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Underwater survey of ancient Gythion, 1972

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Introduction

Based on a preliminary survey made in 1971 (Edgerton & Scoufopoulos, 1972), a more systematic underwater search and survey of the submerged remains of ancient Gythion was undertaken between 8 and 29 August 1972. This area was selected because of its importance as a harbour from Phoenician times and throughout the Classical and Roman periods. Tradition has it that Helen and Paris spent their first night together on the island of Kranae and set sail from there on the long journey to Troy (*Iliad*, iii, 441–6). The find of a large number of murex shells near Kranae suggests that the island may have participated in the Phoenician trade in purple dye.

Gythion, located on the north-western shore of the Laconian Gulf, served as the harbour of Sparta (Fig. 1). Strabo tells us that the naval station there was dug out by man (*Geography*, viii, 5, 2). As the naval base for Sparta (Xenophon, *Hellenika*, vi, 5, 32), Gythion suffered enemy attacks. Tolmides, the Athenian admiral, actually burned the Spartan shipsheds there in 456–5 BC (Thucydides, i, 108, 5; Diodorus, xi, 84, 6).

When Gythion was granted her independence from Spartan domination by Augustus, she became a commercial port, providing a stopping place on the route from Athens to Rome. She was particularly engaged in the export of Lapis Lacedaemonius, a marble quarried in the nearby area of Krokeai and used to decorate Roman baths (Pausanius, iii, 21, 4; Pliny, *NH*, xxxvi, 55). Though several earthquakes shook the town in the 6th and 5th centuries BC, the worst one came in AD 374–5 when a considerable part of the town disappeared under the sea.

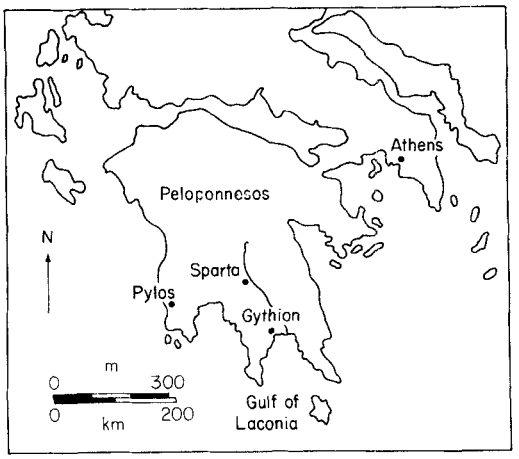

Figure 1. Map showing location of Gythion.

1. The survey

Our survey covered an area extending from the public beach northward to Selenitsa and was divided into five sections: B, C, D, E, F (Fig. 2). The whole area, the topography of which has changed much over the years with the filling-in or reclaiming of land as well as shifting of the river beds (Skias, 1891; 1892: 60–4, with map (65–6) based on Le Bas, 1888: pl.26), was mapped with the invaluable

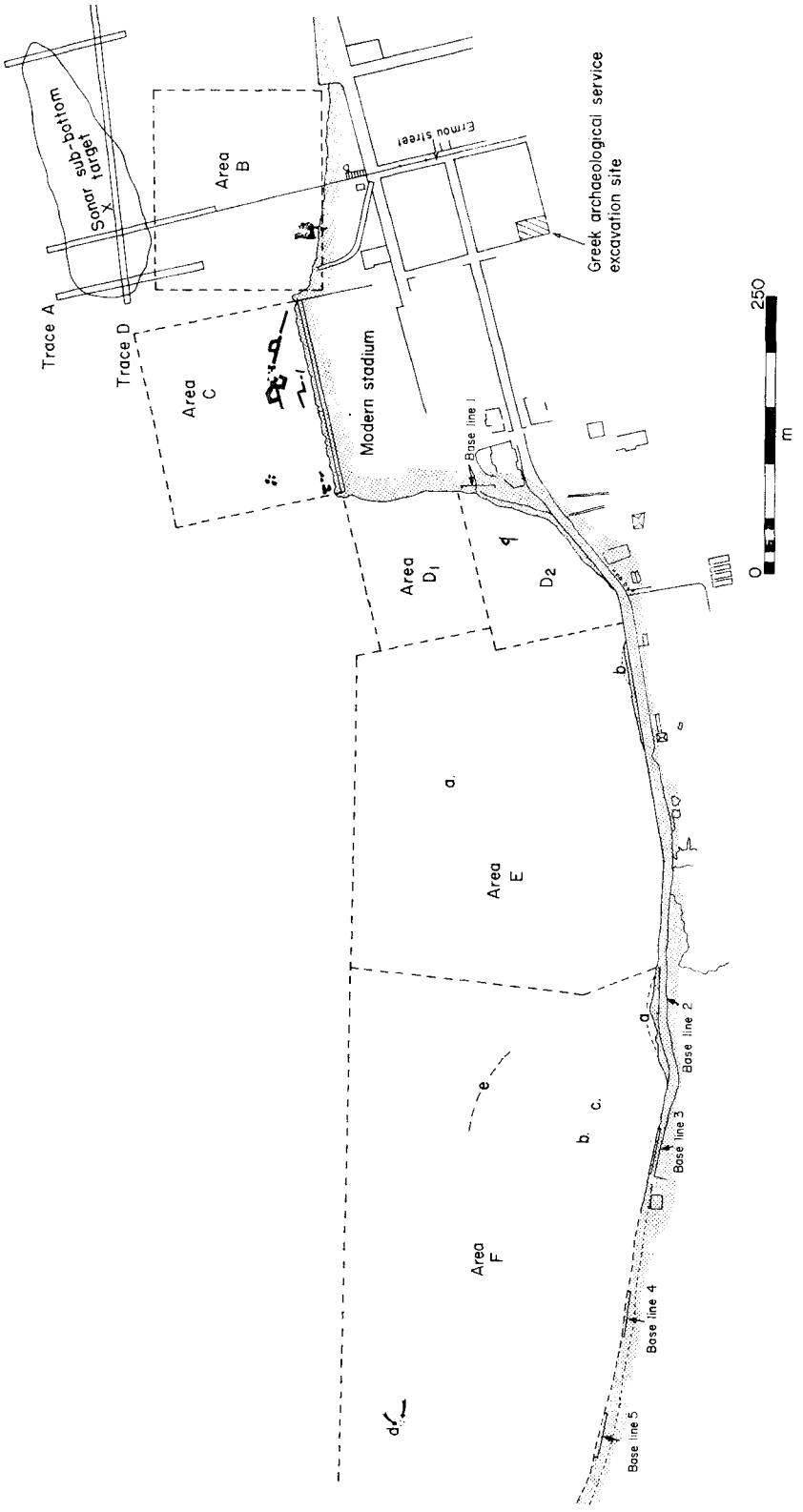

Figure 2. Gythion: map made from photomosaic and surveyor's transit readings. Areas indicated by dotted lines are those surveyed by divers.

aid of Julian Whittlesey who provided a series of aerial photographs taken from a hydrogen balloon equipped with a camera. Photographs taken from a height of about 200 m were made into a photomosaic which covered the shoreline and sea-bottom along the area to be studied. These, combined with measurements taken with surveying instruments, provided the basis for the mapping. Each area was then photographed from a lower height (*c.* 50 m), and outlines of underwater structures with interesting patterns appeared along the bottom. Using these indications, divers swept each area systematically following swimlines that extended 150 m out from shore. Positions of broken blocks, walls or other notable remains were triangulated from the swimlines which were marked every 5 m. This information was then plotted on the general and more detailed maps which follow.

Area B (Fig. 3) is located just south of the filled-in stadium, along the modern public beach. It measures 190 m north-south by 150 m east-west, covering an area of about 7 acres. There is a large structure, the so-called 'Bath of Palaiologos', clearly visible close to the shore. Several rooms are outlined extending out from shore. Remains of a pebble mosaic on the beach are associated with this building, and further wall foundations in the sand to the south indicate that more structures once lined the present shore. Scattered remains of Roman walls of brick and mortar were found throughout Area B. Between swimlines 1 to the south and 6, other considerable building remains were seen: broken blocks of stone and rubble and

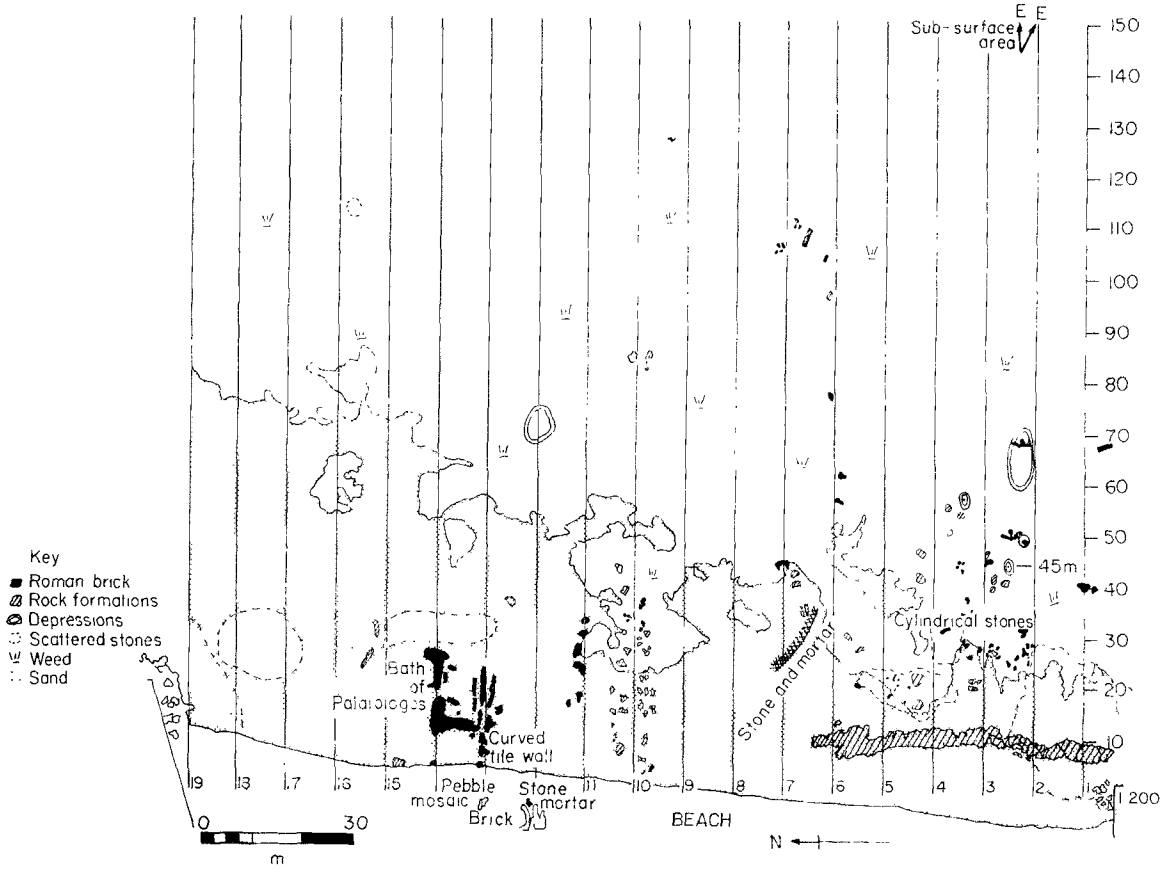

Figure 3. Enlargement of Area B. Vertical lines indicate swimlines used for orientation of divers and triangulation of finds.

several cylindrical stones covered with concretion. Between swimlines 7 and 8 was a raised (0·5 m) construction of stone and mortar, suggesting a roadway. Besides these visible remains in Area B, weed patterns, depressions and probed sub-surface areas suggest further debris.

Beyond Area B, the offshore sub-bottom area found by Dr Edgerton with sonar in 1971 (Fig. 2; Edgerton & Scoufopoulos, 1972), was further explored and plotted more accurately. (See below, 'Techniques and Equipment'.)

Area C (Figs 2 and 4) covers 150 × 177 m, due east of the stadium wall, extending eastward from the ancient acropolis (Skias, 1892: 55) and ancient agora area. This section contains extensive remains still visible today in shallow water (2·5–3 m deep). Large well-cut ashlar blocks form a long wall (85 m) with three rooms attached to it (Fig. 5). Room A (Fig. 4) is trapezoidal in shape (measuring 10 × 5·50 × 8 × 7·20 m). One or two courses of blocks are in position and reach a height of 0·85 m along the north wall. South of A (Fig. 4) the wall runs for 30 m at a diagonal toward the south-western corner of the modern stadium. At points where the grass covers it the wall is not visible but can be followed by probing with a pole. Its average thickness is about 2 m and the blocks vary in size (e.g. 2·15 × 1·20 × 0·6 m; or 1·05 × 0·95 × 0·70 m; or even 0·95 × 0·95 × 0·75 m).

Room B (Fig. 4) begins 14 m north of A where the wall is fragmentary and seems to

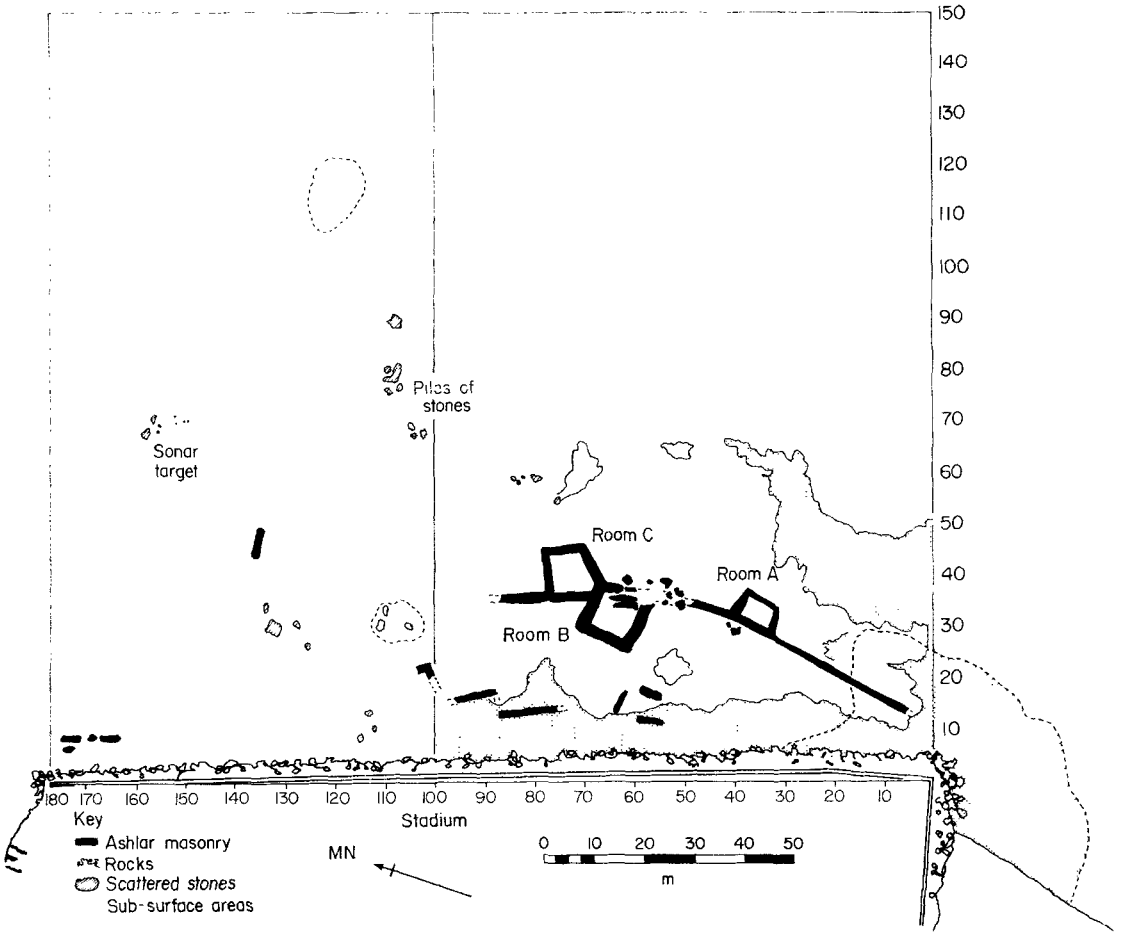

Figure 4. Enlargement of Area C.

Figure 5. Air photograph of wall and tower area in Area C. Rooms B and C (Fig. 4) appear as shapes among the weeds toward the upper left-hand corner of the photo. Room A is obscured by the boat which is tethering the camera balloon.

resume at a new angle. Room B appears to be square, but is attached to the west side of the wall at an angle, with its south-east corner not clearly preserved. The west wall measures 12 m, the north 10·50 m, the south and east 12 m (?) and 10·50 m. Two parallel lines of blocks extend obliquely into the room from the south-east corner and stop abruptly. There is no apparent explanation for this.

Room C (Fig. 4) abuts the east side (12 m length) of the long wall with its south wall (8·25 m) continuing at an angle from the north wall of Room B. The north and east walls both measure 8·25 m. The long wall continues due north from C along a straight line which slowly disappears after about 12 m. The length and construction of this massive wall suggest that it may have been the circuit wall of the ancient town. If so, another section of it may survive in Area D_2 (Fig. 6) where a wall of fine ashlar blocks runs roughly parallel to the shore for

Figure 6. Enlargement of Area D_2. Hatched area at bottom of map indicates amount of fill bulldozed over the ruins during the survey in 1972.

a length of 25 m, disappearing under the sand and then reappearing 10 m further east (Fig. 7); the blocks vary from 1 to 2 m in length and a semi-circular row is attached to the line as if to form a tower or apse. Other fragmentary walls scattered in Area C may belong to houses within the postulated enclosure.

A large sweep by divers covering the wedge between the north-east corners of Areas C and D_1 revealed nothing but high weeds and sand (Fig. 2).

Area E (Fig. 2) has a sonar target a. and remains of several walls which run out from shore into the shallow water b.

Three more walls run north-south along the narrow shoreline where the road turns south of the mill in Area F (a, on Fig. 8). Along with remains of Roman brick walls, mortar, and conglomerate blocks, was found a roughly triangular stone with a hole (0·08 m diameter) near its centre (Fig. 8, b). Its shape and size compare favourably with those anchors found at Marathon which may be either ancient anchors for a small boat or anchors used in modern times to anchor fishing-nets (Frost, 1963: 47). Such an object, found among pre-earthquake building remains, must have been dropped on this spot some time after the earthquake and submersion of AD 375. Nearby is a pile of sherds (Fig. 8, c). Parallel to the shore, at a distance of 130–150 m from it, was found an area of loose pebbles (Fig. 8, e) along a line 50 m long. This may mark the ancient beach and perhaps be related to the stream which today runs just south of the mill. Further north, in an area of large conglomerate blocks (Fig. 8, d), a base, two necks and sherds were found, apparently from amphoras.

At the north end of Area F (Fig. 2), the coastline turns gently to the east along the sandy stretch of Selenitsa beach and the beach of the new *Bungalows Laconis* and ends at a limestone cliff. No obvious man-made structures are apparent in this area.

The beach beyond the cliff is known as Baltaki (Fig. 9) and is of some interest as long walls extend down into the sea through

Figure 7. Air photograph of Area D_2. Apse shape may be seen near right centre.

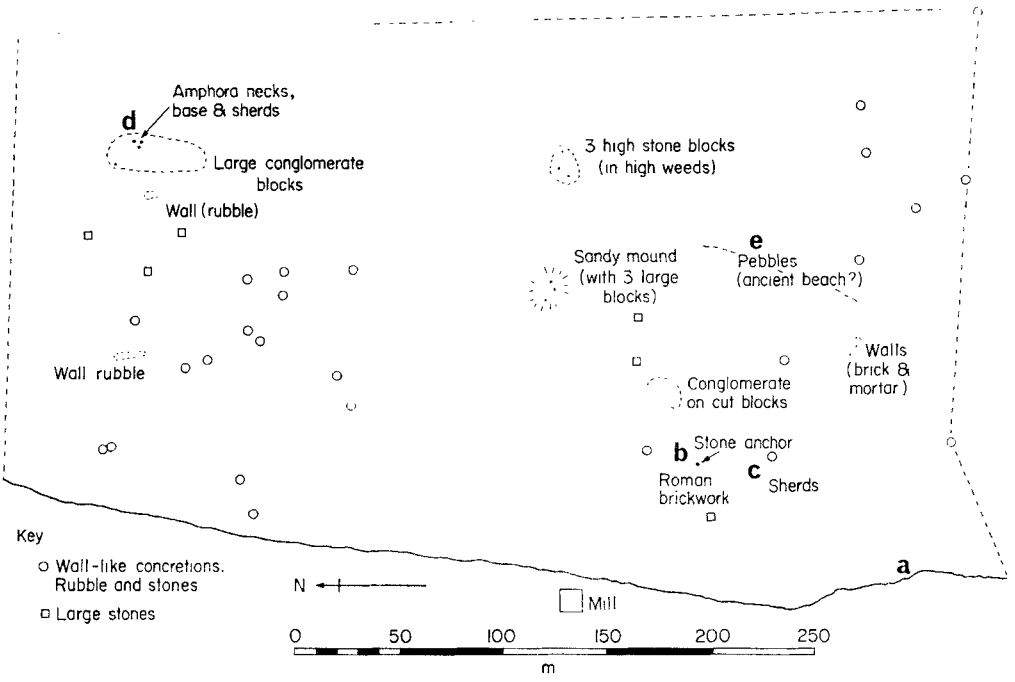

Figure 8. Enlargement of Area F.

Figure 9. Aerial photo of Baltaki. Roman walls appear near the upper right-hand corner. The extensive rock formations are beach rock. Baltaki beach has an east-west orientation.

dunes and grass (Forster, 1906–7: 230) in which there are considerable remains of Roman building as well. The construction is mortar of 18% cement and 82% aggregate by weight[11]. This was also an area where additional structures connected with the ancient, probably Roman, town of Gythion were located.

Further on, to the east, there is a small bay called 'Tis Mantilou'. Parallel walls leading out from the shore here suggest the foundations of shipsheds (those burned by Tolmides in 456/5 BC?). However, the construction here too appears to be Roman. Further study of the remains may reveal the exact purpose and date of these structures.

This area, and the waters around the three islands (Trinisia) and around Kranae, where quick reconnaissance revealed many amphora fragments, need more careful surveys and study to supplement the present work. A fuller picture of the extent of ancient Gythion and its environs may thus emerge, and the location of the Spartan shipsheds may be achieved.

2. Techniques and equipment

Sonar survey by Dr H. E. Edgerton

Equipment

The sonar used on this expedition was an EG&G, Inc. experimental model which had been modified at MIT. Two modes of operation could be selected by switching transducers and amplifiers:

1. Side-scan to port covering 500 ft (200 kHz); and
2. Vertical (5 kHz) sonar for penetration below the bottom.

All records were made on an Alden wet paper recorder. Power for the sonar was obtained from a Honda 300 W gasoline-powered generator. The slight irregularities of the timing traces are due to speed variations of the generator caused by the engine governor.

The large area sub-bottom target

We first explored further and plotted more accurately the offshore sub-bottom area found in 1971 which extends from the city hall to the stadium off Area B (Fig. 2).

The sub-bottom area is approximately 80 m in width, parallel to the shore and 250 m long. It occurs about 5 m below the bottom at a slight slope seawards, parallel to the sea bottom. The shallow end on the shore side is 7 m deep. The ocean side is at a depth of about 15 m. It will be noted from the sonar records that the edges of the anomaly are very distinct; also, a flat geological(?) layer can be seen at 15 m below the bottom in several of the sonar records. There are a few small targets between the large anomaly and the bottom. The nature of these is unknown, but should be explored by a drilling or coring technique.

Many sonar records were made of the entire target area in order to define the position and shape of the target. Figure 10,

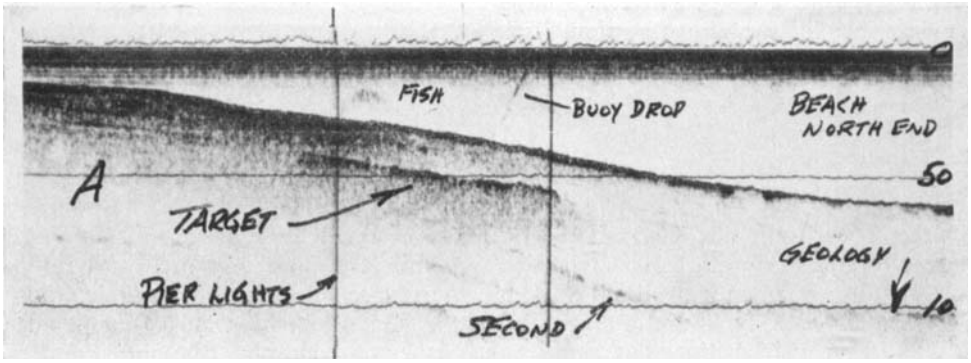

Figure 10. Vertical Trace A (east-west).

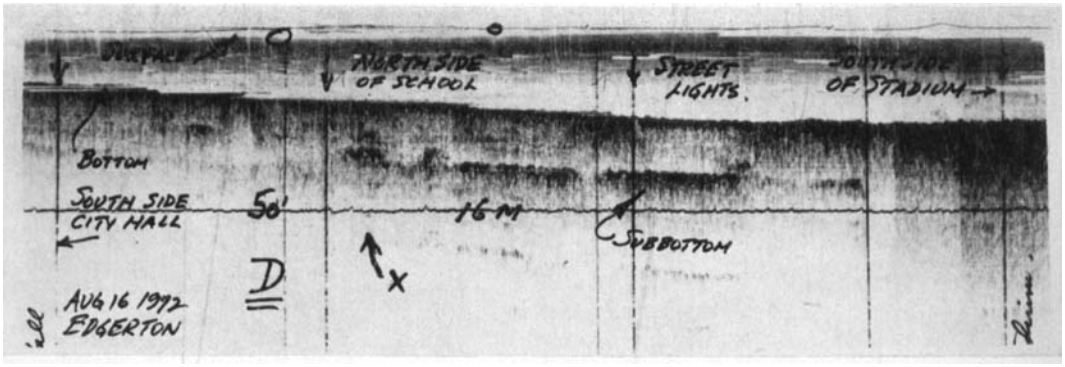

Figure 11. Vertical Trace D (north-south).

for example, shows the east-west record for the trace A. A close examination of the north-south sonar record for trace D (Fig. 11) indicates a break in the bottom near the centre and the existence of three small areas of shallower targets. Two of these are equi-distant from the centre break mentioned above. The most favourable spot for future excavation is indicated on Figs. 2 and 11 by a small x; note in Fig. 11 that the target extends above the sub-bottom pavement. The following depths were measured from the sonar record of Fig. 11 at the target x:

Depth from surface to bottom: 6 m

Depth from botton to target x: 2·4 m

Depth from surface to large sub-bottom target: 10·1 m.

Geological sub-bottom

Many of the 5 kHz sonar records show a sub-bottom layer that is deeper than the large target described in the above section. This layer, believed to be rock, is marked on Fig. 12.

Side-scan sonar studies

A side-scan sonar (port side only) of 200 kHz was used for area exploration. This recorded the sea bottom to a depth of about 30·4 m and horizontally to 152 m. Several dives were made at targets displayed by this side-scan sonar and also by the vertical sonar.

One of these dives was at a spot about 21 m deep, where vertical sonar showed a small target of about 2 m height (Fig. 13). The sonar records (Fig. 14) show a side-scan sonar trace and a vertical one made by 5 kHz. The divers reported smooth rocks, one of which was some 7 m long and 2 m high.

Another dive was made at a spot where a strong side echo target was visible at 27 m (Fig. 13); the vertical sonar showed practically nothing. The divers found stones on the surface, none of them projecting more than a few feet. Stone samples proved to be of limestone. A sample from another spot nearby was also limestone of a different colour and nature. It is believed that both of these samples were ballast stones that could have been thrown overboard from sailing ships which were at anchor as they took on cargo from small boats.

Aerial photography

Using his aerial photography equipment, a Hasselblad EL camera with 50 mm Zeiss Distagon attached to a hydrogen balloon, Mr Julian Whittlesey photographed an area from the southern edge of the public beach known as Selenitsa, along a distance of about 2 km. The lack of wind during the first mornings made this work possible. Soon after this the Meltemi wind began, curtailing further photography, for the balloon cannot be controlled in strong winds and the camera

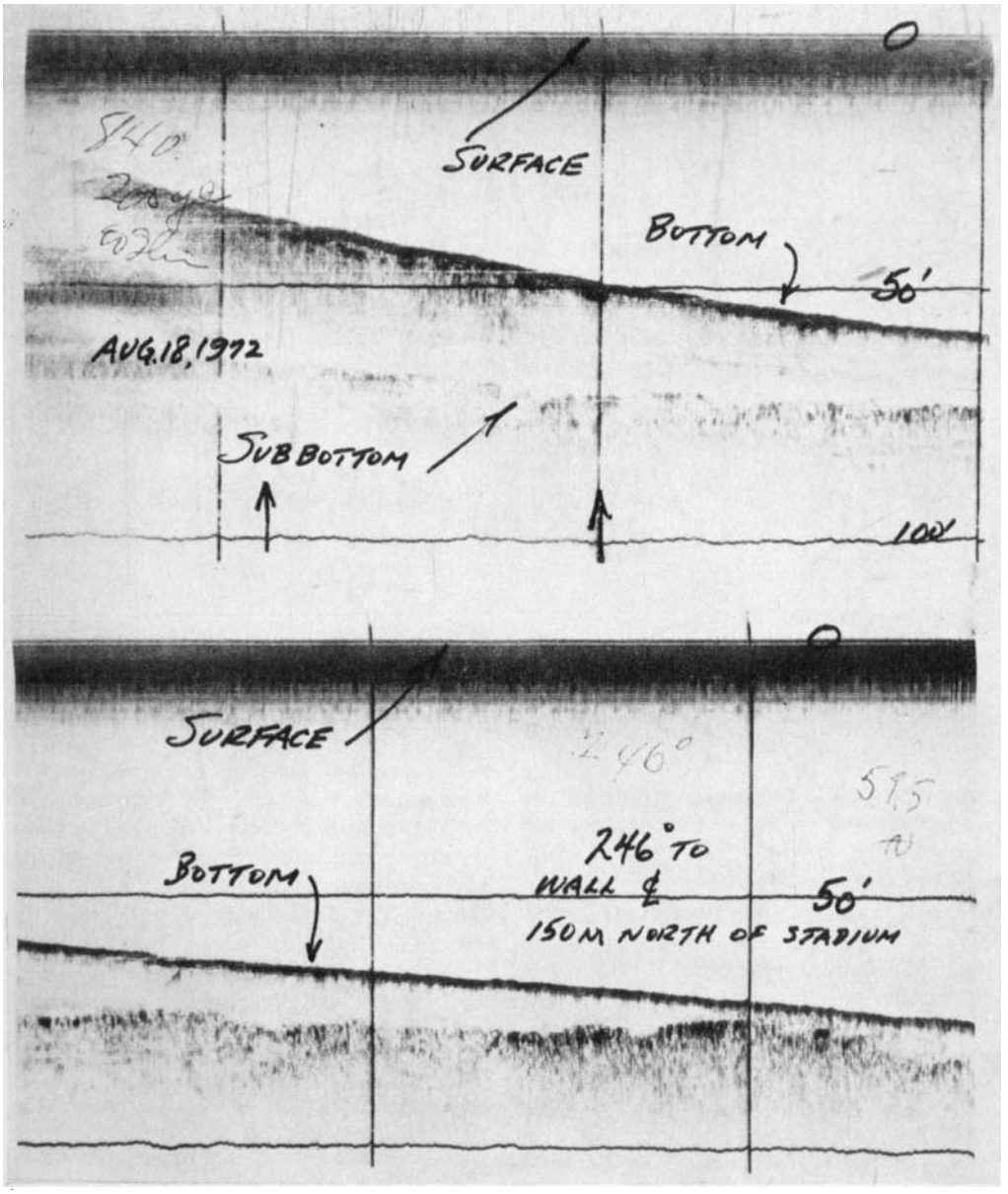

Figure 12. Vertical trace showing geological sub-bottom.

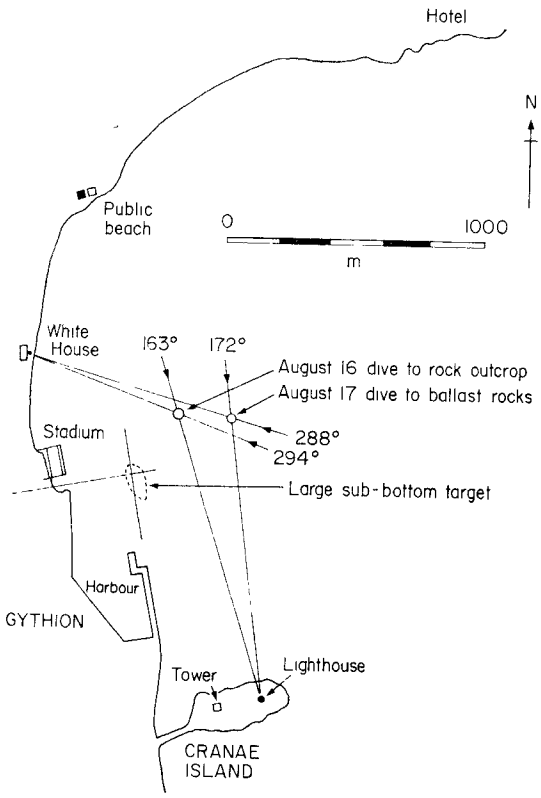

Figure 13. Sketch map of Gythion harbour area (H. E. Edgerton). Not to scale.

is endangered while the rough surface of the sea obscures the bottom. Fortunately the Meltemi abated during the last days of the expedition and Mr Whittlesey was able to complete the work, photographing areas previously missed, as well as the beach area of Baltaki. Time did not permit further work in the areas of Kranae and Trinisia. Preliminary surveys indicate that aerial photographs of these areas might reveal significant remains.

Techniques and equipment used in surveying Areas B-F

Area B: Gythion public beach

Aerial photographs and preliminary investigations in 1971, indicated that a grid system should be used in this area; the remains seemed extensive and scattered over a large area. Grids, made at first from rope and later from metal, proved troublesome and limiting. A more efficient system was needed to cover the large area, so swimlines were used.

From a base line laid out along the beach with a transit, perpendicular swimlines were laid out into the sea (Fig. 3). These were positioned by transit: a diver at the seaward end of the line, following hand signals from the transit man on the beach, attached the line to the sea floor with a metal rod. Metal hoops were used to peg the buoyant line to the sea bottom along its length. These swim lines were calibrated with plastic tags at 5 m intervals to facilitate triangulation. Fibreglass metric tapes were used to triangulate finds from the swimlines.

Area C: Modern stadium

Swimlines were not used here owing to the more concentrated remains in the area; also there was no beach to work from. A sliding line of a different nature was devised by the technical director, Alfred Kann. Two stationary surveyed lines were laid out due eastwards from the north and south ends of the stadium and fastened to the bottom with metal hoops. Another line, not used for triangulation but merely for diver orientation, was stretched between the side lines and looped around them. This line was slid along and positioned at 10 m intervals by the divers. The finds were triangulated from shore sightings on poles, held above the finds by divers, using a combination of transit and alidade and kept in communication by walkie-talkie.

Area D: North-west of the stadium

In order to cover the extensive areas D_2, E and F another survey technique was used. Swimlines were again run out from shore, but they were not positioned precisely with a transit. Finds located by divers swimming out along these lines were marked with buoys which were then triangulated from shore by transit and alidade.

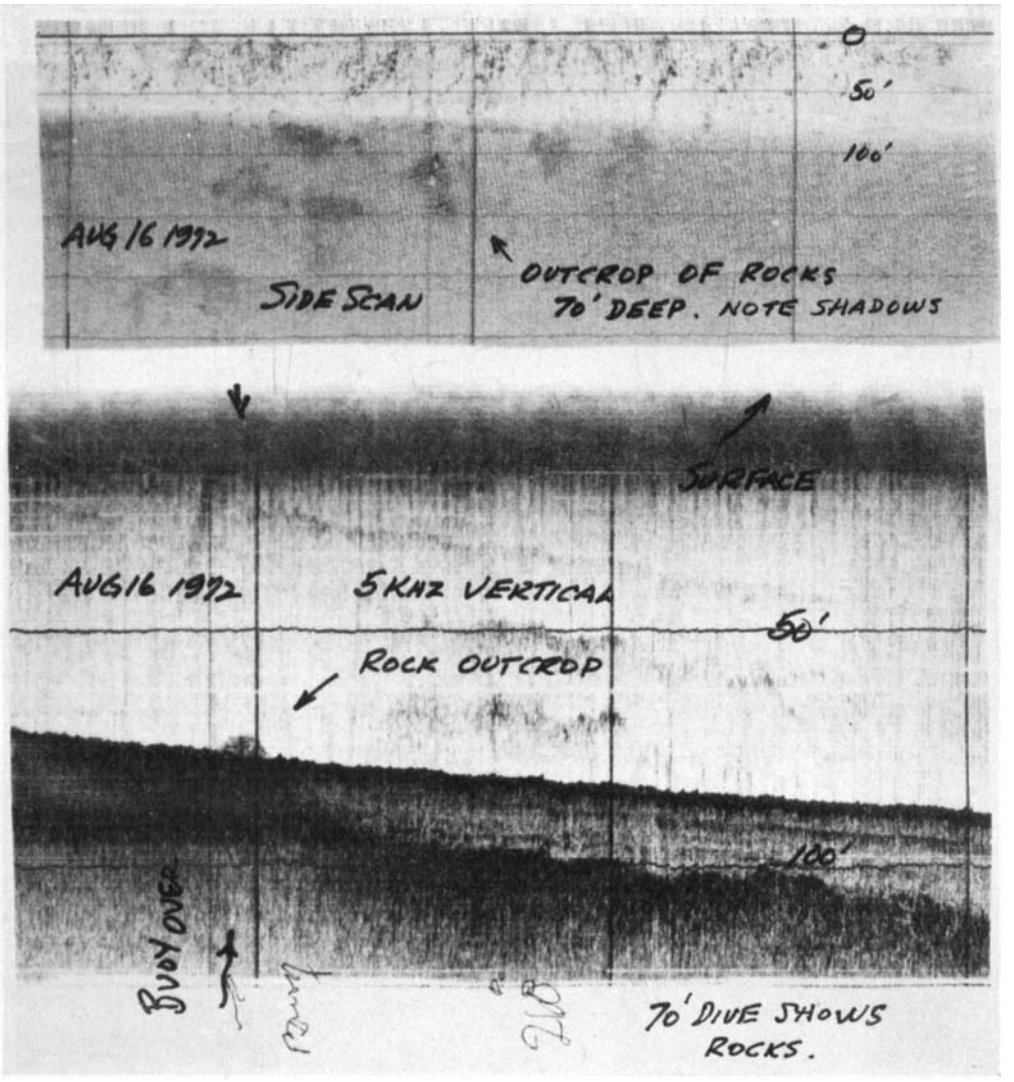

Figure 14. Side-scan and vertical sonar trace: rock outcrop.

Areas E and F: From the stadium to Selenitsa beach

The same technique was used as in Area D_2: swimlines were laid out to a distance of 150 m. It was necessary, however, to survey farther out from shore, to a distance of 300 m. The report by Skias in 1892 indicated further remains in that area and it was too shallow for sonar search. It was also suspected that the ancient coastline might be found in the area. In order to accomplish this survey beyond the 150 m mark, divers followed a stone, which was trailed on a line behind a boat, and used compasses. Buoys were released and triangulation was done from shore.

In general, the work of the divers offshore was done between 06.00 and 12.00 hours. In Areas B, C and D, the work of the divers was hampered by swimmers; also, by noon the silt from the filling for the construction of the modern stadium over the ancient ruins was stirred up by wave action and the visibility was too limited to continue

work. Work continued longer into the day in areas E and F, where there were fewer swimmers and less silt.

Acknowledgements

The writers wish to thank Dr H. E. Edgerton for his survey work at Gythion; without his involvement such a large area could not have been surveyed. Our thanks are due also to Mr and Mrs Julian Whittlesey, whose generous and important contribution to archaeology and particularly to the study of harbours in Greece is well known.

The future of underwater archaeology lies in the realization of its inter-disciplinary character and the cooperation of such dedicated specialists as these.

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Note

[1] For this analysis we are indebted to the Thompson and Lichtner Company in Brookline, Massachusetts who say: 'The cement is of low alumina and sulphate contents not similar to modern cements. The examination and tests are not adequate to determine age. The low alumina indicates that the material is a pozzolana from Santorin. Santorin Ash is used as a cementing material. The sample is apparently of considerable age.'