

Underwater surveys of North Africa, Jugoslavia and Italy

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SUMMARY

In two expeditions in 1966 and 1967 members of the Cambridge University Underwater Exploration Group surveyed and mapped submerged ancient remains in shallow waters of both the North African and Jugoslav coast and on the bed of the River Garigliano in Italy. The nature of both these explorations was primarily that of a reconnaissance survey to establish the whereabouts, extent and, if possible, the origin of submerged remains. The work was not intended to be completely comprehensive for each site. To achieve

this end several methods of searching and surveying were employed which were quick, sufficiently accurate and did not require the use of sophisticated equipment.

In this paper the first section is devoted to a short account of the underwater finds in each country whilst the second section deals with the methods of survey employed. The surveying section has been divided into two categories—clear water and murky water—but obviously the methods used in each are not necessarily divorced.

An attempt has been made to emphasise a simple and practical approach to the subject, and it is hoped

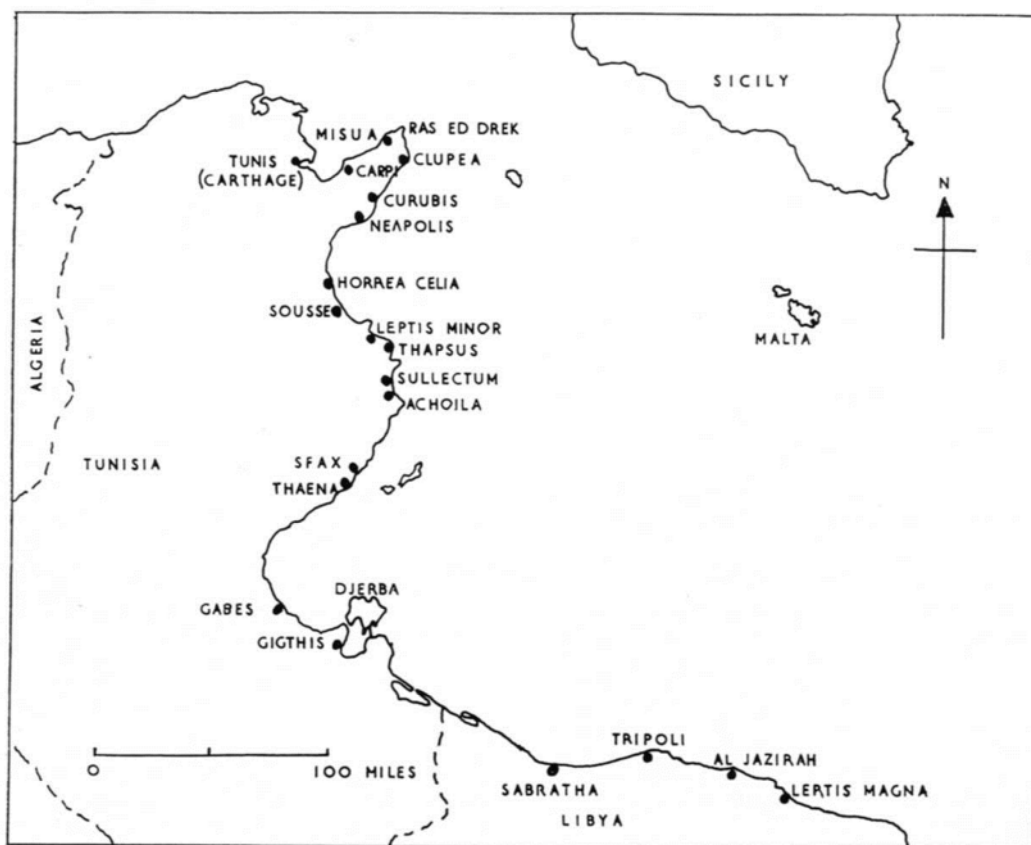


Fig. 1 Map of main North African coastal sites.

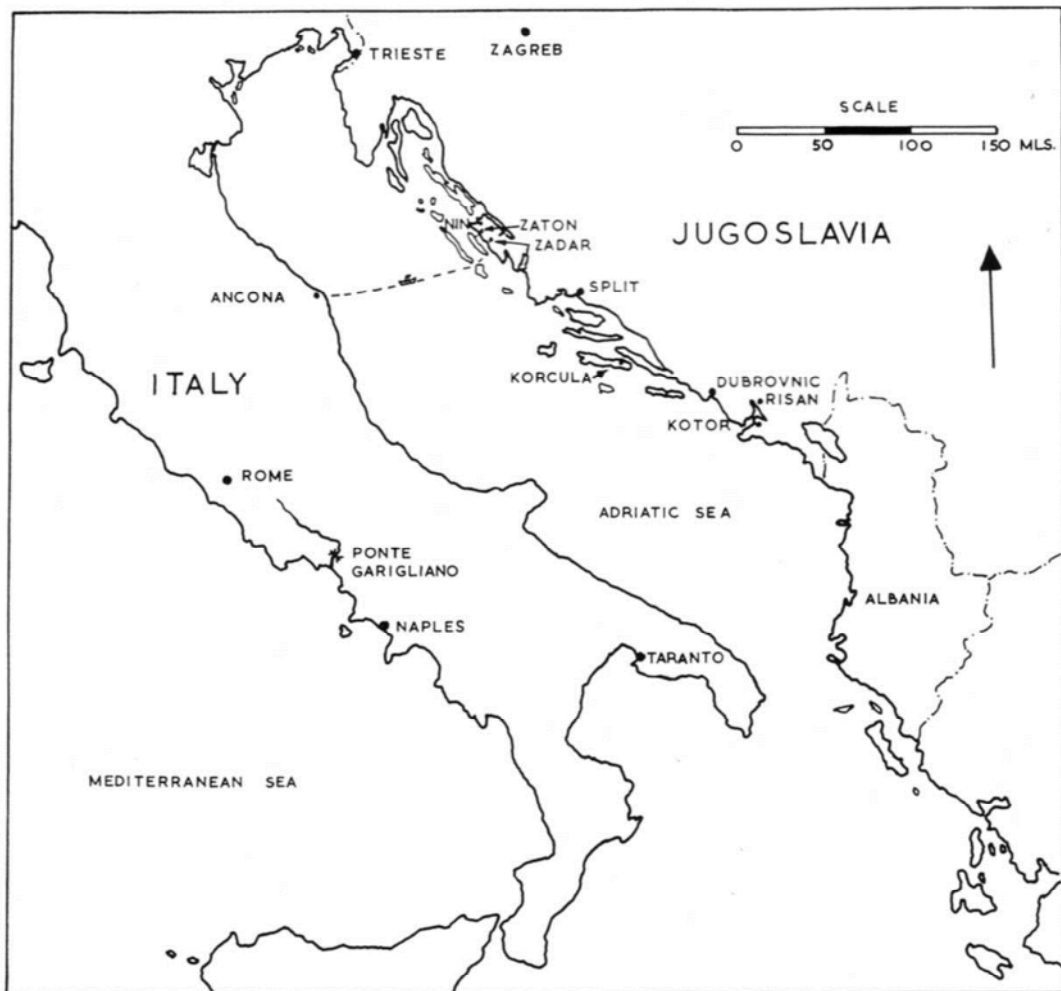


Fig. 2 Map of main coastal sites in Yugoslavia.

that the paper's contents will be of value to all groups engaged in similar work in the future.

INTRODUCTION

The search and survey methods illustrated in this paper were used and, in some cases, developed by two underwater archaeological expeditions from The Cambridge University Underwater Exploration Group.

The first of these, the Cambridge Expedition to Sabratha, 1966, led by R. A. Yorke, explored and mapped the submerged remains of 15 classical ports in North Africa. Starting at the port of Sabratha in Libya the group moved westwards covering most known sites as far as Tunis (Fig. 1).

Following this work members of the same group prepared extensive plans to continue the survey into

Algeria to cover some 30 sites between Tunis and Cherchell. Regrettably, the outbreak of the Middle East War in June 1967 forced the group at the last minute to change the location of its work. The Cambridge Illyricum Expedition 1967, renamed and led by M. F. Dallas, set out to Yugoslavia (Fig. 2) to investigate submerged sites along the coast. Owing to the late stage at which the new plans had been formed it was only possible to carry out a limited amount of work in Yugoslavia, and the expedition then travelled to Italy where it joined a team under the direction of the Council of Underwater Archaeology, San Francisco, which was engaged in a detailed search of the River Garigliano. This lay some 60 miles north of Naples close to the site of ancient Minturnae, and on its bed lay a wealth of remains of undermined buildings and ancient artefacts.

Section I: Account of work in Libya, Tunisia, Jugoslavia and Italy

LIBYA

SABRATHA

The excavated and in many places re-erected ruins of the Roman town stretch along the sea shore. The sea area off the town can best be seen from the commanding height of the Theatre parapets, but the only obvious sign of a harbour is the reef which runs parallel to the shore (Fig. 3).

The outer sea defences of the harbour were formed by the reef and the long breakwater of boulders that was found to run south-east from the western island. The reef was capped with Roman concrete and there are signs that the concrete may have been encased with blocks. Alternatively, there might have been a small building on the western end of the reef. The top of the breakwater was in places only 0.3 m. below the surface and was well marked in rough weather by the surf breaking on it.

The abundance of pottery fragments found by divers during the survey was of particular interest. These piles of sherds were usually fairly localised, and among them perfect specimens of a small pottery jug and a shallow dish were found.

To the north of the Seaward Baths a complex system of rectangular blocks was discovered running 75 m. out towards the reef. Unfortunately, it was partly obscured in places by sand and large growths of the Mediterranean sea-grass, *Poseidonia*, but the visible remains which were surveyed consisted of lines of blocks lying in 6 ft. of water, sometimes two or more courses deep. In the area of the blocks there were a number of sandstone and cipollino columns. It is possible that the blocks were the remains of a quay which might have had a porticoed building or warehouse built on it, similar to the smaller of the ones excavated at Leptis Magna.

On the western shore of the bay a small quay, again made from cut blocks, and numerous parallel rock cuttings were found. Farther east, below the Tuna factory, a circular structure lay at the water's edge. This could, perhaps, have been the foundation of a lighthouse or the end of the Byzantine wall.

Information relating to sea level changes was scarce. On the shore beneath the Temple of Isis the drainage channels from the ruins of the Baths of Oceanus are still above sea level, implying that there can have been little change in sea level since Roman times. The depth of water in the channel to a tank found near these remains and the height of the drainage channels of the circular foundation near the Tuna factory tend to confirm this view.

It has previously been conjectured that the harbour at Sabratha lay only within the reef and that a breakwater connected the eastern end of the reef to the land in the vicinity of the Temple of Isis (Haines, 1947). No indications were found underwater, however, that the reef had been extended to the shore at the eastern end

of the bay. If it is assumed that this breakwater never existed, the main harbour would still have been well protected from the prevailing N.E. wind because the eastern opening is considerably reduced by the nearness of the quay system to the concreted part of the reef. In Roman times the harbour would probably have been one large lagoon, which was entered by the central channel between the reef and the breakwater. The discovery of the breakwater effectively triples the area that would seem to have been suitably sheltered for mooring boats, and the existence of the two quays indicates that the landing facilities were probably compatible with the size of the harbour. A sensible feature of the harbour is that no attempt has been made to close the eastern and western sides ensuring that the coastal current has been allowed to flow unimpeded, thus preventing the harbour from silting up.

Whilst in Libya we visited the other great city of Roman Tripolitania, Leptis Magna. One of the city's many attributes is the magnificent harbour (Bartocchini, *Il porto Romano di Leptis Magna*), which had colonnaded warehouses and a lighthouse 30 m. high. Underwater we examined the foundations of the lighthouse and found that large blocks had been keyed together in a depth of 4 m. The final site in Libya was on the promontory of Al Jezirah, due north of Gasr Chiar. Here we noted the ruins of a small settlement and the remains of a quay. This may be the position of ancient Gaphara, a link in the chain of small Phoenician staging posts along the coast.

TUNISIA

During four and a half weeks, fourteen ancient ports were investigated, and it is worth picking out a selection of these before moving on to Thapsus where one of the most exciting discoveries of all was made.

Unfortunately, from a diving point of view, the eastern coast of Tunisia is shallow and sandy, and much of the archaeological evidence both on land and underwater has been obscured by the sand. This often made the *exact* location of sites a matter of extreme difficulty, but coastal aerial photographs which did in some cases show the positions of underwater ruins were an invaluable asset.

Two interesting examples of Roman pier building were found at Achulla (modern Ras Bou Tria) and Leptis Minor (modern Lemta). At both these ports the harbour jetties are now totally submerged in shallow water, and they had obviously been built out to sea until there was a sufficient depth of water at their ends for mooring or loading boats. Both jetties (each around 500 m. long) appeared to have had a rubble core and been faced with cut blocks of which two courses were still apparent at Leptis Minor.

A completely different form of harbour is typified by the "cothon" built by the Phoenicians at Mahdia. This is a rectangular basin cut out of the solid rock foreshore—a formidable piece of excavation—and joined to the sea by a large channel. Half of the har-

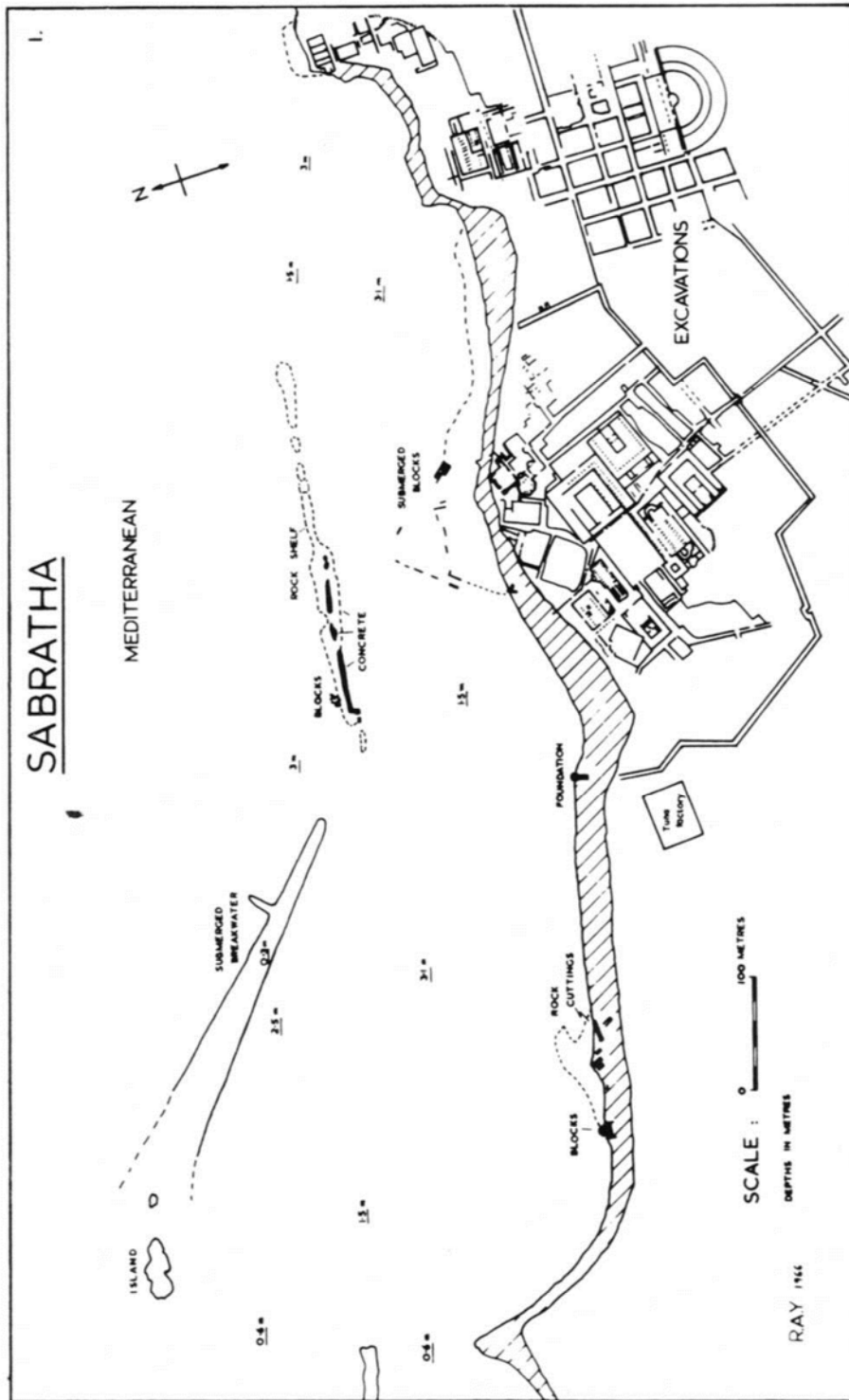


Fig. 3 Plan of the harbour at Sabratha, Libya.

bour is now filled with sand—probably because a smaller second channel for water circulation has been blocked off at a later date—but the remainder is still used by small Arab fishing boats. In 1888 Tissot gave the dimensions of the cothon as 70 m. × 50 m., in 1921 Whitaker gave them as 147 m. × 73 m., but we found them to be 125 m. × 62.5 m.

Another interesting town was Sullectum which is now overbuilt by the fishing village of Salakta. It would appear that the land here has sunk since Roman times because foundations and cisterns now lie in the water near the shore. One of these submerged features would most likely have been a warehouse and another a small tank, probably for holding fish. The harbour itself was divided into two small bays each protected from the prevailing north-east wind by concrete jetties 260 m. in length.

During our work in Tunisia we spent a short time searching for ancient wrecks. The eastern side of the Cap Bon peninsula (the Cape Hermes of antiquity) is notorious for its rocky coastline, and is a likely graveyard for ancient shipping. The point Ras ed Drek was singled out for searching and although no wrecks were brought to light, three Roman lead anchor stocks were discovered among the rocks in 25 m. of water. The two largest, each weighing 55 kg., were raised to the surface with the aid of buoyancy tanks (large empty food tins) which were filled with compressed air by divers on the sea-bed.

THAPSUS (*Ras Dimasse*)

Thapsus (Fig. 4) is thought to have been one of the largest cities in Roman times east of Carthage. Its place in history is not well known but it is recorded as the place of Julius Caesar's great victory in 46 B.C. over the Pompeian forces during the Civil War. The ruins, however, obviously at one time very extensive, have been pillaged over the years for the building of Sousse and Monastir.

The only noteworthy feature of the site now is the ancient concrete mole which runs out from the shore for a distance of 130 m. This was built with semicircular holes, on average 1.4 m. apart, running horizontally into the centre from each side. The holes were in two layers for most of the mole's length. During the survey of the mole, the imprint of a wooden pile and the calcified remains of wood were found in one of the holes.

Underwater search beyond the end of this part of the mole revealed the amazing fact that the mole continued for a further 870 m. beneath the surface. It extended in a sweeping arc often 100 m. wide from the end of the visible concrete, and consisted mainly of concrete and large squared blocks having an average size of 1.5 × 1 × 0.8 m. The edge of the tumbled remains was well outlined against the sand, but in the centre observation was made difficult by the thick growths of weed. The water round the mole was 30 ft. deep and the top of the mole lay between 10 and 15 ft. beneath the surface. This is believed to be the longest

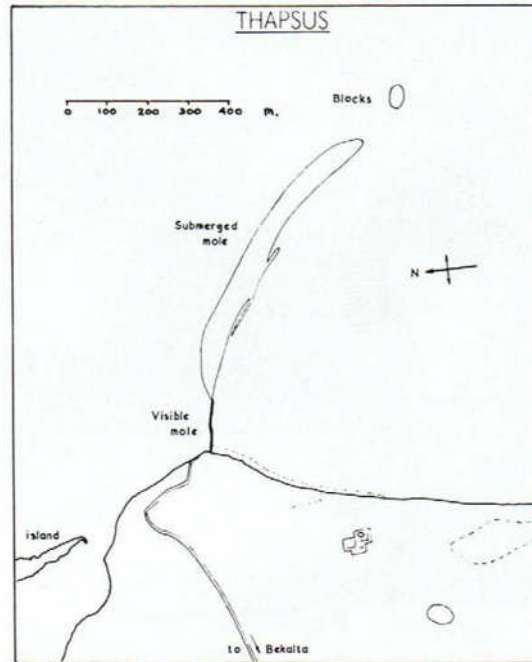


Fig. 4 Plan of the harbour at Thapsus, Tunisia.

freestanding Roman harbour mole yet discovered.

A further area, 60 m. × 80 m., of large blocks was discovered beyond the seaward end of the mole, separated from the mole by a channel 180 m. wide.

The visible part of the mole at Thapsus has been reported by many travellers. Daux, in particular, published dimensions. Daux also thought that it had been built on cedar piles, an idea that is very much substantiated by the finding of the calcified wood, although as yet the type of wood has not been determined. Daux's measurements agree well with what was found except for the mole's length. This was 259 m. when he measured it, and he conjectured that it had originally been 413 m., but it is not known on what grounds this estimate was based.

The complete mole in its original state would have provided excellent shelter from the prevailing north-east wind and a very large area for mooring ships. The blocks off the end of the mole are most likely the remains of a lighthouse or fort.

The size of this remarkable structure is perhaps realised when it is noted that the estimated $\frac{1}{3}$ million cu. yd. of cut stone and rubble that it contains is about $\frac{1}{4}$ the volume of the great pyramid at Gizeh.

JUGOSLAVIA

ZATON

The site (Fig. 5) is situated near the point just north of the village of Zaton on the opposite side of the Zadar Peninsula from Nin (Aenona in ancient times).

Plate 5

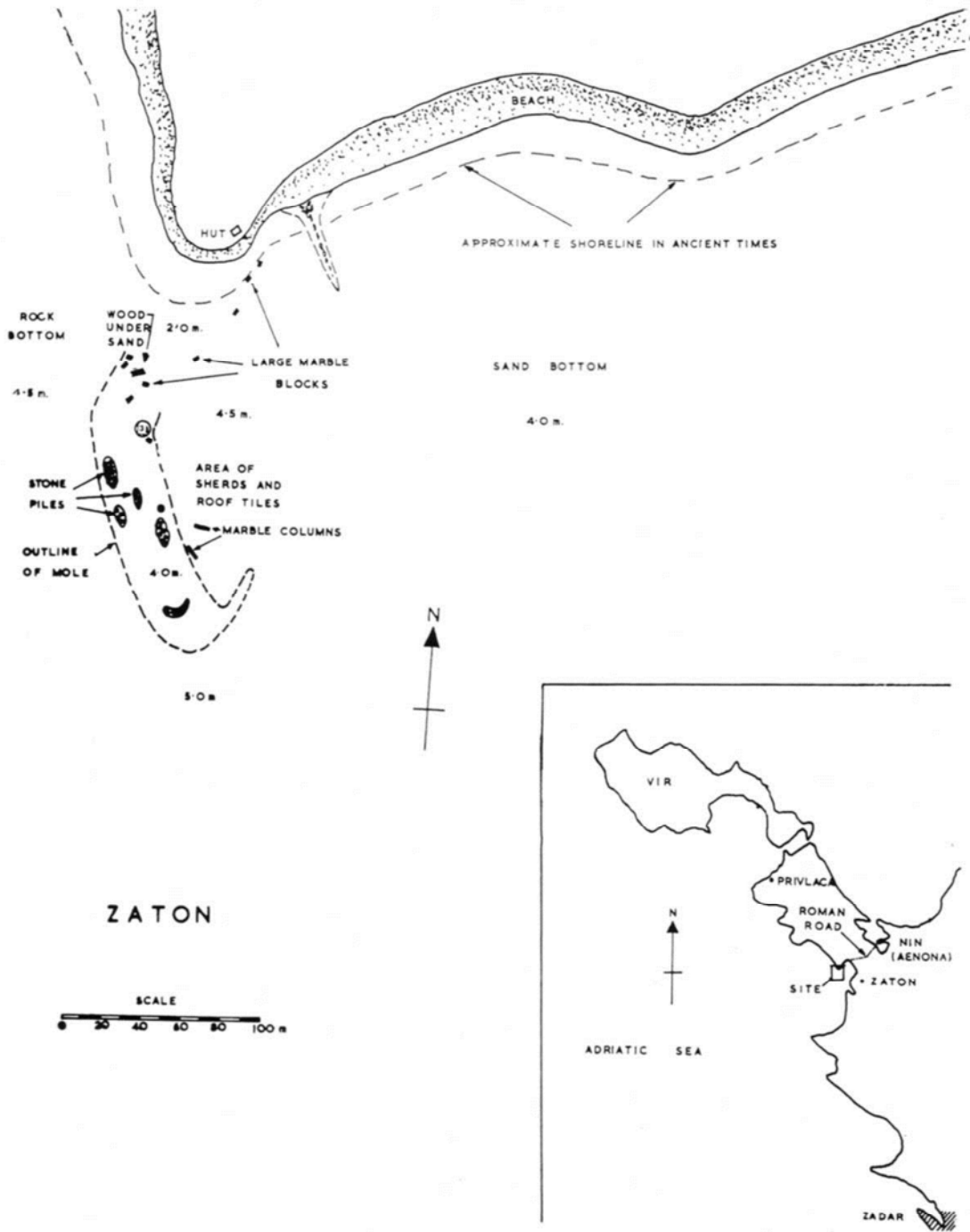


Fig. 5 Plan of the harbour at Zaton, Jugoslavia.

A hook-shaped artificial mole 120 m. long was found to run out westwards from the point, curving toward the south at the seaward end in about 5 m. of water.

The shoreward end of the mole was indistinct but the seaward end was more clearly defined; it consisted of smooth boulders (of a crystalline granite-like material) some 30 cm. in diameter. In several places these boulders were piled 1-1.5 m. off the bottom, and were cemented together with what appeared to be marine concretions.

Many roof tiles and fragments of amphorae and pottery lay on the flat sandy bottom protected by the mole and, close to the seaward end of the mole, two columns, one of pink and one of grey marble were found (Fig. 6).



Fig. 6 Chipping marble samples at Zaton, Jugoslavia.

Other scattered finds included several cooking pots, a bronze coin (unfortunately unreadable), a glass dish, a lamp bearing the stamp of the manufacturer Fortis, and the stamped neck of an amphora. These finds all appear to date between A.D. 0-150.

Beneath about 20 cm. of sand close to the inshore end of the mole several walnuts and seeds were found by fanning away the sand. Nearby several wood planks



Fig. 7 Recovery of a stone mortar at Zaton, Jugoslavia.

(about 30 cm. \times 3 cm. thick of undetermined length) were partially uncovered. A small Italian vase of Roman date lay on top of the wood. Unfortunately, it was impossible to investigate further without the use of an airlift.

From the evidence above it seems that the port was in use during the first two centuries A.D. It is thought that the port served the ancient town of Aenona (Nin) at times when the frequent northerly wind, the Bora, rendered its own port unusable. The location of the port at Zaton would also have shortened the journey from the South by some 40 km. Support for this theory is given by the existence of a Roman road, visible in aerial photographs, leading from Aenona to the site.

Thanks are due to Mr. Brusic of the Zadar Museum, with whom the expedition worked at Zaton, and who was responsible for the discovery of the site.

ITALY

FIUME GARIGLIANO

The area under investigation consisted of about 250 m. either side of the Ponte Garigliano immediately adjacent to the ancient town of Minturnae (Minturno). The aim of the Cambridge team was to survey the riverbed (see Fig. 8) from the campsite to grid FG1 and assist members of the Council of Underwater Archaeology (San Francisco) in the detailed survey of FG1.

Grids FG2-FG5

The upstream end of the grid FG2 (Fig. 9) covered an area of many large squared blocks of local hard sandstone approximately 80 cm. \times 40 cm. \times 30 cm. with a very large number of flat bricks, of average dimensions 25 cm. \times 25 cm. \times 5 cm., in piles between