THE EXCAVATION OF AN EARLY BRONZE AGE CARGO AT DOKOS: THE FIRST TWO CAMPAIGN SEASONS (1989-1990)

Towards the end of August 1975 Peter Throckmorton, who was a founding member of the Hellenic Institute of Marine Archaeology (H.I.M.A.), located piles of broken prehistoric vases in the small bay of Skindos, at Dokos island (Figs. 1a, 1b). He immediately informed the ephor of antiquities George Papathanassopoulos. Thus began a long train of events that has finally culminated in the present programme for a complete archaeological excavation of the site by the Institute.

PLANNING AND METHODOLOGY

The surveys made in 1975 and 1977 of the underwater archaeological site at Dokos revealed the special character of the site and the difficulties involved in a full archaeological excavation of it. It became apparent that although the greatest depth of the site did not exceed 32 m, the time required to set up a grid of the traditional type and to record the positions of the finds by any of the known surveying methods would be excessive in the case of a full-scale excavation.

Taking into account the large number of finds and the fact that many of them were concreted to each other and to the rocks, it was clear that the total time needed to finish the excavation would in this case be almost prohibitive. The magnitude of the problem had been well stated by the archaeologist in charge of the 1977 survey, Charalambos Kritzas.

The results of the one-day survey carried out in May 1989 confirmed these observations, and the traverse section of the site was of great assistance in planning the 1989 campaign, especially for the design of the stereophotographic grid.

In view of the impracticability of using the conventional grid and survey method, mainly because of the steep gradients and irregularities of the seabed in the area of the excavation, we turned to a new system for mapping and recording the positions of finds underwater which we had heard of in February 1988 from the then president of the Institute of Nautical Archaeology, at the A. & M. Texas University, Donald Fray.

This system, known as the Sonic High Accuracy Ranging and Positioning System (SHARPS), had been designed by INA scientists especially for use in

underwater excavations for mapping the seabed and plotting the positions of finds by means of a computer through the transmission of high-frequency sound pulses.

Since this was the first time in the world that the SHARPS was to be used as the principal survey instrument on an underwater archaeological excavation, we also decided, profiting by the past experience of foreign excavation teams, to make a photomosaic and to construct a stereophotographic plan of the site.

By choosing these two topographical systems, the SHARPS and the stereophotographic grid we were sure that the topographical requirements of the excavation would be largely taken care of. We decided to use both systems so that if the results from one of them were not as reliable as expected we could always fall back on the other.

The adoption of these two systems also solved the most difficult problem of the excavation: how to make a scale plan of the underwater site and to record the positions of the finds accurately. The projects for the 1989 season concerned the delimitation of the archaeological zone recording the visible objects on the seabed, attaching numbered labels to each cluster of finds or to important single finds, and raising and transporting them all safely to a museum.

It was decided that the delimitation of the archaeological zone would be carried out by two archaeological divers, and they would also be responsible for locating the finds. To mark all the objects we had made plastic labels with white numbers on a black ground, which would be visible by ordinary light to the eye and in photographs. We also decided because of the large number of objects, chiefly small sherds, to label clusters of sherds rather then individual pieces.

Every cluster would comprise all the objects in the immediate vicinity of a feature find. Each cluster would be placed in a plastic bag with its label and raised to the surface, and for their safe transport the plastic bags with the finds would be placed in buckets and bowls of water.

The projects for the 1990 season, involved repositioning the perimeter exactly as it had been in 1989 and excavating two separate trenches in order to determine the depth of the archaeological deposit and the nature of the stratigraphy. In addition a reconnaissance of the wider area surrounding the site was planned for 1990.

It was decided that both topographical methods applied in 1989 would be used again in 1990.

The methodology was planned, not only with an eye to correct archaeological excavation procedure, but also with the aim of conducting a model underwater excavation that would yield worthwhile results, thanks to the use of advanced technology and to the training of as many archaeologists and scientists engaged in underwater archaeology as possible.

THE EXCAVATION

The 1989 season began on the 20th of August with the transport to Dokos of the equipment and material needed for the excavation and the setting up of the floating and onshore installations. This task was undertaken by a team of HIMA members with technical qualifications aided by three professional mechanics.

Their chief tasks were to moor the yacht "Pnoe", which was to house the excavation team and take part of the portable equipment, to moor the floating platform over the main area of the site, to set up the electric generators and the air compressors for filling the tanks, and to construct the shore platform on which to install the computer for the SHARPS system.

During the three first days the archaeologist Elpida Hadzidaki and Yannis Vichos explored the site of the wreck, covering a total area of 900 m2. The archaeological finds were found to extend over an area from about 15 to 30 m in depth. A few isolated finds were also located beyond the 30 m mark, but it was decided to confine the work in the 1989 season to the main archaeological zone, which occupies an area of 650 m2.

The zone was marked off with a cord fastened to 18 numbered iron stakes. It was polygonal in shape and the perimeter was initially plotted in the traditional way in a series of dives by the topographer Vaso Kyriakopoulou and a number of archaeologists and divers. Later on the perimeter was also plotted using the SHARPS (see Fig. 7).

Both plotting methods were used in order to compare the time needed for each of them and to check the measurements given by the SHARPS, since it was being used for the first time. The results were most interesting and confirmed both the reliability of the SHARPS and its much greater speed.

The following seven days were chiefly spent in setting up and adjusting the SHARPS. This required the positioning of the three receivers at fixed points on the seabed so as to form as nearly as possible an isosceles triangle.

In order to find the best positions for the receivers for the system to function properly without any reflections due to the irregularities of the bottom, the receivers had at first to be moved around a great deal. They were mounted on iron poles about 2.5 m high embedded in cement-filled cans.

The system was calibrated and the speed of the sound pulse, through the water, measured; this is about 1518 m per second. The three receivers were labeled A, B, and C, and the distances between them and from them to the surface were measured.

While the SHARPS was being installed and adjusted, other jobs were carried out, and the area within the perimeter was divided by cords into nine separate sectors in order to simplify the work of recording and plotting the sherds.

As soon as the SHARPS was functioning properly, the perimeter of the working zone and the dividing cords of the nine sectors were plotted. Afterwards pairs of divers, each under an archaeologist, began marking the objects and clusters in each sector with numbered labels from A1 to A250 (the letter A indicates the stratum, in this case the surface of the seabed, to which the 1989 excavation confined itself). When the marking of the finds in each sector was completed, another pair of divers made a list of the numbers of the labels together with a short description of the objects. Meanwhile the first group or another one photographed all the finds and clusters that had been marked. (Fig. 2).

When the task of marking the objects was finished, plotting their positions with the SHARPS began (Fig. 3).

While this was in progress, the stereophotography of selected parts of the delimited zone, where the bulk of the finds was concentrated, began.

Before taking the photographs, the surface of the objects under the frame was cleaned.

During these activities two stone slabs of greenish schist with a hole at one end were brought to the surface after they had first been photographed in place and their positions in relation to the perimeter of the archaeological zone had been fixed. These slabs, which had been located during the reconnaissance dives at depths of 34 and 38 m respectively and some 40 m away from the main site, must be prehistoric anchors and may be directly related to the wreck (Figs. 5a, 5b).

The next step was to map the area with the SHARPS, and particularly to plot the rocks within the delimited zone and fix the archaeological site in relation

to the shore in order to incorporate it into the general topographical map for which a land survey was being made (see Fig. 7).

After completing the marking and plotting of the finds with the SHARPS, the stereophotography and the photography of the finds, we began the task of raising methodically both the separate pieces and the clusters, according to how they had been marked on the bottom and recorded by the SHARPS.

The finds were raised by sectors after being placed together with their labels into plastic bags. The bags were then carried up in a perforated iron basket attached to a lifting balloon. When there were enough finds in the basket, the balloon was filled with air from one of the diver's tanks and hauled up to the floating platform at a point where part of it had been removed to make it easier to remove finds from the basket.

All the work on the bottom and ashore was photographed, and parts of it were recorded on video for the archives of the Institute.

On the last day of the excavation all the finds that had been raised were carried on board the "Energy" to the island of Spetses, accompanied by the director of excavations. There they were put in the Archaeological Museum in the charge of the guards.

The 1990 season began on the 27th of July.

As soon as the site was delimited, the first trial trench was layed out in an area where is a thick sandy deposit. The surface finds were labeled and were raised after their position had been recorded with SHARPS and stereophotography. Subsequently the trench was excavated with an airlift layer by layer (Fig. 6). The finds of each layer were recorded and photographed *in situ* and raised. Three levels A, B and C were determined. All three layers of the trench, the depth of which reached 1,5 m from surface to natural bedrock, contained Early Helladic sherds including large fragments of Early Helladic vases, but also a large number of obsidian blades and flakes, animal bone and teeth, two seeds and other food remains.

Work was continued by locating, recording, and raising surface finds from the entire site, which had not been spotted in the course of the previous season. Obviously sand shifted by currents during the winter had exposed these new surface finds.

Concurrently the second trial trench was layed out at the end of the rocks in the central part of the site.

Due to the limited time available, only the top layer of this second trench was recorded and all surface finds were raised.

Alongside the above mentioned tasks reconnaissance dives were performed in the wider area and two lead anchor-stocks, probably of Classical or Hellenistic date, were located recorded *in situ* and raised.

METHODOLOGICAL RESULTS

The reconnaissance of the underwater archaeological site at Dokos resulted in the delimitation of a zone of 650 m2 that began at a depth of 15 m and went down to 32 m. Nearly all the visible finds on the seabed that had been located during the reconnaissance phase were within this zone. Some isolated finds were outside it at a depth greater than 32 m, but the main bulk of them was concentrated in the middle of the delimited zone.

This was divided into nine sectors of irregular shape, due to the anomalies and steep slope of the seabed. The irregular shape of the sectors did not hamper the plotting of the positions of the finds, because the operation of the SHARPS is unaffected by the shape of any grid; it is based solely on a theoretical horizontal plane bounded by the lines between the three fixed receivers. The nine sectors into which the delimited zone was divided serve only for carrying out the tasks of marking, plotting and collecting the finds.

The latter were marked in clusters, because generally there were many small sherds concentrated in a small area. Individual objects were marked only when they were relatively distant from concentrations of other finds.

We found that the labels had to be attached to the finds with wire, because otherwise there was a danger that they would be swept away by the currents.

Much time was spent in relocating marked finds when plotting their positions and photographing them *in situ* due to the fact that most of the finds were very small in size. In the next season, therefore, the nine sectors of the zone will be subdivided into smaller units to make it easier to locate the finds.

The 1989 season yielded the anticipated results as regards mapping the zone and plotting the positions of the surface finds.

The 1990 season also yielded the anticipated results as regards the excavation of two trial trenches in order to study the area. We found that the involvement of the entire research team in the excavation of only one trench at a time did not allow for the optimal exploitation of the total time spent underwater daily.

Our choice of methods for this task proved entirely successful, and they were carried out in general in the usual approved fashion. Certain omissions and errors occurred due either to technical reasons (power cuts, false signals caused by reflections, etc.) or our inexperience, but these did not affect the final results. The employment of two different plotting systems proved to be especially useful when for various reasons one of the two systems did not produce the correct figures.

In the case of the iron frame for the stereophotography, we found that the material used for the frames was not rigid enough.

The use of a bottom-to-surface intercom proved indispensable for the operation of the SHARPS.

Although we are still at the stage of processing all the evidence, we already have, thanks to the Autocad graphics programme, a complete plan of the archaeological area with the positions of all the finds and rocks marked on it[1], (Fig. 7). We are also able to make drawn sections of any part of the zone and we know the relative heights (depths) of all the finds.

The positions of the main bulk of the finds on the plan made by entering and processing the data from the SHARPS with the Auto cad will be checked one by one on the photomosaic assembled from the photographs taken with the stereophotographic frame.

At the end of the two excavation seasons at Dokos nearly all the visible finds on the bottom that had been marked were raised, except for a number of them that had become concreted to the rocks. Some finds that were found outside the working zone, whose positions are plotted on the SHARPS plan, were also raised.

Recording the finds as soon as they were brought to the surface proved particularly useful and this will be continued more methodically in the coming seasons.

In addition we consider designating two teams each directed by an archaeologist and working simultaneously on two separate *loci* of the site.

After the completion of the excavation of the second trial trench, will be selected the most suitable and promising parts of the site for further digging.

The main participants of the two first campaigns of the research Dokos project (1989-1990) included: Dr. George Papathanasopoulos, director, Dr. Yannis Vichos, field director, Dr. Elpida Hadjidaki, assistant director, Nikos Tsouchlos, technical director, Phaedon Antonopoulos, dive master, Christos Agouridis, Haralambos Kritzas, Thanos Aronis-Webb, Roxani Margariti, George Koutsouflakis, George Valvis, Lucy Blue, Lilian Ray, archaeologists, Stavros Vossyniotis, mechanical engineer, Vasso Kyriakopoulou and Aristotelis Papadakis, topographers, Vassilis Koniordos and Yannis Baltsavias, architects, Kyle Jachney, photographer.

ARCHAEOLOGICAL RESULTS

In the course of the first two excavation seasons at Dokos more than 4000 finds were raised, mostly large and small sherds of Early Helladic wares, two fragments of a lead rod (probably belonging to an anchor's stock of later times), two stone anchors (see Fig. 5), several millstones and querns, a large number of obsidian blades as well as animal bone and teeth.

The obsidian and the animal remains were found, together with early Helladic sherds, mostly in the lower level of the first trial trench. These finds should not belong to the "closed deposit" of the Early Helladic II ceramic finds, that were raised chiefly from the top layer of the site; they are rather to be regarded as rubbish dumped from the shore, as would be expected in an area that has served as a natural harbour from prehistoric times till the present day.

The finds of Early Helladic II pottery are of great significance, regarding both the variety of sizes and shapes of the vessels they represent and the total number of pots comprising this sealed deposit, which is perhaps the richest sealed deposit of Early Helladic pottery ever uncovered.

The sherds that were raised represent all the known types of fine pottery as well as many types of cooking wares of the Early Helladic II.

They include many of the curious deep spouted vessels known as sauceboats in a variety of different shapes and sizes (Figs. 8a, 8b), as well as cutaway jugs (Figs 9), shallow and deep bowls (Figs. 10a, 10 b, 10c), also in a variety of different shapes and sizes, amphoras (Fig. 11), plates, cups, jars, askoi (Fig. 12) and pithoi, and household utensils (Fig. 13), querns and grinders.

Another important fact that emerges from a preliminary examination of the pottery from Dokos is that the assemblage seems to contain certain Cycladic elements or traits.

All the finds that have been raised are currently being conserved and studied at the Museum of Spetses[2] (Fig. 14).

The study of the finds is being conducted by the two authors of this paper jointly with Prof. Yannos Lolos (pottery) and Mr. Christos Agouridis (querns and grinders). It is based on an extensive computer programme that will include drawing the objects (computer graphics, see Figs. 9a, 9b and 10a, 10b) and recording all the data of the project as well as comparative material. Drawing of the finds has been the work of the archaeologists Tonia Koutsouraki, Stella Demesticha and Alexandra Mari

This programme will ensure a speedy and efficient processing of the data and will facilitate the final study. An additional objective of the programme is the publication, both popular and scientific, of the project's results with the electronic means (CD-Rom) that will be widely used in the near future for an improved dissemination of research results and other knowledge.

The ambition of the Dokos project is not limited to the completion of the excavation of the Early Helladic II "closed deposit" which most likely represents the cargo of the oldest known wreck ever discovered; it extends to the application of revolutionary technology for the conduct of the research and the processing of primary and secondary data so that the Dokos project may serve, as a model and precedent for the subsequent underwater research in Greece and elsewhere.

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NOTES:

1. This paper was presented in August 1991 at the Symposium, during the 3rd excavation campaign at the Dokos cargo site. The topographical plan published here presents the surveyed artifacts of the 1991 campaign.
2. At the same time that the material from the EH II wreck is being processed, the study is underway of a series of pottery and other finds from the neighbouring EH II site of Ledeza on the north shore of Dokos, which are also in the Spetses Museum (Fig. 15). These finds came from earlier rescue collections made by Mr Adonis Kyrou on land and in the sea at the locality of Ledeza (Kyrou 1990, 71, 72, 250-251), and from the underwater survey carried out there by H.I.M.A. in August of 1991. For a preliminary study of the material from Ledeza see (Papathanassopoulos, Lolos and Vichos, 1995, 27-29).

ILLUSTRATIONS

1. a Map of the Argolic Gulf with the position of the Dokos island (drawing, K. Kazamiakis).
1b. Topographical plan of the Skindos bay and the promontory Myti Kommeni, with the positions of the cargo site and the prehistoric settlements on land (drawing, K. Kazamiakis).
2. A pottery fragment with its label B20 (photograph, K. Jachney).
3. Surveyor V. Kyriakopoulou plotting the positions of finds with SHARPS (photograph, K. Jachney).
4. Taking stereophotographs with the frame. On the bottom under the frame can be seen the photographic scales used for the photogrammetry (photograph, K. Jachney).
5a and 5b Drawings of the two stone anchors, one round, the other pear-shaped, pierced with one hole each (drawings, T. Koutsouraki).
6. Archaeologist Lucy Blue excavating with the air lift (photograph, K. Jachney).
7. Topographical plan of the cargo site (drawing, V. Kyriakopoulou).
8a. Four sauce boats of different type and size (photograph N. Tsouchlos).
8b. Drawing of an almost complete gigantic sauceboat with a strikingly small spout (drawing, T. Koutsouraki).
9. Neck and upper body of a beaked jug. Note the incised mark in the form of an M (drawing, T. Koutsouraki).
10a. One deep and one shallow bowl (phiales), after restoration (photograph, N. Tsouchlos).
10b. and 10c Drawings of the same type of the above vessels (drawings, S. Demesticha)
11. An almost intact amphora of medium size. Note the marine concretions in the inner part of the body (photograph, N. Tsouchlos).
12. A large part of an askoid vase with a flat handle and an incised mark (drawing, T. Koutsouraki).
13. An almost complete EH II brazier after restoration (photograph, N. Tsouchlos).
14. Conservation by mechanical treatment of a deep bowl at the laboratory of H.I.M.A at the Museum of Spetses.
15. Large EH II bowl from the underwater site of Ledeza at Dokos (photograph, N. Tsouchlos).

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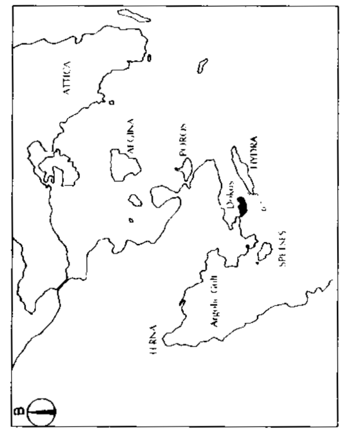
ATTICA
AEGINA
POROS
HYDRA
SPETSES
LERNA
B

FIG. 1b

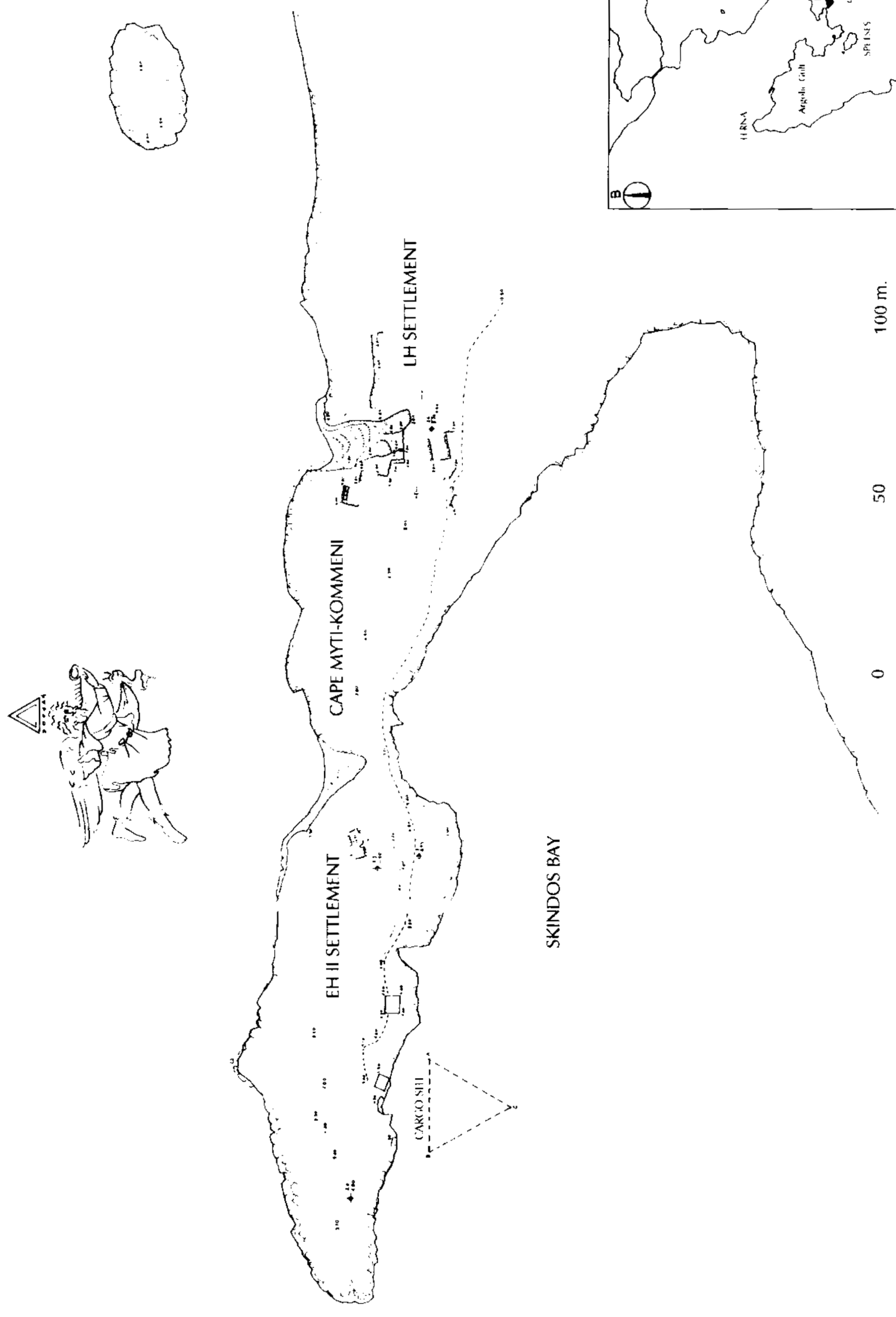
LH SETTLEMENT
CAPE MYTI-KOMMENI
EH II SETTLEMENT
SKINDOS BAY
CARGO SITE
0
50
100 m.

FIG. 1a

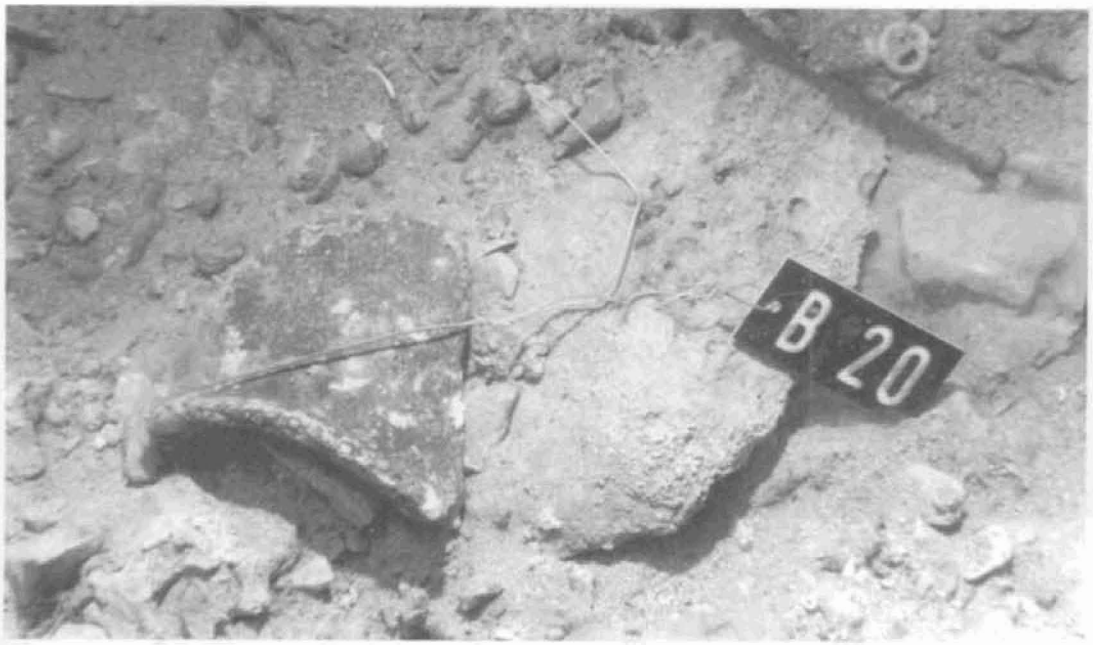

FIG. 2

FIG. 3

FIG. 4

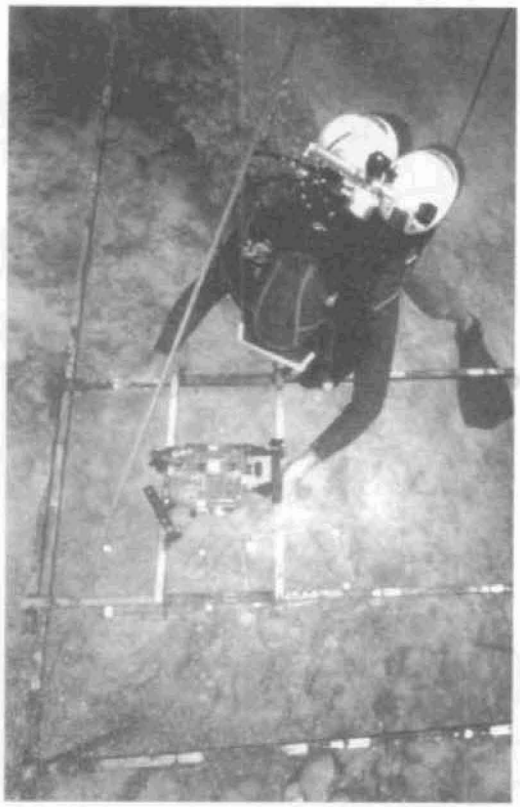

FIG. 6

FIG. 5b

FIG. 5a

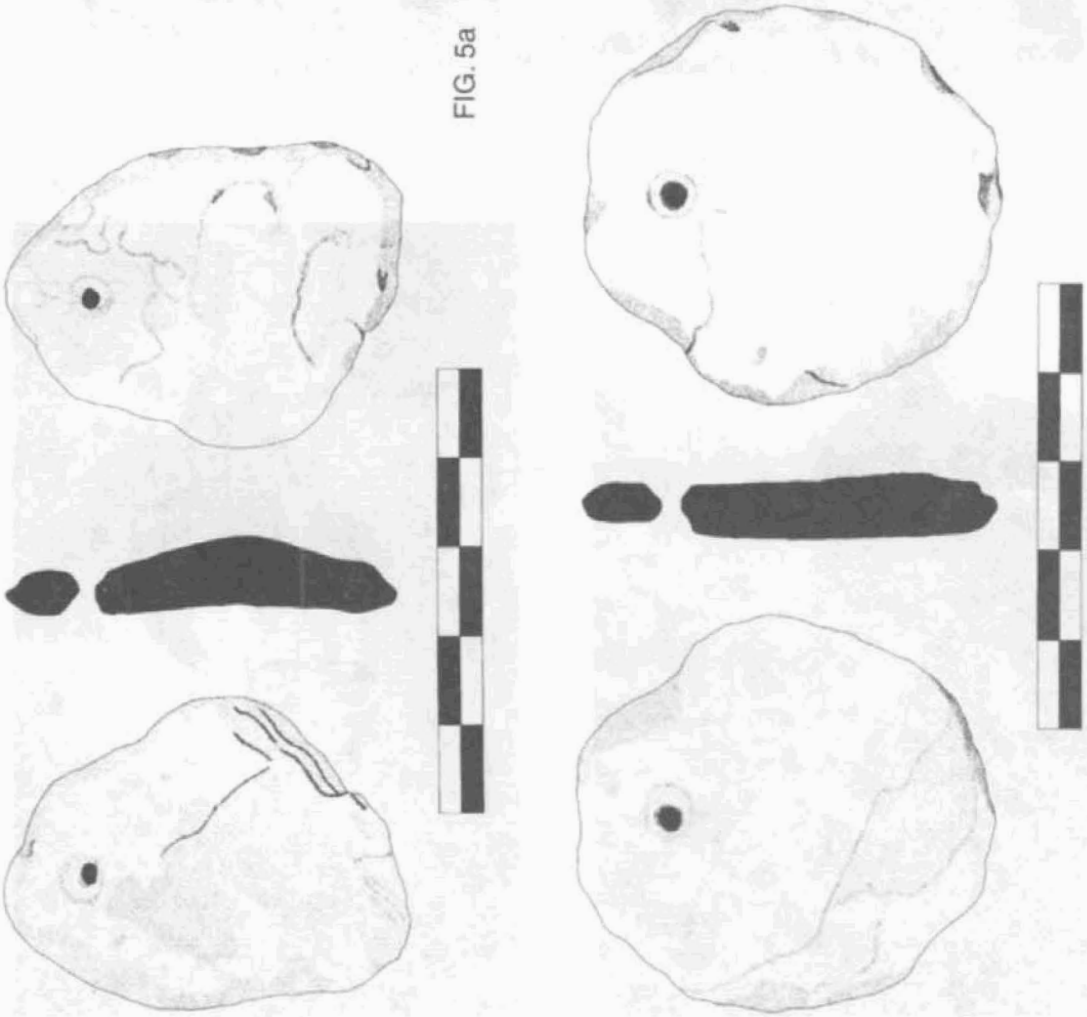

FIG. 7

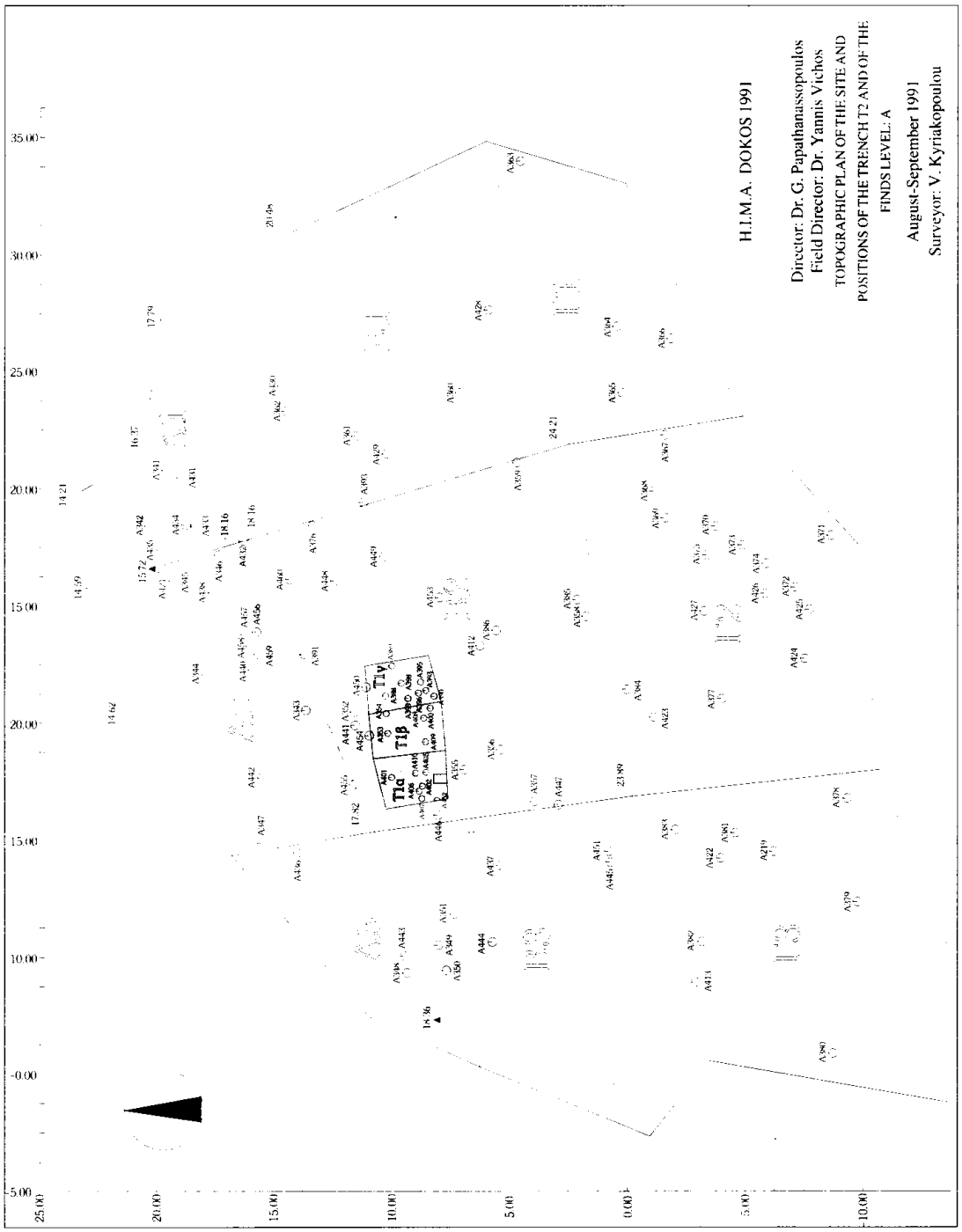
H.I.M.A. DOKOS 1991
Director: Dr. G. Papathanassopoulos
Field Director: Dr. Yannis Vichos
TOPOGRAPHIC PLAN OF THE SITE AND
POSITIONS OF THE TRENCH T2 AND OF THE
FINDS LEVEL: A
August-September 1991
Surveyor: V. Kyriakopoulou
T1γ
T1β
T1α
35.00
30.00
25.00
20.00
15.00
10.00
-0.00
-5.00
25.00
20.00
15.00
10.00
5.00
0.00
5.00
10.00

FIG. 8a

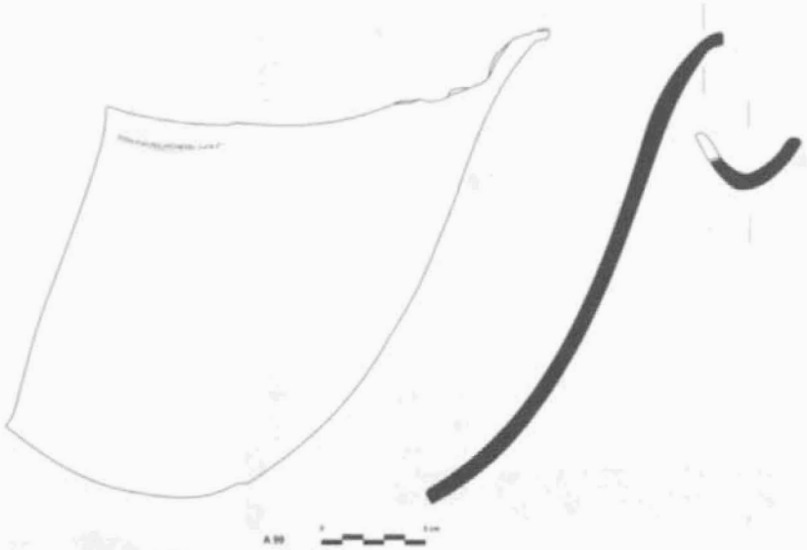

FIG. 8b

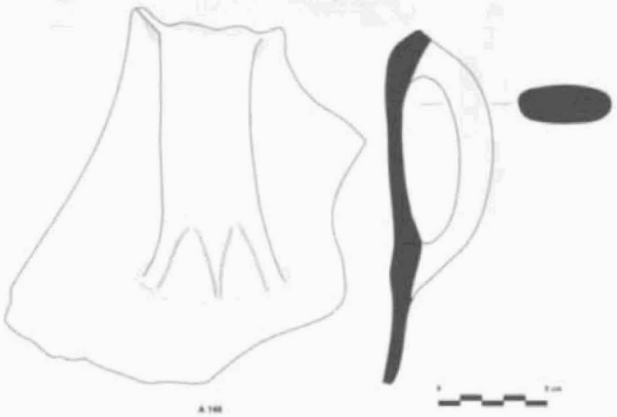

FIG. 9

FIG. 10a

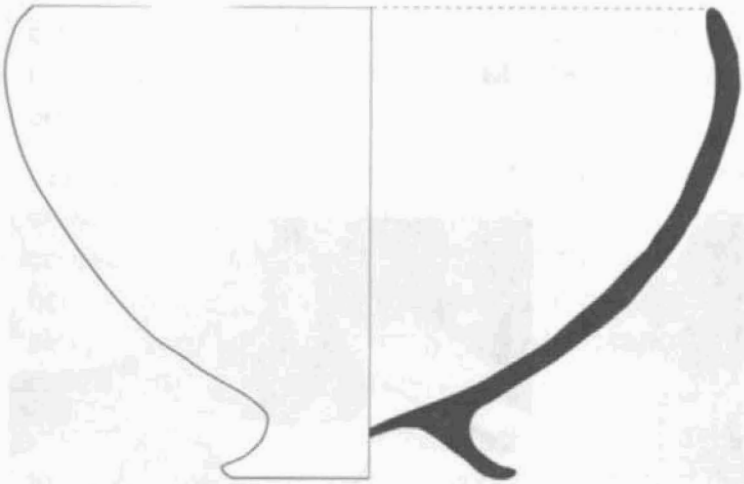

FIG. 10b

FIG. 10c

FIG. 11

FIG. 12

FIG. 13

FIG. 14

FIG. 15