st view (left) and 2nd view (right) of stone anchor A155 from the Early Helladic II wreck site at Dokos.*

The lead anchor stocks

The two anchor stocks found outside the limits of the bay *(fig. 36)* are parts of lead bars that were cast in wooden moulds. The larger one weighs 181 kilos *(figs 34, 37)* and the surviving half section of the smaller one *(figs 35, 37)* 10 kilos. The other half section was not found in spite of repeated dives at a depth of 55 m in the place where the stocks wee discovered, even with the aid of a metal detector.

It is not possible accurately to date the stocks, which presumably came from the same ship, since there were no other archaeological finds in the area, such as pottery, to give them a context.

They appear, however, to belong to a type of ancient anchor that is rare in the Mediterranean but occurs in the Black Sea. According to the tentative opinion of Gerhard Kapitän, who has studied, classified and dated the anchors of the historical period, the type represented by the Dokos stocks dates to the 4th c. BC, but may have already been in use from the 5th c. These anchors may well be the first of their kind to have been found in Greek waters.

They will be studied in detail as part of the general ongoing study of the Dokos finds; the lead will be analysed by the radioisotope method and the wood by the radiocarbon method to try and establish the provenance of the lead and the date of the remains of the wood.

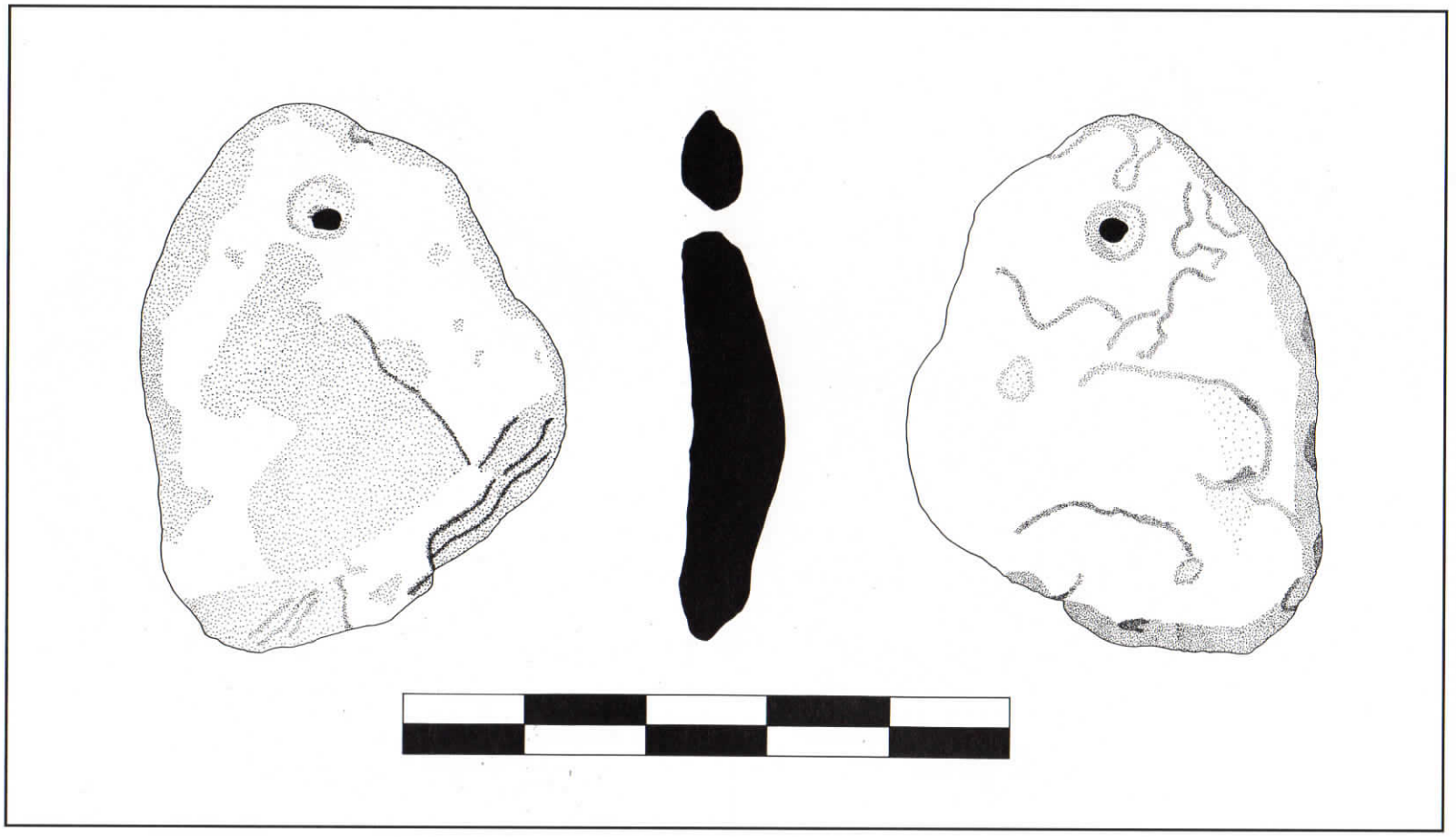


Fig. 32. *Side views and section of triangular stone anchor A144. Drawn by T. Koutsouraki.*

NOTES

1. Honor Frost believes that the holes in Early Bronze Anchors were drilled first from one side and than from the other, using a wooden bow-drill with sand and water, perhaps after a depression had first been pecked out in both surfaces with a stone point and hammer. Sometimes a hard stone was mounted on the end of the drill, which gave a cupular form to one of the two sides of the hole, and sometimes a combination of the two methods was used. In the Late Bronze Age, Frost adds, and in some regions, the holes were smoothed or even directly cut with bronze chisels. And see Frost 1966, 57; 1969a, 240-241; Frost 1969b, 438-439.

2. According to Honor Frost, stone anchors fall into three categories: a) Rock anchors, with a single hole. These relied solely on their weight, and would have held on rocky bottoms but dragged on sandy ones. b) Sand anchors, with many holes to take wooden spikes. These were usually small stone slabs and their holding power on sandy bottoms depended on the wooden spikes. c) Compound anchors, with three holes. These are triangular in shape and in addition to the hole for the anchor rope have two more holes in the other two coners. They were used on both sandy and rocky bottoms, holding on sand by their two wooden spikes and on rock chiefly because of their weight. And see Frost 1962; Frost 1969a, 240-241; Frost 1969b, 432-436.

3. It appears from ancient texts and the archaeological evidence that Bronze Age ships carried several anchors of different sizes and weights. Apollonius Rhodius mentions that Tiphys, the steersman for the Argonauts, advised his comrades to take the small anchor with them and leave it at the sacred fountain of Artacia, and to replace it with a heavier one (Apollonius Rhodius I, 950, and Frost 1966, 57). A study of the Bronze Age anchors found in the eastern Mediterranean has shown that their weight ranges from 20 to 500 kg. See also: Frost 1969b, 434-436; Frost 1970, 393; Frost 1979, 154.

4. For Bronze Age anchors weighing up to 500 kg see Frost 1970a; Frost 1970b, 383; Frost 1979, 154.

5. 24 anchors of different sizes have so far been found at a Late Bronze Age wreck on the coast of Lycia (Ulu Burun, Kas). See Pulak 1990.

6. For the ships, the gear for hauling up heavy anchors and the methods of anchoring, see Frost 1969b, 435-436; Frost 1970b 392-393.

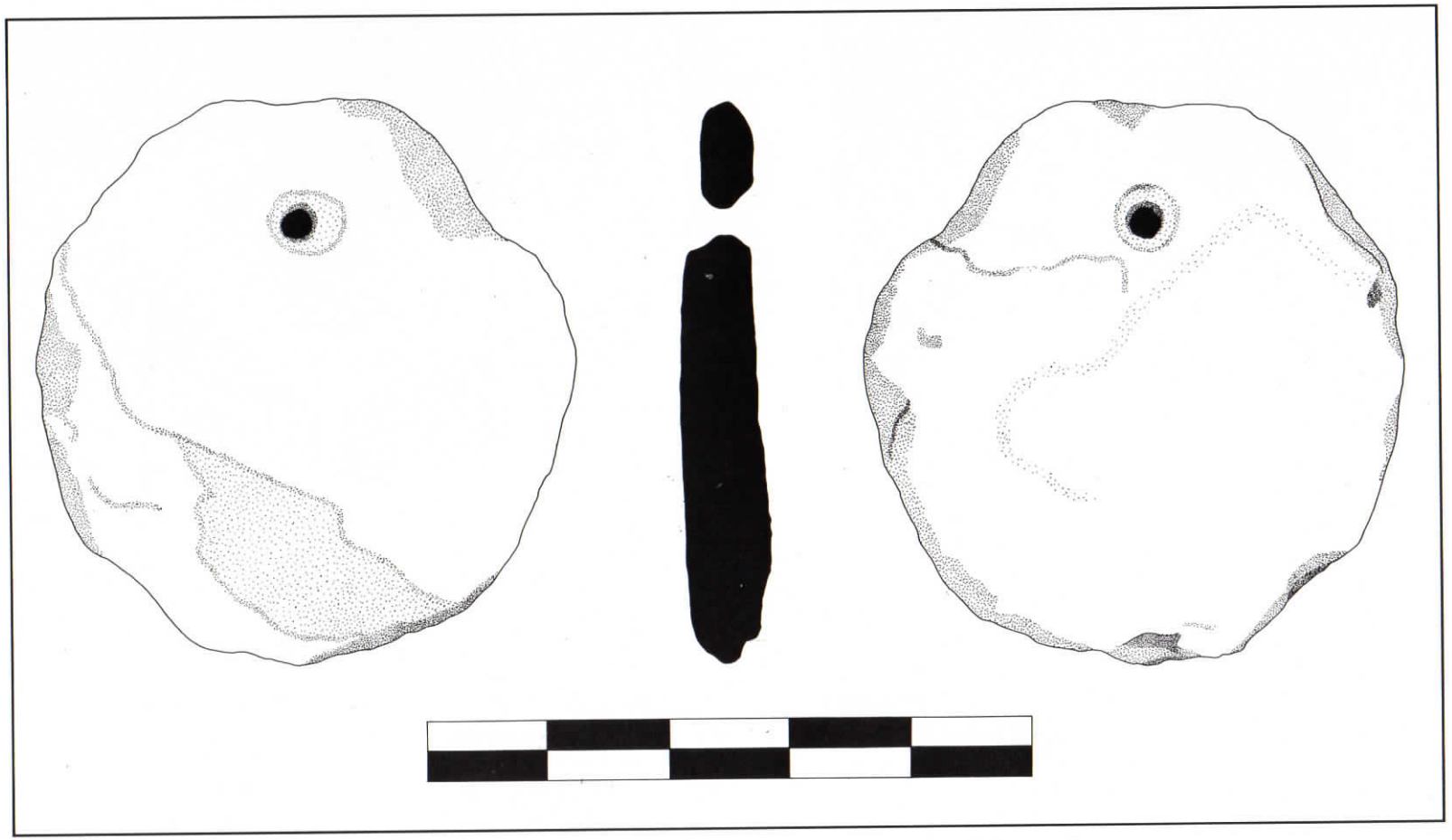


Fig. 33. *Side views and section of circular stone anchor A155. Drawn by T. Koutsouraki.*

Photo: K. Jachney

Fig. 34. *Large anchor stock of lead.*

Photo: K. Jachney

Fig. 35.
Small anchor stock of lead.

Photo: N. Tsouchlos

Fig. 36. Lead anchor stock in situ.

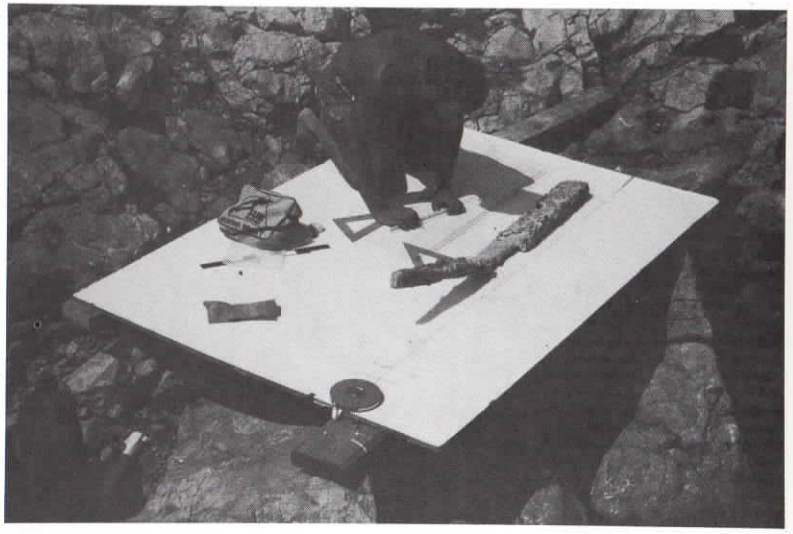
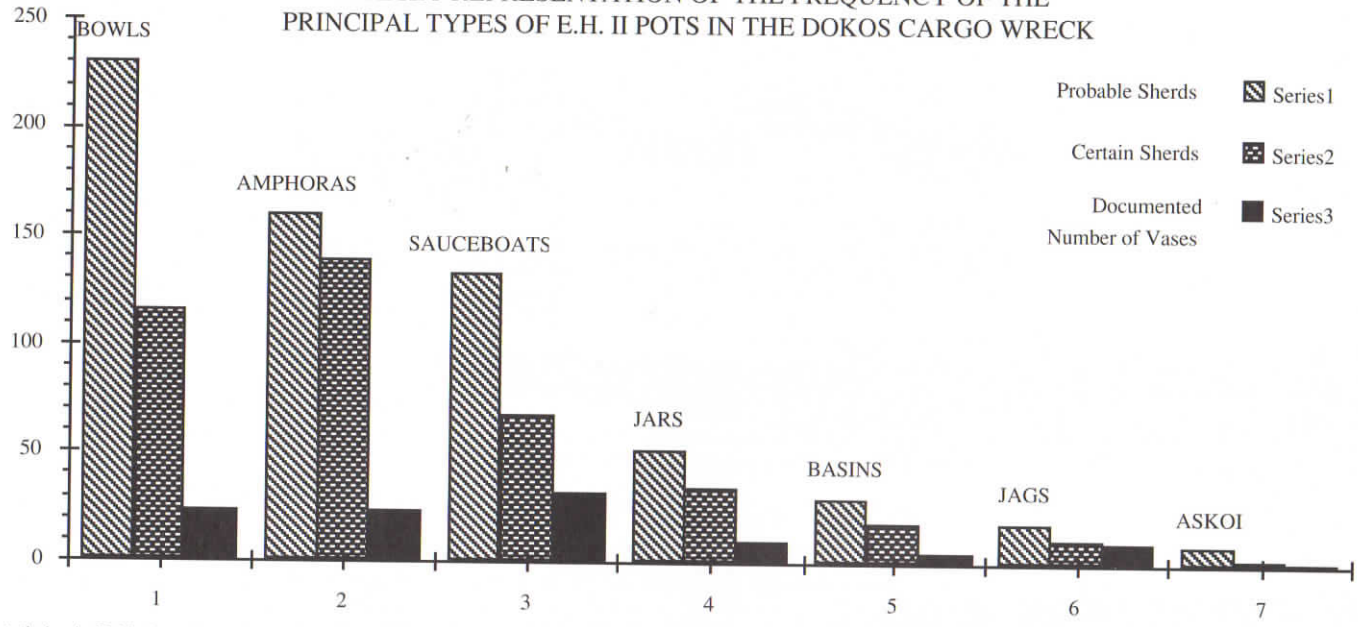


Photo: K. Jachney

Fig. 37. Architect V. Koniordos drawing the two lead anchor stocks at Dokos.

Table I

GRAPHIC REPRESENTATION OF THE FREQUENCY OF THE PRINCIPAL TYPES OF E.H. II POTS IN THE DOKOS CARGO WRECK



The statistics in Table I are based on our study so far of the finds recovered in the 1989 and 1990 campaigns. The estimate of the minimum number of pots in the cargo was arrived at by counting all the typical diagnostic features for each type of pot as follows: for bowls, the total number of complete or nearly complete vessels; for amphoras, the total number of necks and handles; for sauceboats, the total number of spouts; and for the other shapes, the number of large typical fragments of rims, bases and handles.

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DOKOS: 1990 CAMPAIGN TOPOGRAPHICAL SURVEY

by Vasso Kyriakopoulou

The survey work carried out at Dokos during the 1990 campaign included the following:

1a. Laying out the area with stakes and rope and marking the apexes of the polygonal perimeter with numbered labels. It differed this year from the 1989 perimeter in places where the previous year's stakes were missing or where new positions were chosen in order to fix them more securely.

1b. Measuring the perimeter.

2. Marking and measuring all the surface finds (level A) in the area enclosed by the perimeter.

3. Laying out, marking and plotting two trial trenches, T1 and T2.

4. Marking and measuring the finds in levels B and Γ in Trench T1. 5. Taking photogrammetric shots of Trenches T1 and T2 at level A in Trench 1 and levels A, B and Γ in Trench T2 with overlapping pairs of photographs, and positioning photographic scales in order to produce photogrammetric plans of the trenches.

The survey points were determined by measurements. The instruments used were a plastic measuring tape and the SHARPS. The latter automatically calculates the Cartesian coordinates x, y, z for each designated point in an arbitrary system of reference, and the tape measurements give the coordinates x and y for each point in the same system of reference.

The installation of the SHARPS started with the positioning of the stakes carrying the fixed transmitter-receivers in positions close to those set up in 1989. In the course of calibrating the system it was necessary to move one of the transmitter-receivers, which did not have good optical contact with the other two. The speed of the sound was calculated, and the distances between the transmitter-receivers and the bottom were measured. The time needed for these initial procedures was considerably shorter both ashore and especially in diving than the time taken in 1989 for the same tasks, because of the experience gained in the previous campaign, but it was still longer than it should have been due to problems caused by some of the system's equipment.

Fig. 1. *Stereophotographic grid used during the 1990 campaign at Dokos. (photo: K. Jachney).*

Some of these problems were successfully overcome on the spot. In the case of others, which could not be directly solved in the field, alternative methods of working were adopted. Thus, when the trigger mechanism of the mobile transmitter failed to function from the outset, we used the automatic system of activating the transmission of the sound signal at fixed intervals, at the same time recording the beginning and end of the group of measurements for each point. Communication between the diver and the surface was better than in the previous year and this greatly assisted the recording process.

Due to the breakdown of the mobile transmitter during the last days of the excavation, some of the finds mere measured by tape from points on the perimeter. The same method was also used to measure some of the finds before the SHARPS was set up.

Taking measurements with the SHARPS required the diver to locate the marked points, sight on them and communicate with the surface. In addition to measuring the points, it was also necessary during each dive to measure the points of reference.

The reference points established in 1989 were located after setting up the SHARPS, marked with buoys and then used to correlate the 1989 system with that of 1990. This was effected by turning and transferring the beginning of the axes of the one to the beginning of the other.

For the photography a grid measuring 2 x 5 m was used, similar to the one in 1989 *(fig. 1)*. The camera mounted on the grid was a SLR Nikon F3 with a 35 mm lense in a watertight Ikelite case with a Domeport. To calibrate the camera

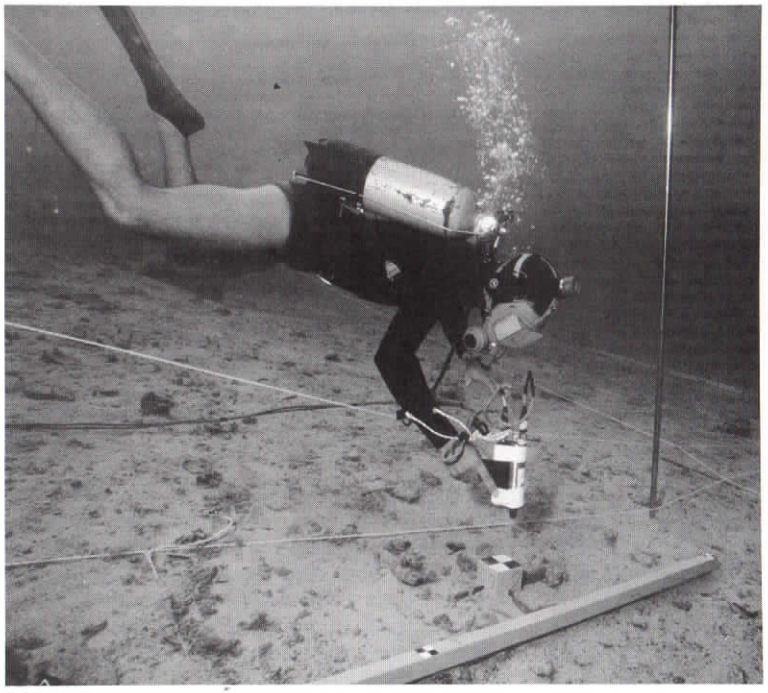


Photo K. Jachmey

Fig. 2.

Figs. 2-3.
Recording (with the SHARPS) of the photographic scales in Trench 1.

Fig. 3.

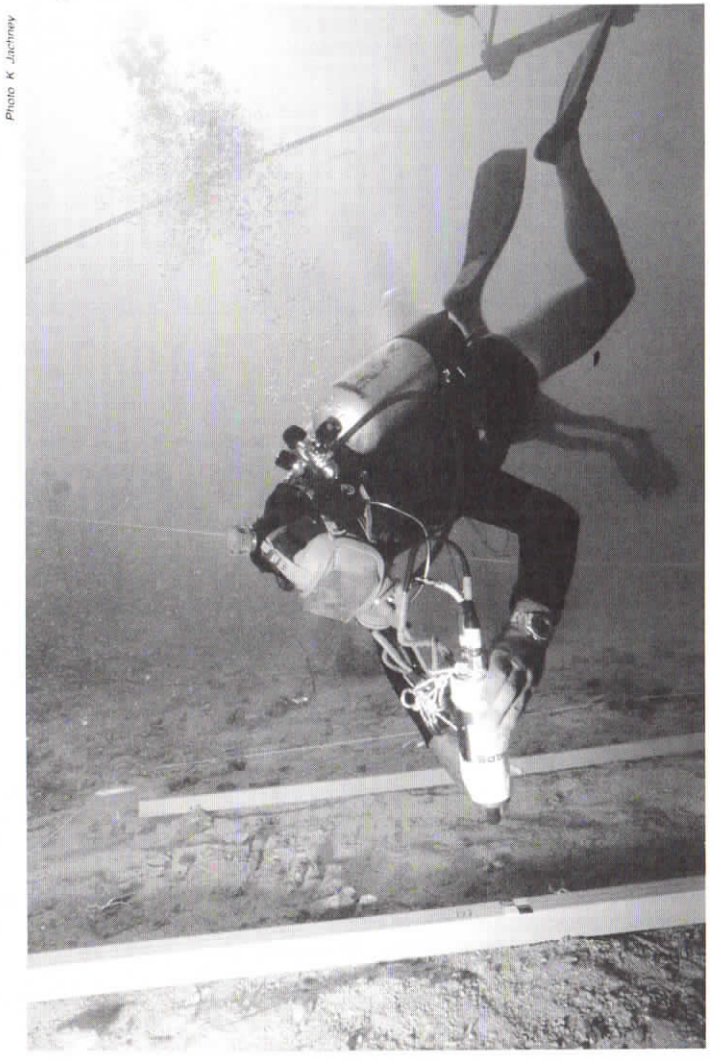


Photo K. Jachmey

two joined pieces of wire mesh were used *(fig. 4)*. Shots were made with the camera at different distances from the wire mesh.

15 previously marked photographic scales were also placed in position; these were markers whose coordinates had been defined and they were used for the photogrammetry. Two kinds of photographic scale were used: 5 wooden cubes of 8 x 8 cm and two metal poles of square section and 4.24 m long by 4 mm wide with 5 marks on each *(figs. 2, 3)*.

A total of 15 shots were taken for each grid position, 3 per strip over 5 strips. To cover the whole trench the grid was moved along so as to include coverage of at least 20% of the previous frame, with its long dimension along the sector photographed. The shots were taken at an average distance from the bottom of about 2 m. The photographic scales were placed beneath the grid and their coordinates measureed by the SHARPS for each of the grid's positions *(figs. 2, 3)*.

As a check on the measurements the distances between the scales on

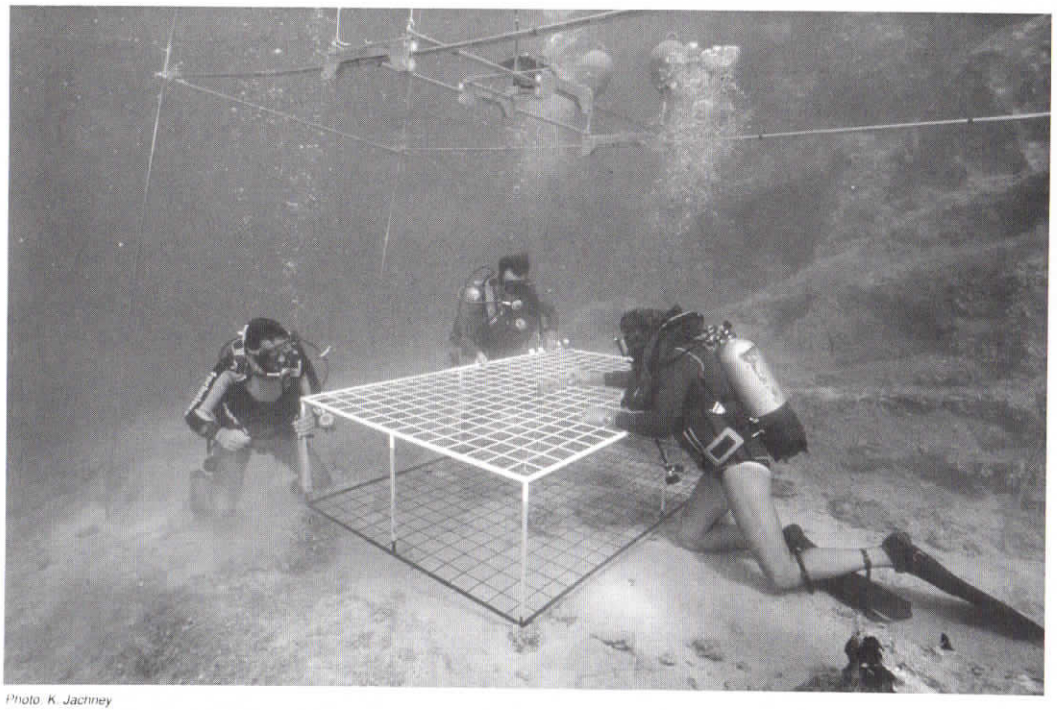


Photo: K. Jachney

Fig. 4. Photograph of the special metallic frame for the calibration of the camera.

each pole were measured on the seabed, and in certain cases the SHARPS measurementss for determining the position of the scales on the bottom were combined with measurements of the distances between the scales made by the tape.

The photogrammetric processing was undertaken by the E.M.P. (Polytechnic School of Athens, Photogrammetric Laboratory).

The survey data were processed on a 386SX computer and the drawing was carried out on a plotter.

From the computerized SHARPS results containing the x, y, z coordinates with many measurements for each point the mean value of the coordinates for each point was calculated, using a program written in BASIC; the number assigned to the point (e.g. A251) was then added and files were created having the form Ai, xi, yi and zi.

These files were then used as data for the SURFER and AUTOCAD programs in order to create general and perspective plans.

The following plans have been produced from the data processed so far:

1. A plan of the laid out excavation area showing the positions of the finds in the second campaign (1990) in levels A, B and Γ on a scale of 1:100 *(plan 1)*.

2. A plan showing the positions of the finds in level A for the years 1989 and 1990 on a scale of 1:100 *(plan 2)*.

3. Plans of sections of the site showing the positions for the years 1989 and 1990 in levels A, B and Γ of:

3a. Trenches T1 and T2 on a scale of 1:50 *(plans 3, 4)*.

3b.i. Trench T1 on a scale of 1:20 *(plan 5a)*.

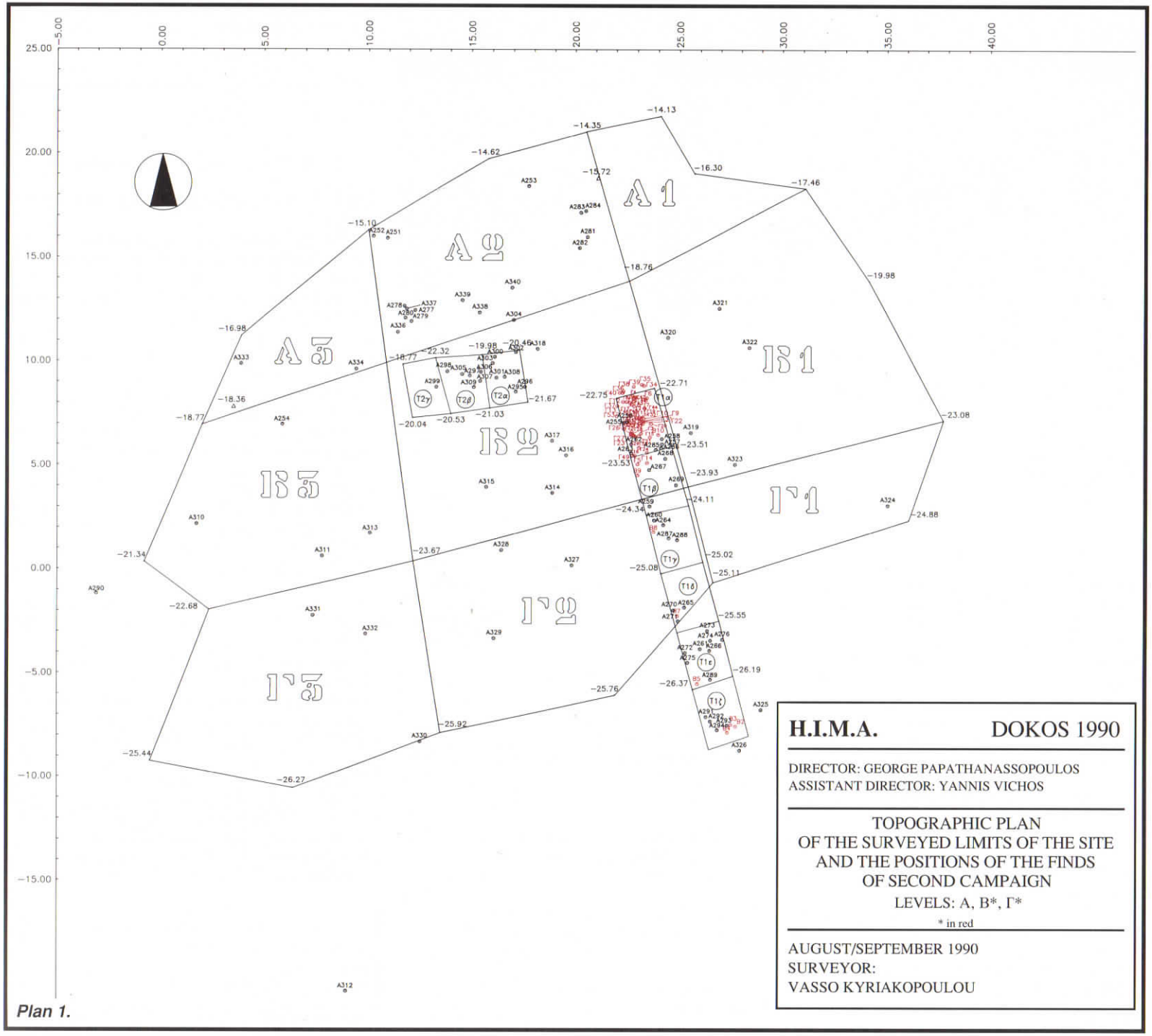
3b.ii. Trench T2 on a scale of 1:20 *(plan 5b)*.

4. Perspective plans of the conformation of the bottom with the positions of the finds in the section of the extension shown on the general plan from different angles, which are specified in the notes *(plans 6 to 9)*.

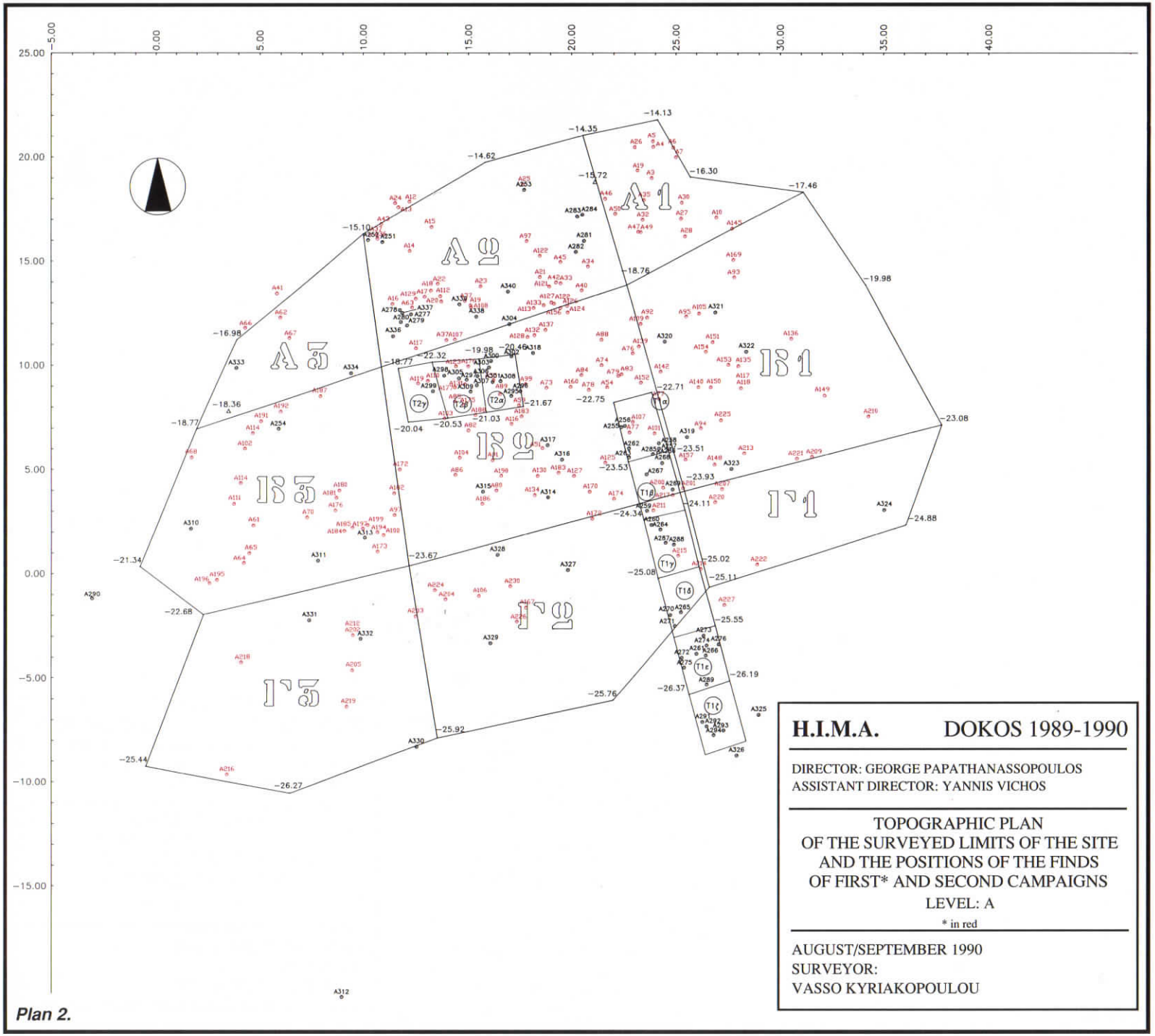
For plans 1, 3, 6, 7, 8 and 9, only the 1990 measurements were used. In perspective plans, only the data from the SHARPS measurements were used, since the z coordinate was necessary; in plan 1 the tape measurements were also included. In the perspective plans the depiction of the sea bottom is more accurate at the points with clusters of finds, and where there were thus real depth data. In the areas between the measured points and the boundary of the site the z coordinate was estimated on the basis of the algorithm of the program (SURFER).

It is obviously not possible to present a detailed picture of the bottom conformation at every point, but a general picture is given; this can be improved by filling in the 1989 SHARPS data and taking further measurements for this purpose. Plan 2 was the result of combining plan 1 and the 1989 plan (*ENALIA ANNUAL* 1989, vol.I, 1990, 28) using the AUTOCAD.

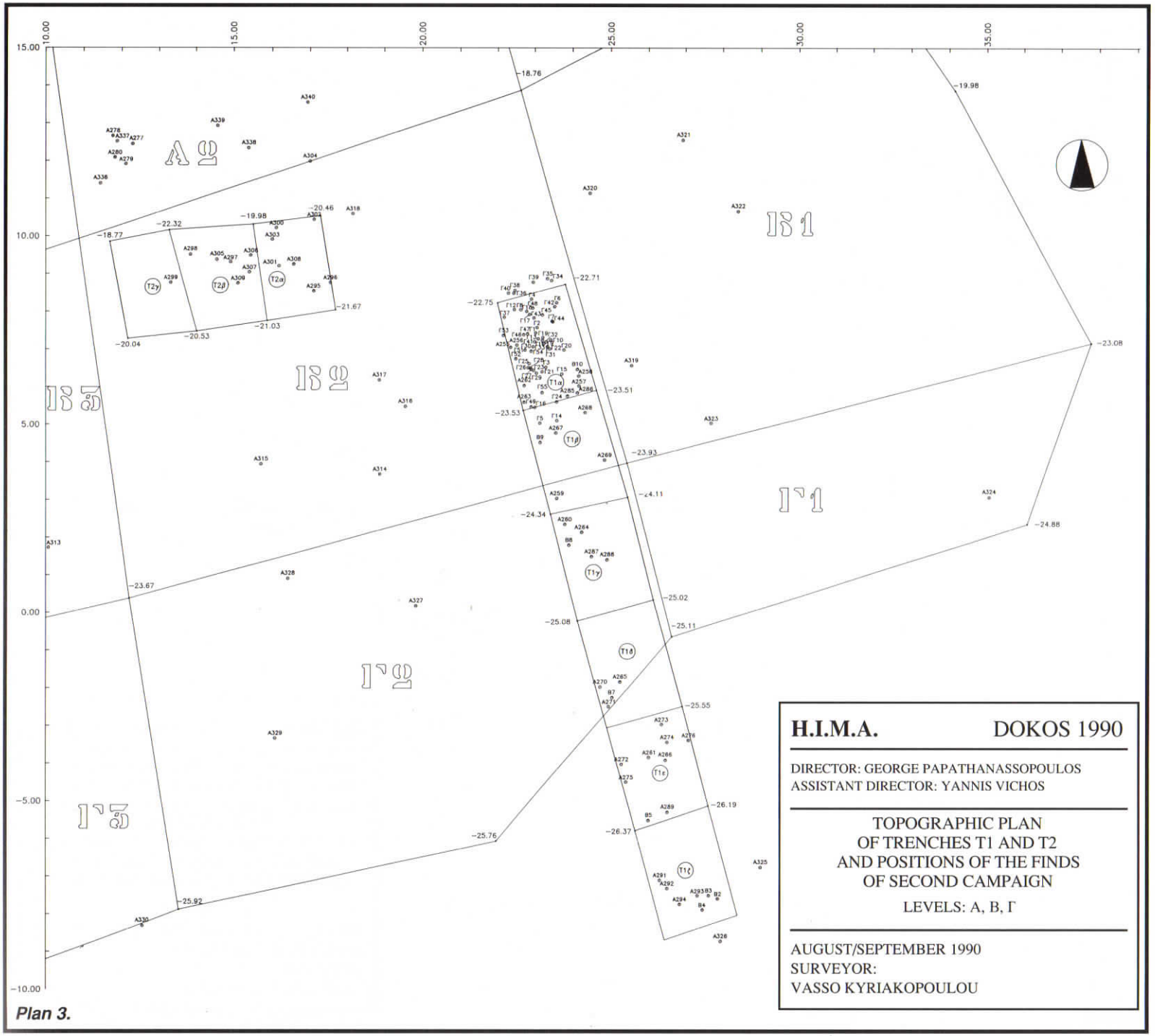
The 1989 plan was rotated and shifted so that the reference points as measured in 1989 coincided with those of 1990. The perimeter shown is the one laid out in 1990. Lastly, the nos. 3, 4, 5 plans were produced by enlarging plan 2 to different scales.


H.I.M.A.
DOKOS 1990
DIRECTOR: GEORGE PAPATHANASSOPOULOS
ASSISTANT DIRECTOR: YANNIS VICHOS
TOPOGRAPHIC PLAN
OF THE SURVEYED LIMITS OF THE SITE
AND THE POSITIONS OF THE FINDS
OF SECOND CAMPAIGN
LEVELS: A, B*, Γ*
* in red
AUGUST/SEPTEMBER 1990
SURVEYOR:
VASSO KYRIAKOPOULOU

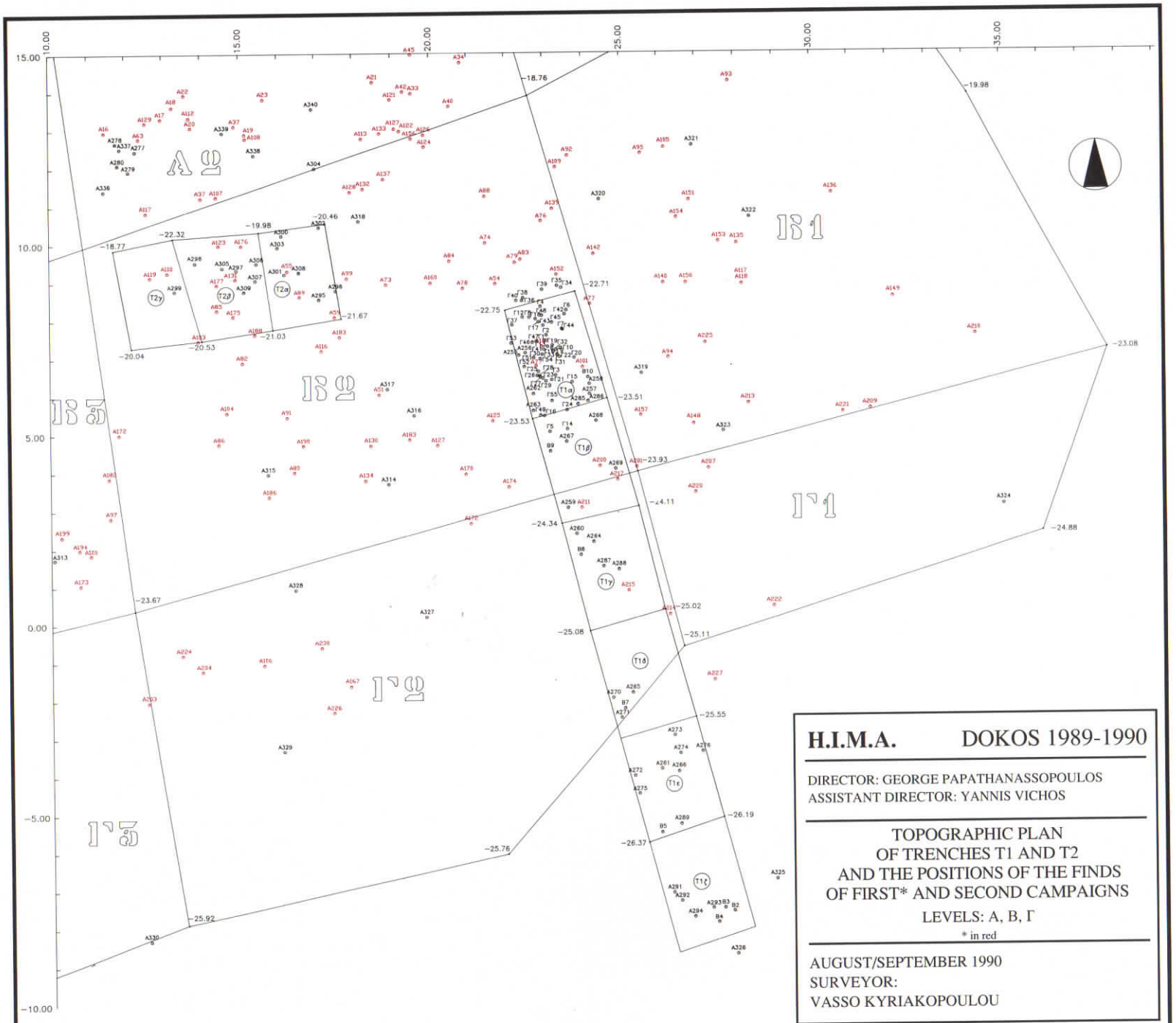
Plan 1.


H.I.M.A. DOKOS 1989-1990
DIRECTOR: GEORGE PAPATHANASSOPOULOS
ASSISTANT DIRECTOR: YANNIS VICHOS
TOPOGRAPHIC PLAN
OF THE SURVEYED LIMITS OF THE SITE
AND THE POSITIONS OF THE FINDS
OF FIRST* AND SECOND CAMPAIGNS
LEVEL: A
* in red
AUGUST/SEPTEMBER 1990
SURVEYOR:
VASSO KYRIAKOPOULOU

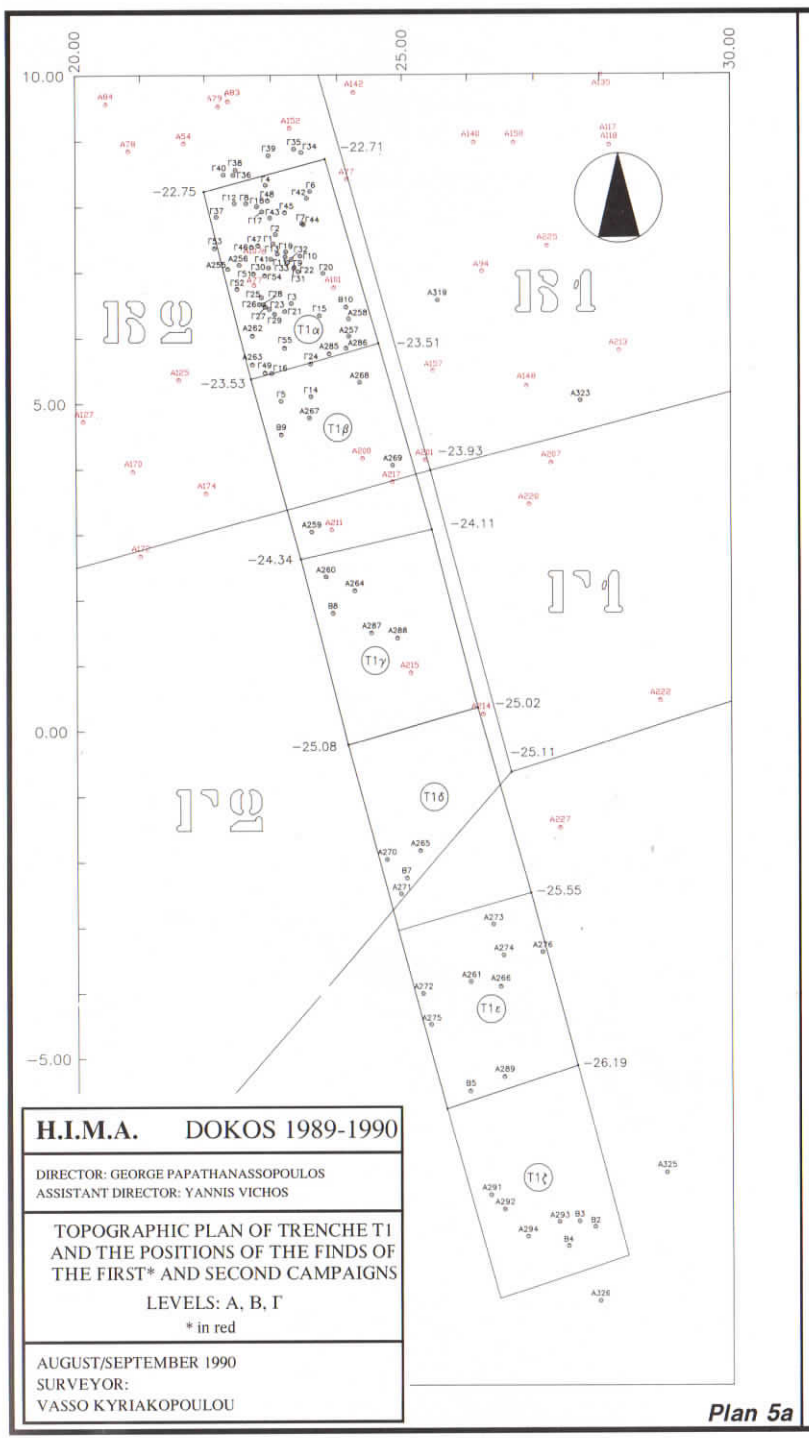
Plan 2.


H.I.M.A.
DOKOS 1990
DIRECTOR: GEORGE PAPATHANASSOPOULOS
ASSISTANT DIRECTOR: YANNIS VICHOS
TOPOGRAPHIC PLAN
OF TRENCHES T1 AND T2
AND POSITIONS OF THE FINDS
OF SECOND CAMPAIGN
LEVELS: A, B, Γ
AUGUST/SEPTEMBER 1990
SURVEYOR:
VASSO KYRIAKOPOULOU

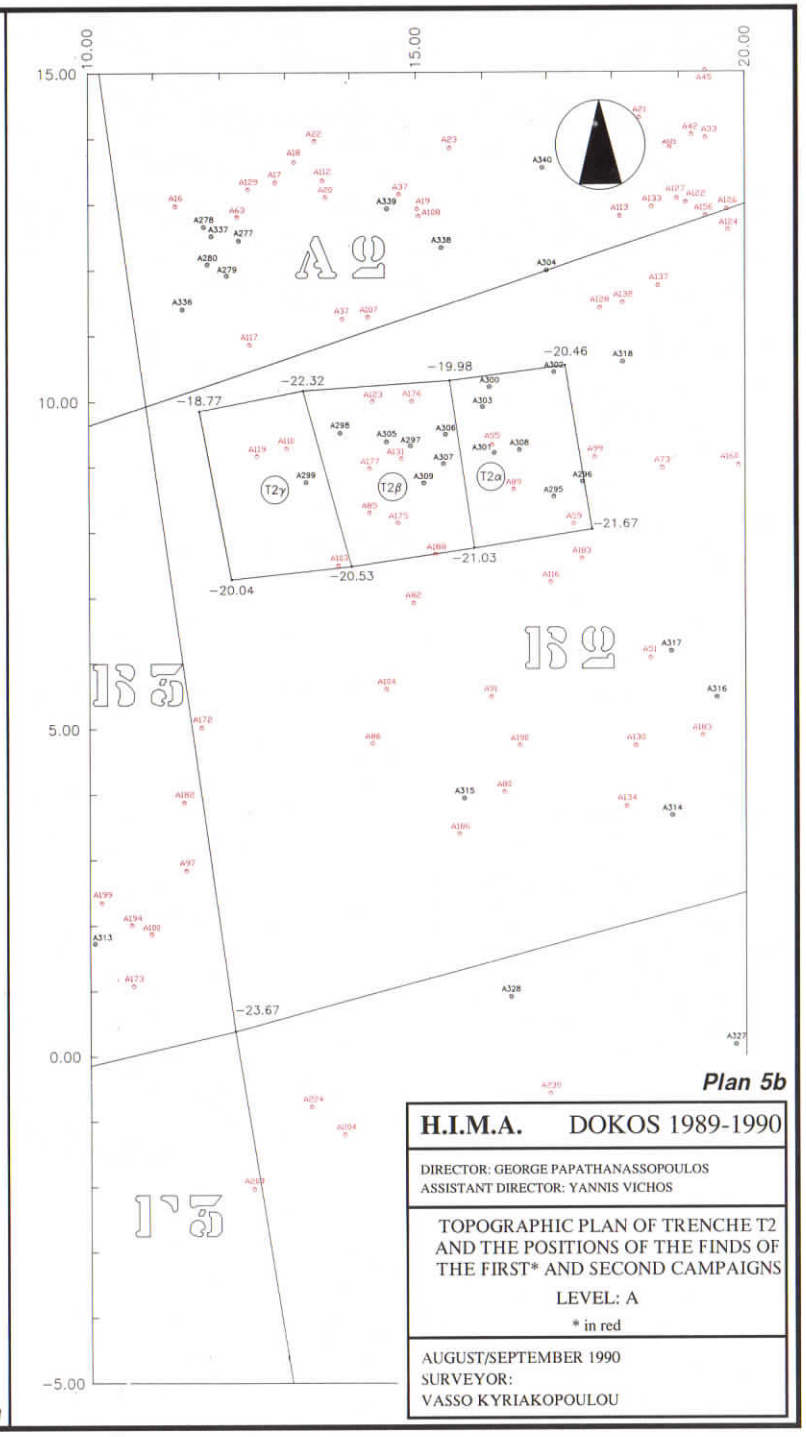
Plan 3.


H.I.M.A.
DOKOS 1989-1990
DIRECTOR: GEORGE PAPATHANASSOPOULOS
ASSISTANT DIRECTOR: YANNIS VICHOS
TOPOGRAPHIC PLAN
OF TRENCHES T1 AND T2
AND THE POSITIONS OF THE FINDS
OF FIRST* AND SECOND CAMPAIGNS
LEVELS: A, B, Γ
* in red
AUGUST/SEPTEMBER 1990
SURVEYOR:
VASSO KYRIAKOPOULOU

Plan 4.



Plan 5a



Plan 5b

H.I.M.A. DOKOS 1990

Plan 6.

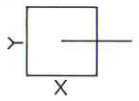
DIRECTOR: GEORGE PAPATHANASSOPOULOS
ASSISTANT DIRECTOR: YANNIS VICHOS

PERSPECTIVE VIEW OF THE SURVEYED LIMITS OF THE SITE
AND THE POSITIONS OF THE FINDS (recorded with the SHARPS)

LEVELS: A, B*, Γ* (*in red)

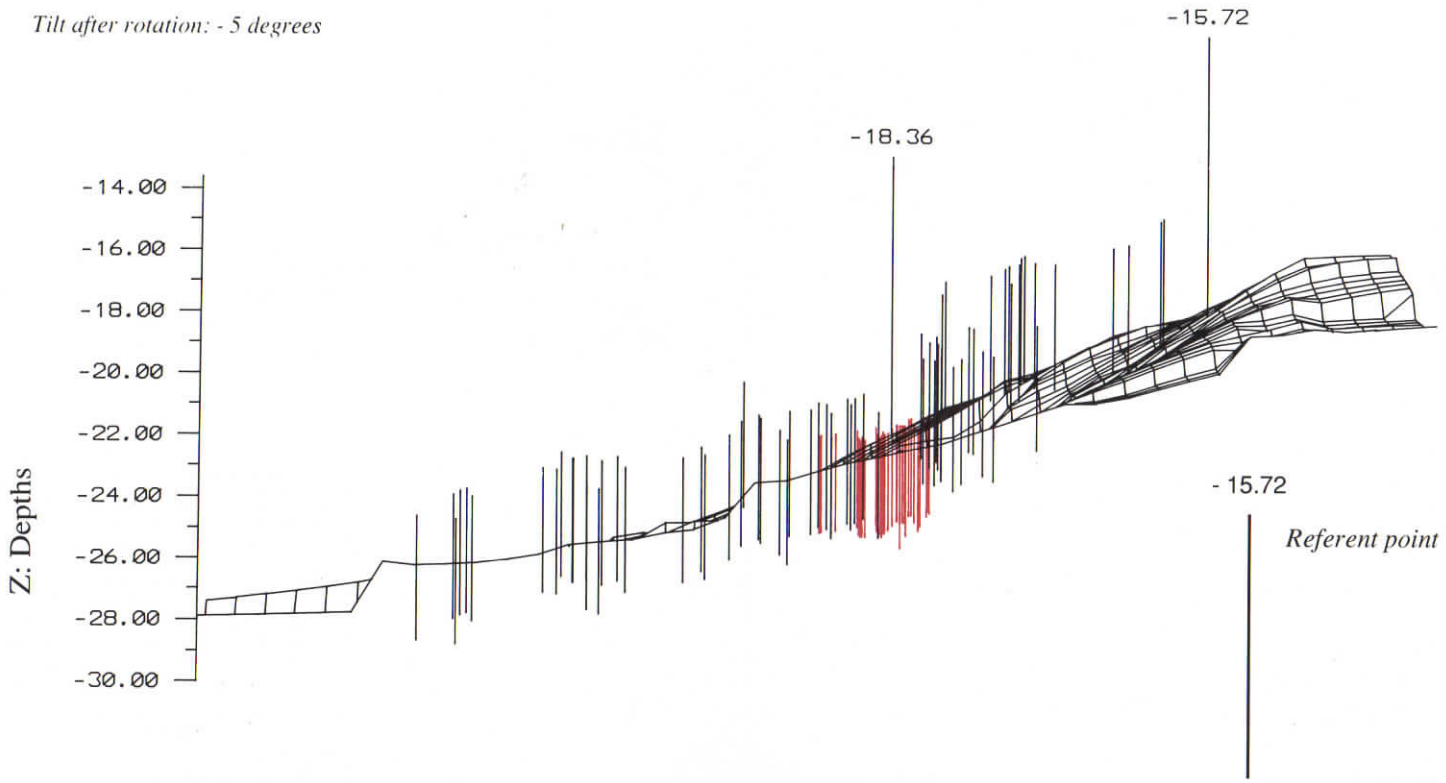
FEBRUARY 1991

SURVEYOR: VASSO KYRIAKOPOULOU



Rotation about Z axis: 0 degrees

Tilt after rotation: - 5 degrees



Plan 7.

H.I.M.A. DOKOS 1990

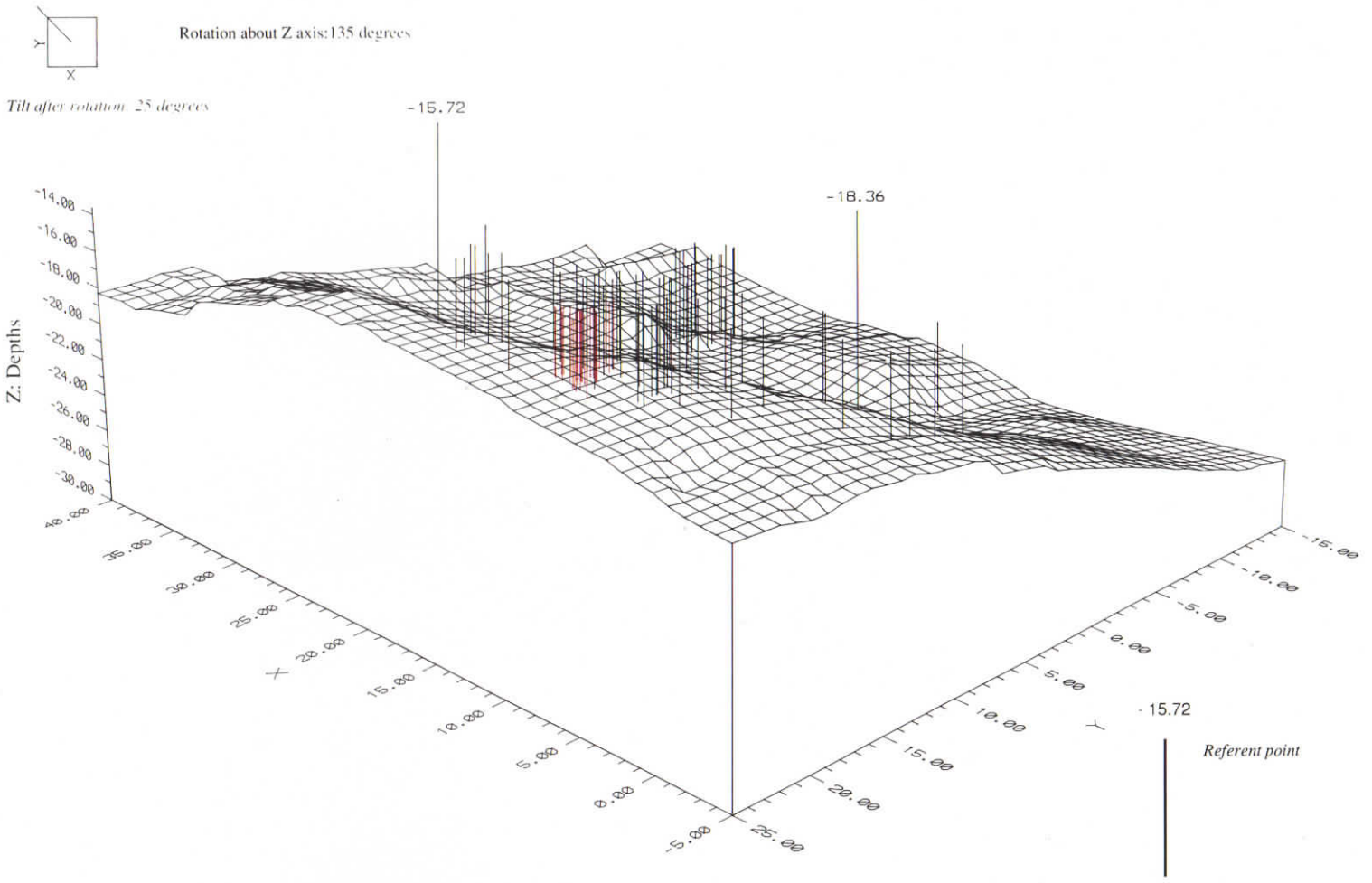
DIRECTOR: GEORGE PAPATHANASSOPOULOS
ASSISTANT DIRECTOR: YANNIS VICHOS

PERSPECTIVE VIEW OF THE SURVEYED LIMITS OF THE SITE
AND THE POSITIONS OF THE FINDS (recorded with the SHARPS)

LEVELS: A, B, Γ* (*in red)

FEBRUARY 1991

SURVEYOR: VASSO KYRIAKOPOULOU



Plan 8.

H.I.M.A. DOKOS 1990

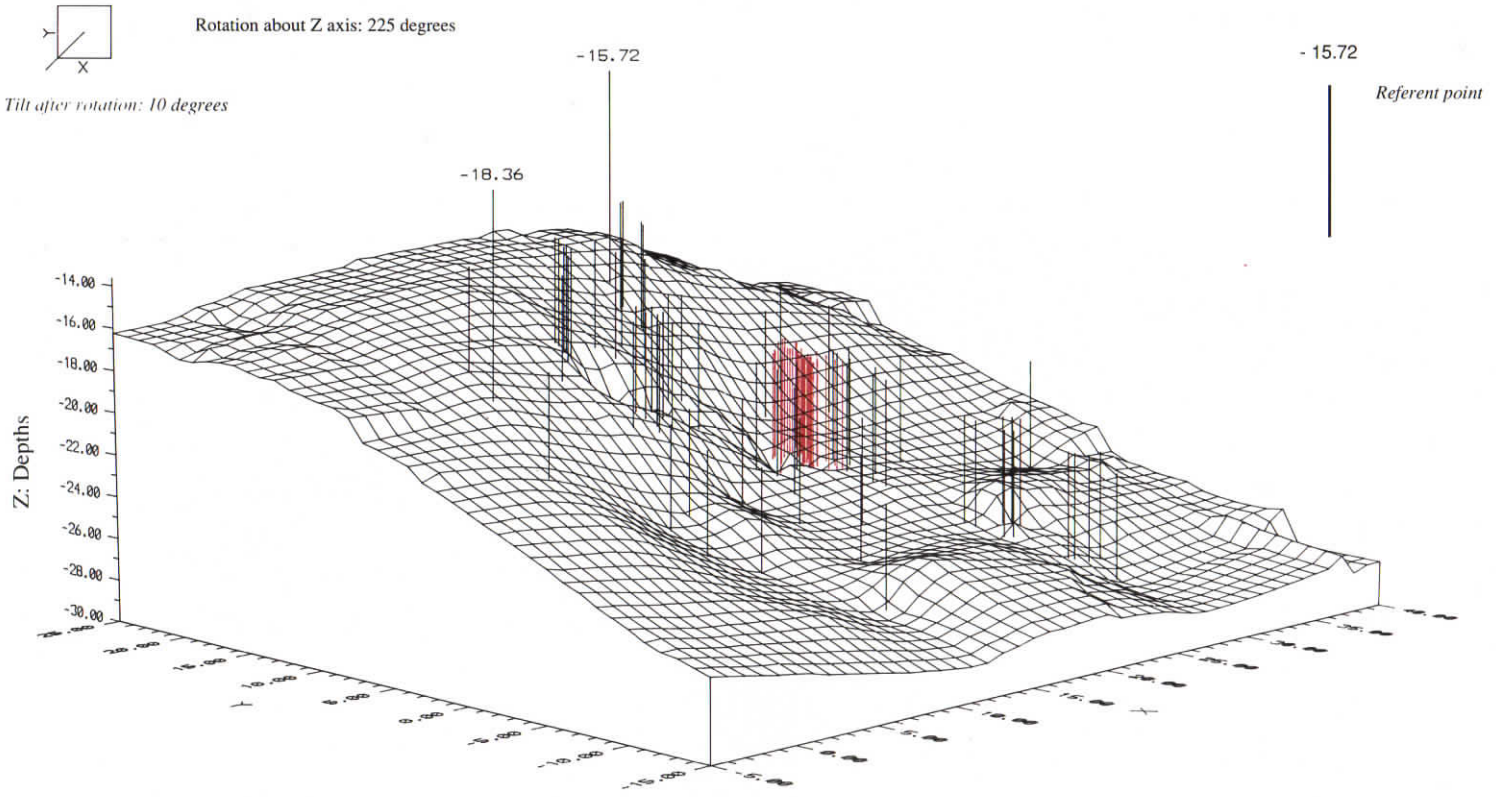
DIRECTOR: GEORGE PAPATHANASSOPOULOS
ASSISTANT DIRECTOR: YANNIS VICHOS

PERSPECTIVE VIEW OF THE SURVEYED LIMITS OF THE SITE
AND THE POSITIONS OF THE FINDS (recorded with the SHARPS)

LEVELS: A, B,* Γ* (*in red)

FEBRUARY 1991

SURVEYOR: VASSO KYRIAKOPOULOU



Plan 9.

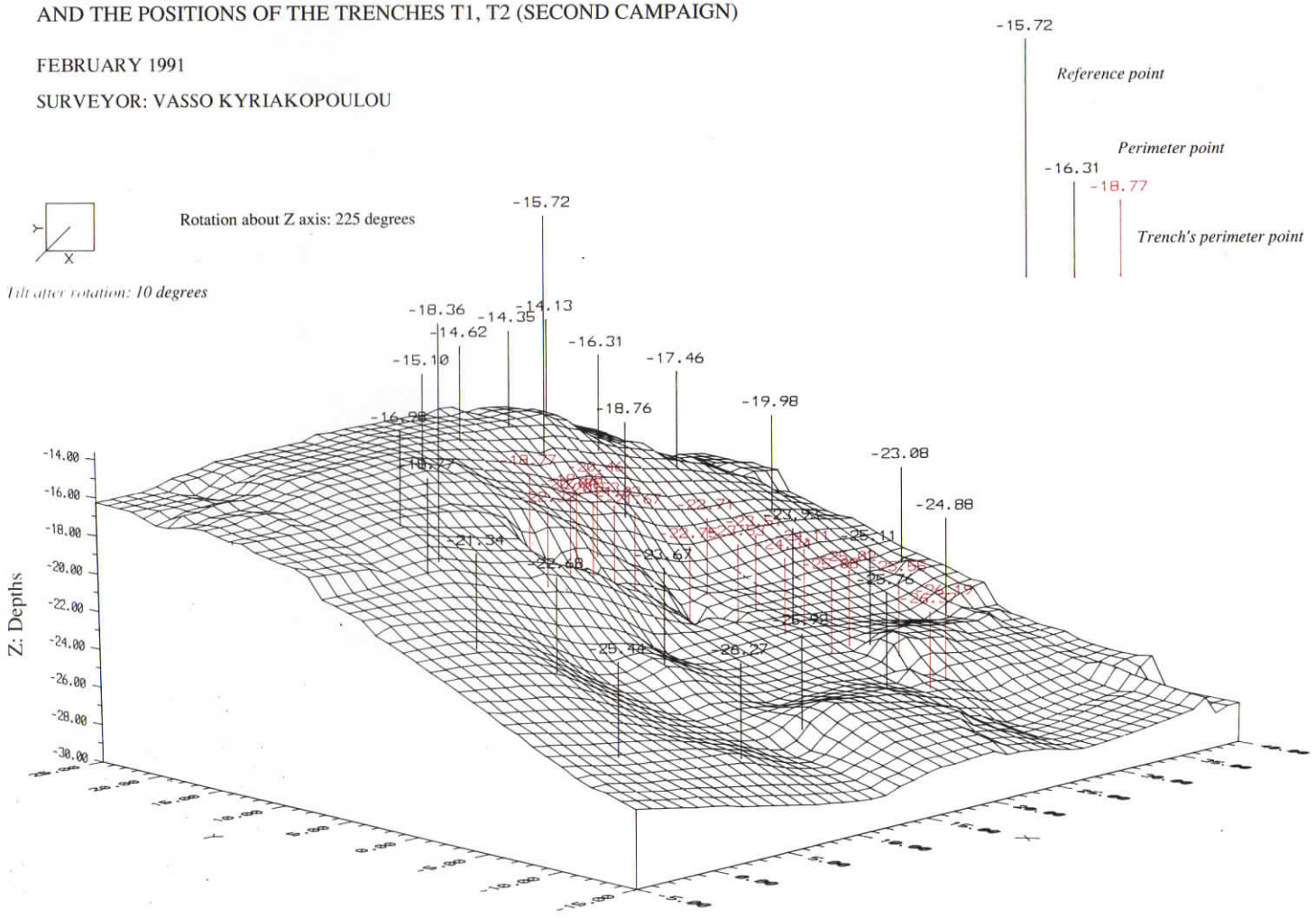
H.I.M.A. DOKOS 1990

DIRECTOR: GEORGE PAPATHANASSOPOULOS
ASSISTANT DIRECTOR: YANNIS VICHOS

PERSPECTIVE VIEW OF THE SURVEYED LIMITS OF THE SITE
AND THE POSITIONS OF THE TRENCHES T1, T2 (SECOND CAMPAIGN)

FEBRUARY 1991

SURVEYOR: VASSO KYRIAKOPOULOU



DOKOS: 1990 CAMPAIGN
THE SHARPS AND THE MECHANICAL EQUIPMENT

by Stavros Vossyniotis

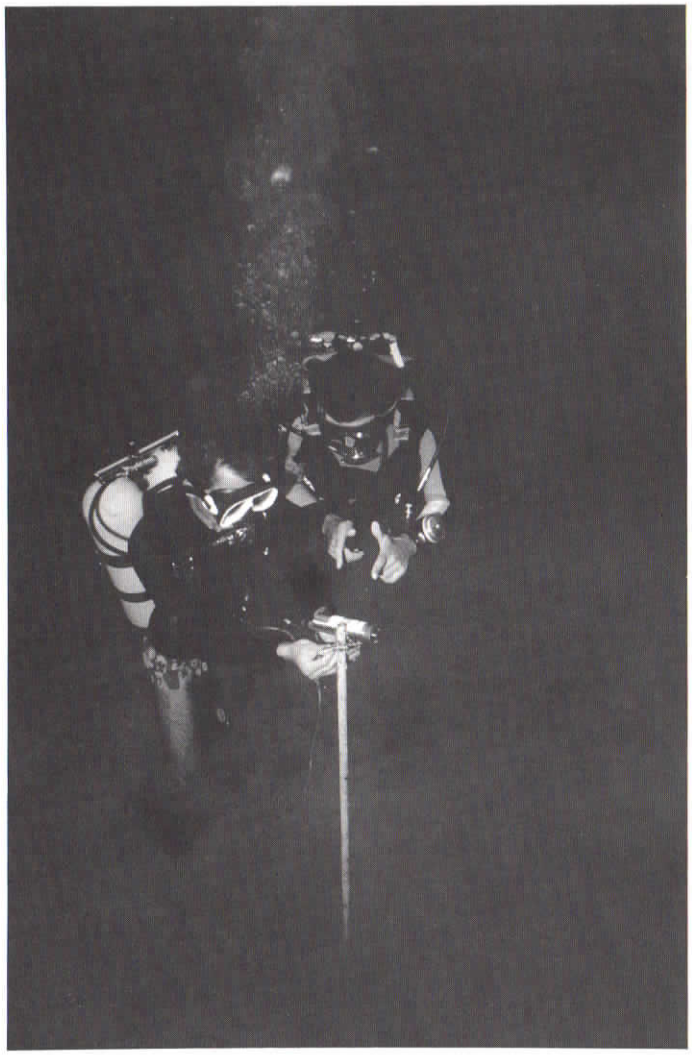


Fig. 1. *Placing one of the three tranceivers of the SHARPS on the seabed (photo: K. Jachney).*

THE SHARPS SYSTEM

During this season, independently of the final results, certain technical problems manifested themselves.

With regard to the SHARPS, certain problems had already appeared during the 1989 campaign. The first year's experience was undoubtedly very valuable, but we would like to offer a few comments that may contribute to the improvement of the working of the system. SHARPS, it will be remembered, is an echo sounding system directly connected (on-line) to a computer and used for underwater surveying (see *ENALIA ANNUAL* 1989, vol. I, 1990, 24).

Our problems started with the terminal fittings on the SHARPS transmitter-receivers, which leaked and caused short-circuits, resulting in the destruction of the safety fuses on the SHARPS card in the computer. Clearly, particular consideration should be given to the impermeability of these terminals and especially to their o-rings *(fig. 1)*.

Another cause of delay was the calibration of the system. The solution was simple but time-consuming: the distance between the three fixed transmitter-receivers was measured by tape, and then by making continuous corrections to the estimated speed of sound through the water we succeeded in reading these measurements on the SHARPS. It would be most helpful if the manufacturing company, Marine Telepresence, supplied special bases for the transmitter-receivers that facilitated the accurate calibration of the system. It should also supply special bases to attach the transmitter-receivers to the fixed poles. Lastly, the trigger of the portable transmitter should be a simple switch. The electric circuit it contains at present should be transferred to the central card of the SHARPS. The trigger proved to be totally unreliable, and it had no fuse in the event of a short-circuit.

The program supporting the SHARPS system is adequately user-friendly and the screens appearing on the monitor are very easy to understand. However, the program has certain deficiencies. For example, it is not possible to cancel the last command (eg the menu display) within the program. The length allowed for the file names is not always sufficient. And also it should be possible by some combination of keys, eg ^C, to interrupt any task and return to the main menu.

Another problem concerns the start of the automatic continuous measurement reading. The SHARPS support program is able to reject a measurement if it is totally erroneous in relation to the previous one: for example, because of reflections two measurements with a difference of 0.2 seconds might differ by 5m.

This capability is a great help in using the program. If, however, the first measurement is wrong, any correct ones that follow are rejected and the system "sticks"at the first measurement. When it begins measuring, the program should take a sample of the measurements (10-15) and then decide which of them are correct (usually the majority are correct and close to each other). Secondly, when the operator interrupts the measuring for a short interval and restarts the process, the same routine should again be followed, since the diver holding the transmitter has obviously moved some distance in the meanwhile.

As regards the editing of the files created by the SHARPS program, we suggest the following:

a) it should be possible to select a cluster of points and from these produce a point whose coordinates would be the mean values of the coordinates of the points in the cluster[1].

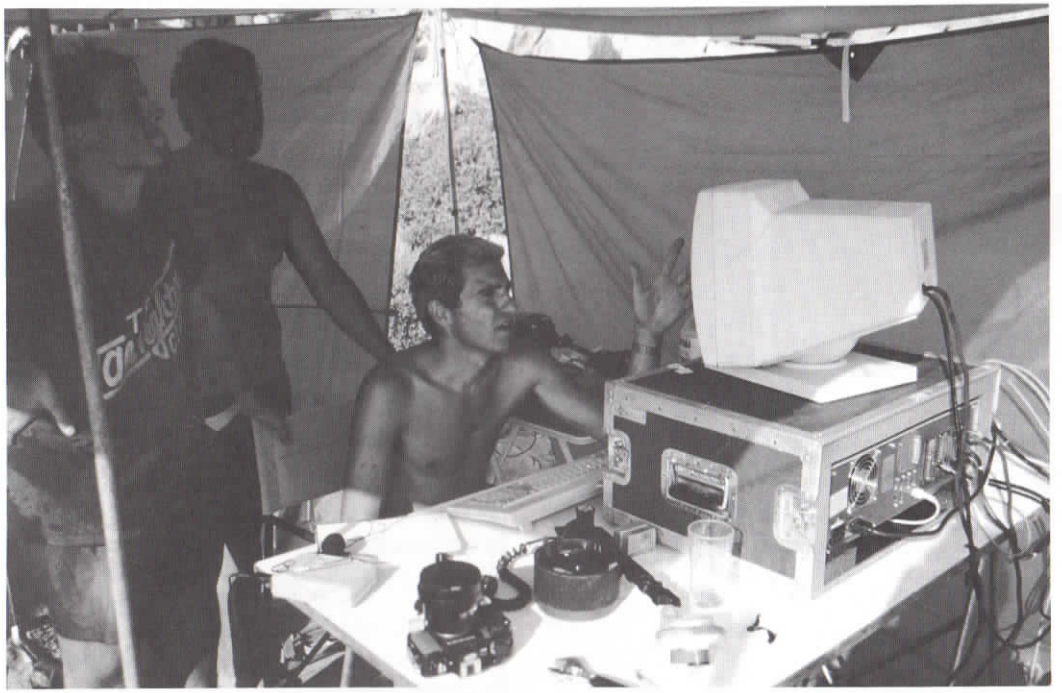


Fig. 2. *Processing the SHARPS data in the computer during the 1990 campaign at Dokos (photo: K. Jachney).*

b) There should be a provision for naming the points. When a point is selected, in addition to its number in the series and its coordinates in the margin of the screen, it ought to be possible to give it a name (10 characters would suffice).

A great effort was made during the summer of 1990 to organize the use of the SHARPS as much as possible *(fig. 2)*. Thus every activity to do with it was meticulously recorded. In the log book kept of the measurements made by the system all the information exists that is needed to process the data supplied by the SHARPS, From the daily calibration to the contents of each file. The main purpose of the innovations in the use of the system was to safeguard the measurements, to ensure their reliability and to store them in an systematic way.

The safeguarding of the measurements was effected by keeping a double back-up on a daily basis. Their reliability was assured by the daily calibration of the system and the existence of two fixed points of reference in each file.
The organization of the storage of the measurements was based on two points: naming the files with the measurements and placing them in directories according to context.

Using this method it is possible to find immediately which directory and which file contains the position of each find, and equally which finds are in each file. Each find is stored according to its trench (e.g. A2), its position in the trench (e.g. T1a) and the level to which it belongs (e.g. A), as well as the date when it was recorded.

The above are the conclusions and expections about the functioning and structure of the SHARPS system.

MECHANICAL EQUIPMENT

A variety of machines were used at Dokos this year:

a) A diesel single-phase 6 kw generator.

This was used to power the electrical apparatus. It proved very reliable, and its maintainance was undemanding and without problems. Good lubrication and fuel kept it going for some 450 hours during the period of the excavation, and it is hoped that we may have it with us next year. We also had a reserve generator provided by the Greek Navy, which was not called upon.

b) Low pressure compressor.

This supplied the compressed air for the airlift, and it was the machine that caused the most trouble *(fig. 3)*. In 1991 we must ensure that it stands in a completely horizontal position and is well cooled. The horizontal position is necessary for its proper lubrication. Most of the time this machine operates at low revolutions, which increase only when the pressure drops in the pressure tank. In our case we had the pressure tank open continuously with the result that the motor ran constantly at high revolutions. The temperature of the motor therefore requires careful watching, and next season oil and temperature gauges will be desirable accessories.

c) Airlift

This is used to suck up the sand from the bottom. After some initial disagreement about the way to position it, it was decided that the rigid section of the airlift should be vertical in order to reduce its buoyancy to zero. In this way one point of attachment on the bottom is sufficient and it is easy to move the airlife around. When in use, once the lifting of the sand has stopped it is necessary to continue sucking up water until no more sand remains in the airlift. Also a marker to indicate the open and closed positions of the valve would be a great help to the divers, who frequently mixed them up.

d) High pressure compressor

This is for filling the divers tanks and was loaned by the Greek Navy. It is a first-class machine,

Fig. 3. Low pressure compressor used for the air-lift during the 1990 campaign at Dokos (photo: K. Jachney).

and in spite of some leakage at the safety valve, which was replaced, it filled the tanks with air at a pressure of 200 bars in about ten minutes. Apart from refuelling, the machine needed a regular change of oil and of the carbon air-filters. Starting up in the morning could be a problem, but a very minor one compared with many others. We hope the Greek navy will be as generous next season and lend us this machine again.

No difficulties were experienced with the rest of the mechanical equipment, which consisted of various small appliances.

Mention should be made of the very complete kit of tools at our disposal, for which we have to thank the president of H.I.M.A., Nikos Tsouchlos.

Lastly, we hope that in the coming season the technical problems will be minimal and will cause no waste of time.

NOTE:

1. The need for something of this sort was sufficiently great for us to create a separate program for this purpose at Dokos.

MAIN SPONSORS OF DOKOS 1990 PROJECT

- HELLENIC NAVY
- YANNIS LATSIS
- I. F. KOSTOPOULOS Foundation
- Costamare Shipping Co
- Shell Company (Hellas) Ltd
- Shell Chemicals (Hellas) Ltd
- Rainbow Computer S.A.
- "EPIROTIKI LINES"
- D.E.P. S.A.
- I. BOUTARIS & Son S.A.
- INTERAMERICAN
- ETHNIKI ASFALISTIKI S.A.
- Greek Fafineries of Aspropyrgos S.A
- PLIADES S.A.
- Koutsourakis-Elefteriadis Ltd
- NASCO KARAOGLAN HELLAS Ltd
- HYDROFOIL JOINT SERVICE
- KODAK (Near East) Inc.
- BP Greece Ltd
- ELINOIL S.A.
- Greek Diving Center
- PANORAMA Cultural Society
- ELENIT S.A
- Fulgormare
- A. PALLIS S.A
- RANK XEROX Greece S.A.
- TAG-HEUER of Greece
- ELAIS S.A.
- I&S SKLAVENITIS S.A
- AXION-PSION
- ASSO DIVERS

POINT IRIA WRECK

by Haralambos Pennas

... the sea
Green without brilliance,
a slain peacock's breast,
Received us like time, without a rift.

(George Seferis, The King of Asine, *Poems*, translated by Rex Warner, Bodley Head, 1960, p. 71).

Initial discovery

Nikos Tsouchlos first heard of the wreck in 1961-62. In May 1974 Haralambos Kritzas, Nikos Tsouchlos and Peter Throckmorton dived in the area of the wreck and made a cine film of the seabed as part of a program by Bruno Vailati, "Men of the Sea". Three pithoi were seen embedded in the sand at a depth of some 23 m, as well as a triangular stone anchor with three holes in shallow water at a depth of six or seven metres.

First survey in 1990

In 1990 it was decided that H.I.M.A. would carry out an underwater survey to locate the position of the wreck, determine its extent, identify the finds that had been recorded 16 years previously and photograph the site, pottery and any other finds in situ.

On 10 June 1990 we set out from Tolon in the *kaiki* belonging to the fisherman Panayiotis Lambrinakis, and after an hour and a quarter we arrived off Point Iria on its western side a few metres northwards of the tip.

The whole operation took one day, in the course of which four dives were made. The diving was organized by Phaidon Antonopoulos, a specialist in this field.

The first team, Nikos Tsouchlos and the Italian physicist and diver Gianluigi Sacco, located one of the pithoi in exactly 25 minutes and set a marker over it.

The second team to dive, Phaedon Antonopoulos and Haralambos Pennas, archaeologist and director of the survey, quickly returned to the surface, Pennas not having practised any diving for the last eleven years.

The third team, Ilias Spondylis, archaeologist and representative of the Ephoria of Underwater Antiquities, and Yannis Vichos, a H.I.M.A. archaeologist, photographed and sketched the objects.

Lastly, the fourth team of Antonopoulos and the archaeologist Mensun Bound from Oxford University MARE reconnoitered the site and made general measurements.

Afterwards, before returning to Athens, the members of the teams discussed the map and the sketches they had made and their impressions and ideas, in particular checking their measurements. The result is shown in the preliminary sketch in *fig. 1*.

Pithoi *(fig. 2)*, amphoras *(fig. 3)* and body sherds of large vessels were found spread over a length of some 30 m and at depths of from 17 to about 25 m. The shapes of the vessels, the positions of the handles on the jars and amphoras and the shapes of their necks and rims point to a date before the Geometric period. Sub-bottom profilers were not used and no photomosaic was made.

The bottom is rocky with sandy patches and the visibility was moderate. The existence of the sand between the rocks and the shallows may be explained by the shifting of the sand due to rough seas and currents. As an indication of the latter, the second team had to dive twice, because as they tried to submerge they were carried northwards from the marker buoy by the relatively strong surface current in spite of almost calm conditions.

The site itself, stretching from north to south on the west side of Point Iria, is very exposed to westerly and southwesterly winds. The waves strike against the west side of the point, rebound towards the island of Ypsili and are deflected back again to the point, thus amplifying the force of the heavy sea. In the opinion of Lambrinakis the fisherman, when the weather bulletin gives a force 7 wind in the area, gale conditions approaching force 10 are experienced in the narrows between Ypsili and Point Iria.

In the event of a full survey in the future it should be noted that the site of the wreck is not accessible by car from the land. The nearest road stops at the end of the Iria beach to the south, as can be seen on the map.

In particular the factor of probable rough seas has to be reckoned with, calling for special technical support both at the site itself and in the nearest fairly sheltered bay, where it will be necessary to set up a well organized auxiliary base for this purpose.

To sum up: during the one-day operation a total of four dives were carried out; the wreck at Point Iria was pinpointed and its extent ascertained; the finds of sixteen years before were identified; and the site and representative examples of the pottery were photographed *in situ* and marked on a general sketch plan.

In conclusion it must be stressed that in view of the fact that the archaeological finds are visible on the bottom and that the site is in the heavily frequented Argolic Gulf, it is essential to plan a ten-day trial excavation for the immediate future with a full diving team to carry out the following:

1. locate, determine and plan the whole area of the site;

2. make a photomosaic and perform other photographic work;

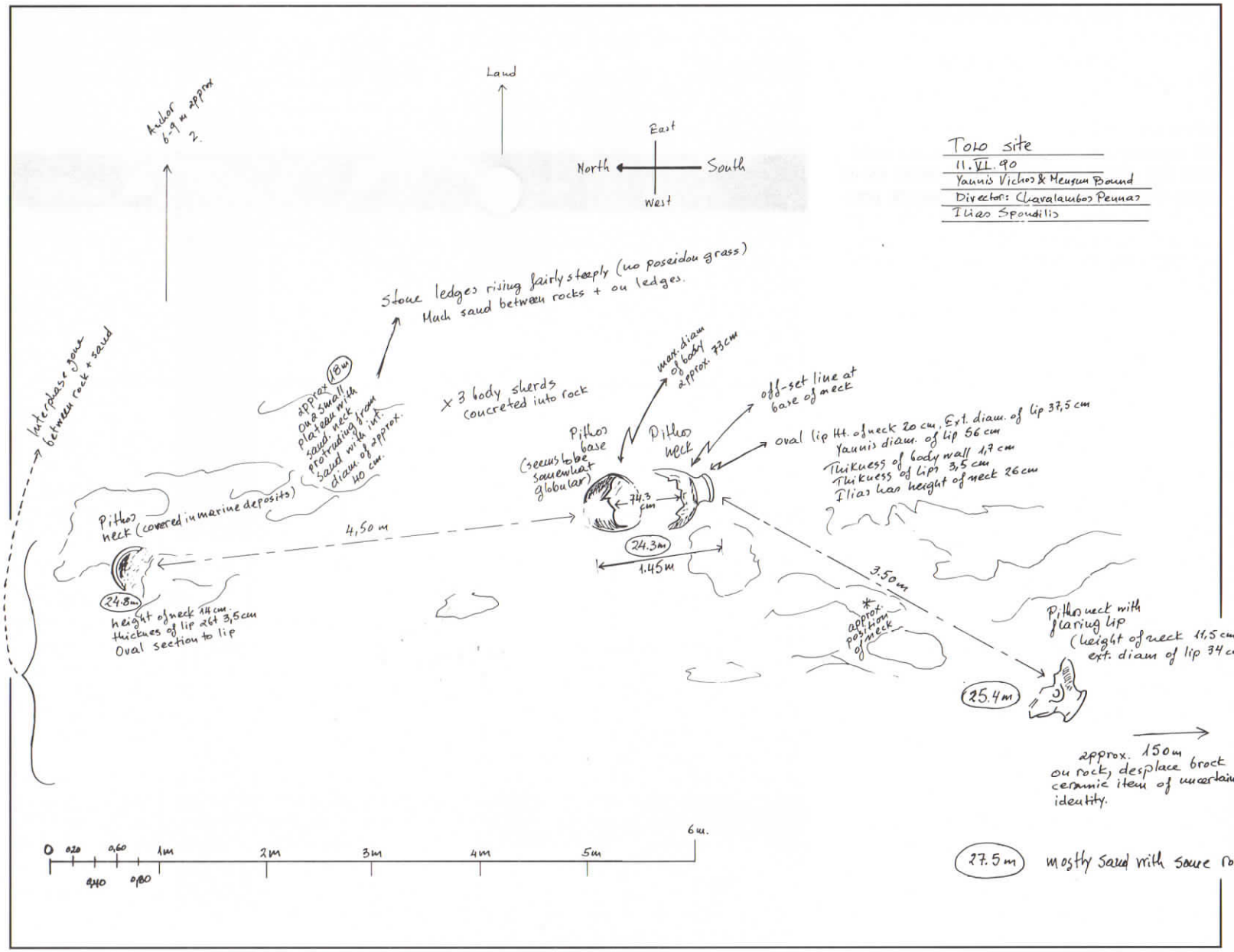


Fig. 1. *Sketch plan of the wreck site at Point Iria with the positions of some of the finds (by Mensun Bound).*

3. recover typical examples of the finds for dating and study.

Postscript

During the expedition, both archaeologically and literarily the King of Asine, which dominates the whole area, refused to leave us in peace, since Nikos Tsouchlos insisted on periodically reminding us of him. Sepheris's poem matched our circumstances, period, working conditions and mood. But what struck a particular chord in us was the description in these lines from the poem of the place where the wreck site lay:

From high above the veins in the rock descended,

Twisted vines leafless, many branched, regaining life

At the touch of water, while the eye, following them,

Strove to escape the weary rocking motion And gradually lost strength.

(George Seferis, The King of Asine, *Poems*, translated by Rex Warner, Bodley Head, 1960, p. 71).

Photo Y. Vichos

Fig. 2. *Upper part and neck of a large pithos. Point Iria wreck site.*

Fig. 3. *Upper part of the belly and neck of an amphora with two horizontal cylindrical handles. Point Iria wreck site.*

CORCYREAN AMPHORAS

by Dimitris Kourkoumelis

Pointed-base amphoras, used for wine, oil and other products, were among the commonest and handiest containers produced in the ancient Mediterranean workshops, and in recent years they have become an important subject of research for archaeologists, excavators and historians. Their study has made great progress and amphoras are acquiring increasing significance in the eyes of archaeologists, to such an extent indeed that the term amphorologue, for the archaeologist specializing in amphoras, has begun to appear in the archaeological vocabulary.

Amphoras were one of the most important elements for the economy, trade and contacts between the different city-states and countries in antiquity. Whether found in the hold of a ship at the bottom of the sea or in a potter's workshop, or in the storeroom of a house or villa, they are always indicators of economic development and commerce, which until quite recently were rather matters for speculation than knowledge among archaeologists.

Studies and research have made great strides. Chemical and magnetic analyses, theories and suggestions have not ceased to enrich our knowledge about pointed-base amphoras and their role in the ancient economy. This progress, however, has not been without errors and misunderstandings, and it is constantly necessary to return to what we already know and to correct any errors and apply our theories to the new data.

This is the situation with the Corcyrean pointed-base amphoras. For a long time it has difficult to identify them, although they have been known since antiquity from historical and literary sources, just as the fine quality of the wine produced on the island was also known.[1] Until today it has been difficult assign the name Corcyrean to a particular shape because the archaeological evidence was lacking. Although some archaeologists and scholars have at times applied the name Corcyrean to a certain type of amphora, there was never any confir-

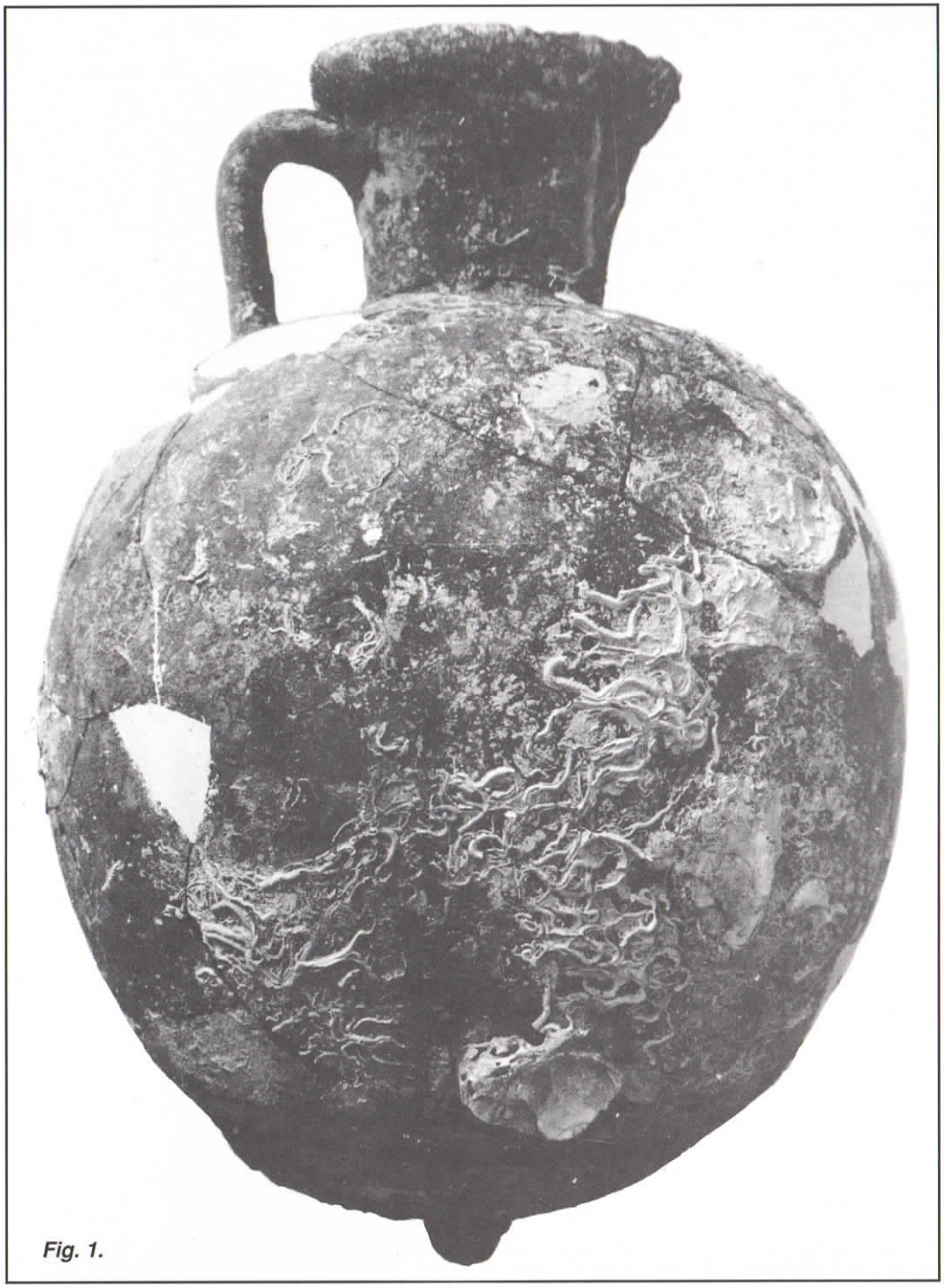


Fig. 1.

Fig. 2.

mation of the truth of this theory,[2] and in particular nothing was known of the development, chronology and typology of the amphora. These efforts perhaps reflected a desire to fill the gap in the long list of known ancient Greek pointed-base amphora, a gap that was the more conspicuous in view of the large number of ancient texts referring to the production of wine on Corcyra and the consequent great economic expansion of the island, above all in the 5th and 4th centuries BC.

Until recently the best and fullest study of the amphoras that frequently turn up in excavations on Corfu was Mrs C. G. Koehler's doctoral thesis.[3]

In it two separate types of pointed-base amphoras are described, which she calls "Corinthian A and Corinthian B Transport Amphoras". We now know it can be said with certainty that the "Corinthian B" amphoras have absolutely no connection with Corinth, which furthermore had no tradition of wine production in antiquity, but were made in Corcyrean workshops for the export and storage of Corcyrean wine.

The archaeological proof of the provenance of the Corcyrean amphora was given by the excavations of the 8th Ephoria of Prehistoric and Classical Antiquities on Corfu[4] at the site of Figareto in the ancient city of Corcyra on the Kanoni peninsula. Beginning in 1983, these excavations, which are not yet completed, have uncovered a very important Corcyrean potter's workshop. In an area of 650 square meters, the extent so far excavated, buildings, kilns, and wells have been revealed that for at least two and half centuries were used among other things for the production of amphoras.

From the 5th to the 3rd c. BC, a long time for a pottery to be in operation, a very large number of amphoras were made, the remains of which have enabled many conclusions to be drawn.

These sherds[5] have for the first time made it possible to make an accurate study of the Corcyrean amphora and its development throughout the period of functioning of the workshop.

The typology and chronology correspond closely to those proposed by Mrs Koehler for

Fig. 3.

the "Corinthian B" amphoras.

Very few sherds of amphoras before the 5th c. BC were found in the excavation of the workshop, but they occurred in the excavation of the ancient cemetery of Corcyra, where 6th century amphoras were used for the burials. There were no levels later than the end of the third century in the workshop excavations. That does not however necessarily signify that the production of amphoras ceased at this time. It is possible that future excavations in other places on the island will fill this gap, and it seems probable that its accession to Rome in 229 BC coincided with end of the mass production of amphoras. It is therefore preferable to place the development of the Corcyrean amphora between the 6th and 3rd c. BC.

The typological characteristics of the 6th century amphoras are an almost spherical body, relatively short neck, cylindrical rim, flattened handles and a conical base sharply offset from the body. The height is 49 cm, the diameter 42 cm and the capacity 25.5 l. In the 5th c. BC the body becomes perfectly spherical, the rim is triangular in section, the handles remain flattened and the conical base is sharply offset from the body. The height is 49 cm, the diameter 37.5 cm and the capacity is 25.1 l *(fig 1).*

In the 4th century the Corcyrean amphora followed the general trend of Greek amphoras: the body was more elongated and pointed oval in shape, this becoming more pronounced in the 34d c. BC. The rim remained triangular in section and the neck was relatively short; the handles were flattened. The base, although following the line of the body more smoothly, continued to be offset and conical. The height reached 54 or even 62 cm, the diameter remaining the same, between 35 and 37 cm. The capacity of the 4th c. amphoras varied between 24 and 25 l *(fig. 2).*

Important changes in the general shape appeared in the 3rd c. BC: the body kept its pointed oval shape and became almost triangular in profile. The neck was taller and the rim became squarer in section. The handles remained flattened cylindrical, and the base was only slightly offset from the body. The height increased to 74 cm, the diameter varied be-

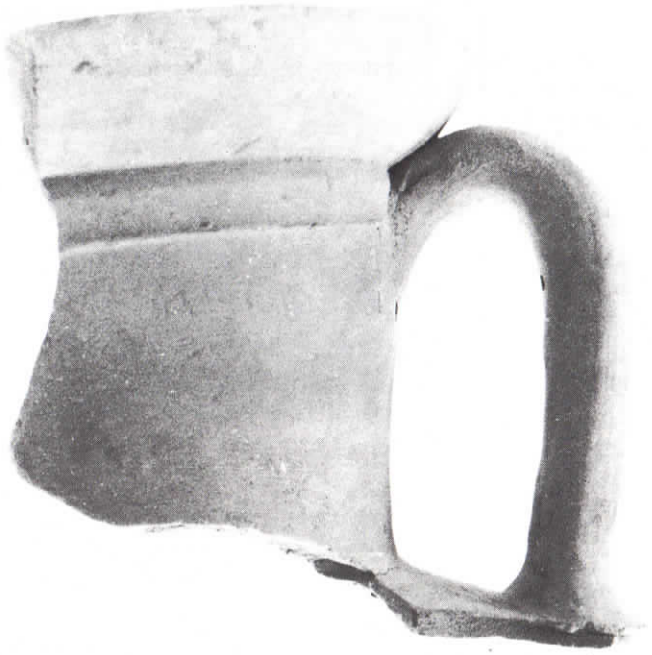


Fig. 4.

Fig. 5.

tween 38 and 39 cm and the capacity was up to 21 l *(fig. 3)*.

A common feature of the Corcyrean amphoras, which does not appear to have chronological significance, is that during the 5th and 4th c. BC they have one or two decorative bands around the base of the rim *(fig. 4)*, which disappear in the 3rd c. BC. A further trait characteristic of the 4th and 3rd c. amphoras is the way the handles were pressed onto the mouth, giving it a slight figure-of-eight shape *(fig. 5)*.
Stamps make their appearance on Corcyrean amphoras chiefly in the 3rd c. BC. They are always on the handles, either on the base or on the top of the bend. They depict various motifs, such as a monogram, eight or sixteen pointed star, caduceus, amphora, bunch of grapes, club, ivy leaf, etc. *(figs. 6-11)*.

These subjects are similar to those depicted on the Corcyrean coinage. This direct connection between the subjects on the stamps and on the coinage is another indication of the origin of the amphoras. On the other hand no complete personal names appear on them, as they do on other types of amphora (eg from Thasos).

Thus all the evidence, historical and literary, from the excavation of the workshop and from the connection between the stamps and the Corcyrean coinage, clearly indicates the provenance of the amphoras that have hitherto been called "Corinthian B" and have now been shown to be purely Corcyrean. The discovery of their real identity is of great importance since they form a useful addition to the already well-known provenance lists of pointed-base

amphoras and especially because they demonstrate for the first time the production of amphoras in western Greece.
The steady economic expansion of ancient Corcyra was founded on its geographical situation in the Adriatic (see Thucydides VI, 3) and in particular on its trade and communications with the western Mediterranean (southern Italy, southern France, Spain, North Africa). It was a commerce based largely on the production of high-quality wine that was exported both to the Greek mainland (Athens, Corinth, Olympia) and the western Mediterranean.

If Corcyra found itself frequently at the centre of political and military quarrels, one of the reasons was its key position on the sea route to southern Italy and the western Mediterranean; another reason was its great economic strength, especially in the 5th and 4th c. BC, which rendered it one of the most significant naval powers in the ancient world. This economic strength was chiefly due to its wine trade, a fact previously known to us only from the ancient literature.

Now that we have confirmed the provenance of the Corcyrean amphoras, we possess the archaeological evidence that we have hitherto lacked. Certainly the study of them is far from complete. Continued excavation and above all the underwater investigation of wrecks around the island, which are under the continuous threat of looting and destruction, are indispensable in order to uncover more evidence that will increase our knowledge about the chronology of the amphoras, their distribution throughout the Mediterranean, and the culture and economy of ancient Corcyra.

Footnotes:

1. The earliest texts referring to the production and consumption of wine on Corcyra are in the *Odyssey* (vii 99, 294; viii 70, 468; xiii 42, 50). Later there are many references in the histories, such as Thucydides (III, 70, 4), Xenophon (VI 2, 6 and VI 2, 26) and in literature, such as pseudo-Aristotle, *Περί των θαυμασίων ακουσμάτων* (104, 839,), Athenaeus, *Δειπνοσοφισταί* (I 33,), Florentianus, *Γεωπονικός* (V 2, 4), and in Hesychius of Alexandria's *Lexicon*: "Corcyrean Amphoras".
2. Eg H. Bulle, "Ausgrabungen bei Aphiona auf Korfu", *Athenische Mitteillungen* 59 (1934), 147-240; Virginia Grace, "Samian Amphoras", *Hesperia* 40 (1971), 360-370; C. Boulter, "Pottery of the mid-Fifth Century" *Hesperia* 22 (1953) 108-109.

3. C. G. Koehler, *Corinthian A and B Transport Amphoras of the Greek Period,* Doctoral Thesis, Princeton University, 1978.

4. I should like to express my thanks to the directress of 7th Ephoria of Prehistoric and Classical Antiquities, Mrs K. Preka, for giving me permission to publish the amphoras that were found during the excavation of the pottery workshop.

5. Over 3000 amphora sherds have been studied, all of which came from the excavation of the pottery workshop.

CAPTIONS

Fig. 1.
5th c. BC Corcyrean amphora.

Fig. 2.
4th c. BC Corcyrean amphora.

Fig. 3.
3rd c. BC Corcyrean amphora.

Fig. 4.
Decorative bands on the base or the rim of a 4th c. BC Corcyrean amphora.

Fig. 5.
Mouth of a 3rd c. BC Corcyrean amphora slightly compressed by the handles into a figure-of-eight shape.

Figs. 6-11.
Stamps on Corcyrean Amphora handles:

6. *monogram*

7. *16-pointed star*

8. *caduceus*

9. *amphora*

10. *bunch of grapes*

11. *club*

Figs. 6-11

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