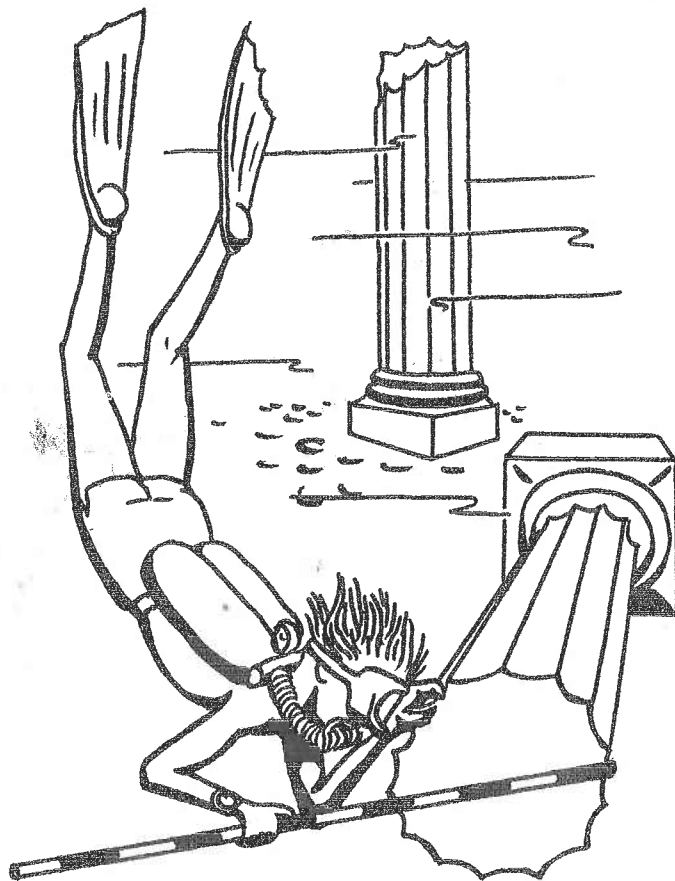


CAMBRIDGE EXPEDITION
TO
SABRATHA
1966
REPORT



Patrons:

Lady Brogan, M. A., F. S. A.

Dr. K. Kenyon, Principal of St. Hughes College, Oxford.
Director of the British School at Jerusalem.

CAMBRIDGE EXPEDITION

to

SABRATHA

1966

Patrons:

Lady Brogan, M.A. F.S.A.,
Dr. K. Kenyon, Principal of St. Hughes College, Oxford.
Director of the British School at Jerusalem.

Sponsored by the Royal Geographical Society.

Approved by the Cambridge Expeditions' Committee.

"Nothing beside remains. Round the decay
of that Colossal Wreck, boundless and bare
The lone and level sands stretch far away."

(Shelley)

ERRATA:

- P.2, Para.3, line 1: for 'Sabrathe' read 'Sabratha'.
P.3, Para.2, line 2: for 'quanitty' read 'quantity'.
P.6, Para.4, line 4: for 'Phoenicians' read 'Romans'.
P.9, Para.4, line 7: for 'suitable' read 'suitably'.
P.12, line 1, for 'Rass' read 'Ras'.
P.17, line 6, for 'Hergia' read 'Hergla'.
P.29, line 16, for 'Dr J.M.Morrison' read 'Dr Ian Morrison'.
P.31, line 36, for 'Rabone Chestervian Ltd.'
read 'Rabone Chesterman Ltd.'
Throughout: for 'serial' read 'aerial'.
Throughout: for 'Justinianapolis' read 'Justinianopolis'.

MEMBERS:

- R.A. Yorke, (Marlborough and Clare). Leader of the expedition; surveyor, photographer, diver. Graduated 1966 and now working for the Birfield Group. Age 22.
- M.F. Dallas, (Sherborne and Queens^e). Surveyor, diver. Now in his fourth year reading Chemical Engineering. Age 22.
- J.W.C. Ward, (Haileybury and Pembroke). Mechanic and diver. Now in his fourth year reading Chemical Engineering. Age 21.
- G.J. Parker, (Christ^s Hospital and Peterhouse). Archaeologist, diver. Third year reading Archaeology and Anthropology. Age 21.
- D.P. Davidson, (Oundle and Sidney Sussex). Cook and diver. Third year reading Mechanical Sciences. Age 21.
- C.R.M. Kemball, (Ampleforth and Pembroke). M.O. and diver. Now in his second year reading law. Age 19.
- D. Kerr, (Trinity Hall). Surveyor and diver. Graduated in 1965 and now working for W.S. Atkins and Partners. Age 23. Joined the expedition for three weeks.
- D.J. Blackman. Lecturer in Classics at Bristol University and Harbours Officer (Mediterranean) for the Committee of Nautical Archaeology, London. Assisted the expedition for two weeks.

CAMBRIDGE EXPEDITION TO SABRATHA

AIM:

In early January of 1966 the expedition was formed by members of the Cambridge University Underwater Exploration Group. The aim was to make an extensive underwater archaeological survey of the harbour of the Roman town of Sabratha in Libya. It was also hoped, if time was available, to extend the survey to a number of other Classical Ports between Tripoli and Tunis.

INTRODUCTION:

In the ninth and eighth centuries B.C. the Phoenicians established a number of colonies all along the North African coast. Later, after the Roman conquest in 146 B.C., many of these became important as ports trading with Rome.

The three Roman cities, Sabrathe, Oea (Tripoli) and Leptis Magna gave the province of Tripolitania its name, "the land of the three cities". Sabratha, the most westerly of the three, smaller than Leptis Magna but more compact in its layout and building, was undoubtedly a large trading centre for the agricultural products of western Tripolitania and an entrepot for trade with Central Africa. In past years, when Sabratha was extensively excavated, no serious work was done to discover the extent of the harbour.

The writings of Tissot, Reinach (Geographie de la Province Romaine d'Afrique) and Daux, both of whom travelled along the Tunisian coast at the end of the nineteenth century, provided much of the information for the ancient ports in Tunisia, from which large quantities of local produce are known to have been exported. This information, although rather sketchy in nature, as it only applied to any remains that could be seen from land, gave the necessary leads from which to work.

The Cambridge Expeditions Committee granted its approval to the project and successful application was made to the Royal Geographical Society for sponsorship. Generous contributions were also received from many trusts and industrial organisations.

The expedition purchased a long wheelbase hard-top Land Rover. An expedition of this kind requires a considerable quantity of heavy equipment; it was found necessary to take six aqualung diving sets, an air compressor and a Zodiac inflatable dinghy, with outboard motor, besides the usual equipment and food. To help carry this, a large trailer was borrowed from the diving club of Imperial College, London.

On June 16th, the expedition left Dover on one of the non-strikebound ferries and travelled through France to Marseilles, where it embarked for Tunis. In Tunis the party was the guest of E.H. Noble Esq., the Commercial Secretary to the British Embassy. Two days were spent in Tunis searching through the archives of the Service Topographique for serial photographs relevant to the Tunisian sites.

From Tunis the expedition travelled south, crossed the Libyan frontier negotiating no less than five customs posts on the way and reached Sabratha a week after leaving England. Work at Sabratha occupied three and a half weeks. For two of these weeks the Libyan Antiquities Department kindly provided accommodation for the expedition in the excavation rest house. Monty Wood of the Esso Oil Company (Libya) must be thanked for the continual assistance, of all kinds, that he gave the expedition during its stay in Libya.

After Sabratha, a visit to Leptis Magna and a coastal site at Al Jezirah occupied a further three days.

The 17th July saw the start of the second half of the project. The expedition left for Tunisia and made its first stop on the island of Djerba. This was the beginning of four weeks of travel along the eastern coast of Tunisia during which time a further fourteen sites were investigated.

On August 16th the expedition left Tunis by boat for Marseilles and the main party arrived back in England on August 19th. Two members travelled on to Greece where they visited the American School's excavations at the harbour of Kenchreai and were later fortunate enough to become involved in the search for Atlantis with the Mavor-Galanopoulos expedition to Santorini.

Topography

The western coast of Tripolitania is one of the few regions in Libya where agriculture is practised. Arid and sandy with scattered plantations of date palms and olive groves, the coast is low lying and the water off-shore is generally shallow. The south and eastern coasts of Tunisia are similarly sandy and the sea is again very shallow. It is not until Cap Bon in the north that the terrain becomes mountainous and rugged with water depths of seventy feet or more close inshore.

Harbours Report

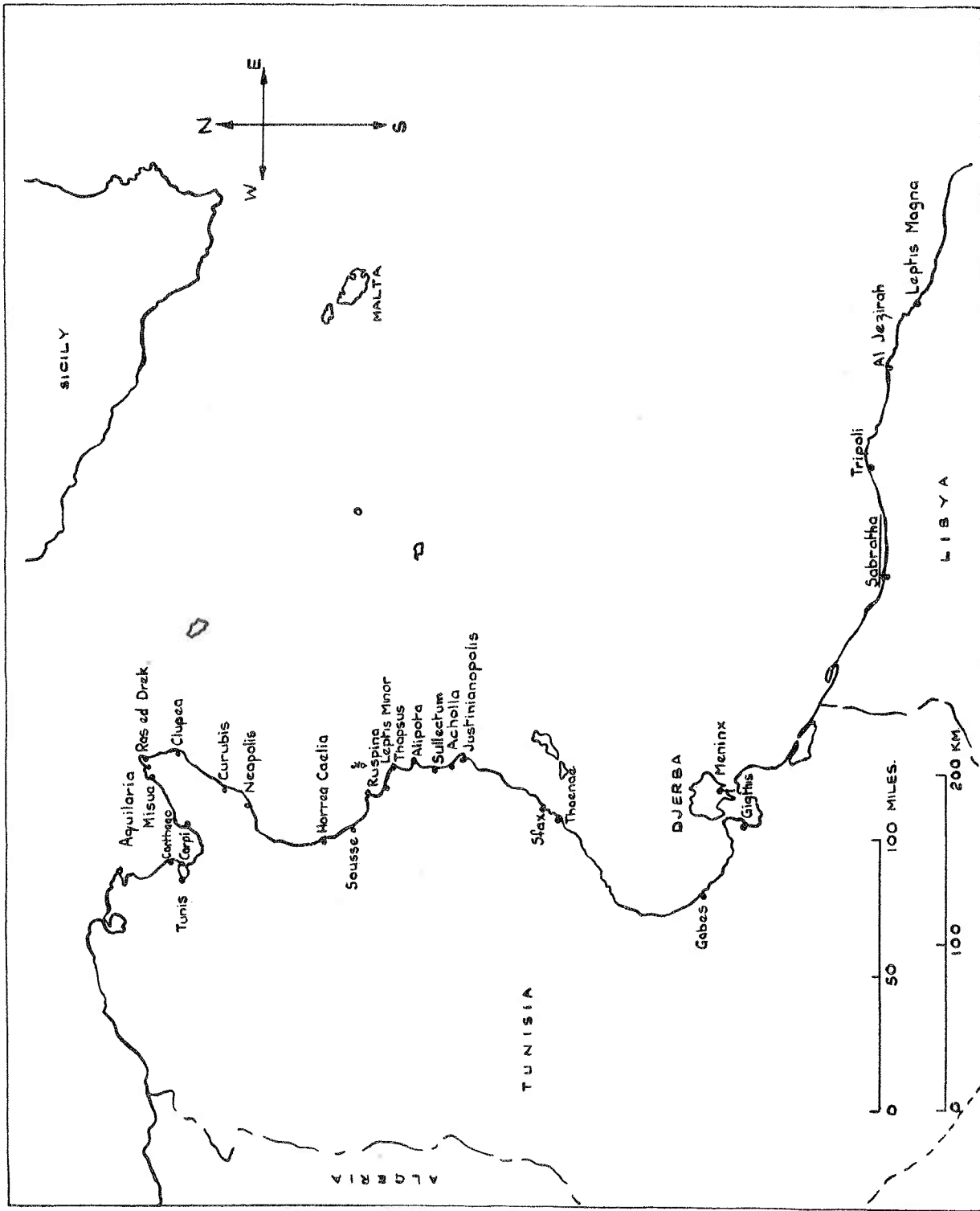
This is arranged with a section for each site that was visited. Sites were located from large scale maps, aerial photographs and directions from the local inhabitants. Enquiries about "Roman remains" would often produce helpful directions, though seldom all consistent and often a guide would be forthcoming. These guides, however, were usually more interested in the Land Rover and its contents than the whereabouts of any remains.

The types of harbour works that were found and surveyed by the expedition can be divided into two main categories: large breakwaters and piers built out into the sea from the shore; and quays, building foundations and tanks found in the water or on the beaches. The former may again be divided into two different types: the breakwater or mole that was built in relatively deep water to provide shelter for mooring vessels; and the pier or jetty that was built out on a shallow shore until there was a sufficient depth of water at its end for mooring or loading boats.

Another form of harbour that was often used by the Phoenicians was the cothon. This was usually a harbour basin cut out inland and connected to the sea by a channel. Probably the best known examples of this type of harbour are the two cothons at Carthage.

One of the common building materials used by the Phoenicians was concrete; very similar to the material of today, this consisted of an aggregate of large stones, on average about 3 inches in diameter, set in a matrix of mortar.

Due to submersion, many of these harbour works have remained undiscovered over the centuries and are not visible without a thorough underwater investigation. Submersion may have been caused by wave-action and erosion, local tectonic change, subsidence or a rise in sea level. Each site must be considered on the evidence available but of course any sea level change would be uniform over the Mediterranean.



SUMMARY OF FINDS

SABRATHA: Concrete capped natural breakwater, 300 metre breakwater of boulders, quay system of blocks.

Al Jezirah: Small quay of blocks.

MENINX: Uncertain.

GIGTHIS: 90 metre jetty with a semicircular end. (Previously reported.)

THAENAE: A few foundations.

ACHULLA: 460 metre jetty.

JUSTINIANAPOLIS: Nothing.

SULLECTUM: 260 metre mole, foundations, tank.

ALIPOTA: Cothon. (Previously reported.)

THAPSUS: 1000 metre curved mole, calcified wood in structure of mole.

LEPTIS MINOR: 560 metre jetty,* foundations.

RUSPINA: Two small cothons and a tank*.

HORREA CAELIA: Two long lines of large concrete blocks.

NEAPOLIS: Many blocks.

MISUA: "Causeway" of blocks to the island.

CARPIS: Two jetties of rough stones.

CARTHAGE: Many blocks.

Ras ed Drek: Three lead anchor stocks.

* Investigated for the expedition by Dr. N.C. Flemming.

The excavated ruins of the Roman town lie on the coast two kilometres from the modern village of Sabratha.

The remains of the Roman town stretch along the sea shore and show, by their layout, the most likely places where harbour remains may be found. During the time that the expedition spent at Sabratha, a sea area one kilometre by half a kilometre was systematically searched but attention was initially focussed on the reef which runs parallel to the shore.

This was found to be capped with concrete for 180 metres of its length. Although the concrete had been considerably eroded by wave action, it was rectangular in its plan at the western end of the reef and 20 metres away, in the water, a large number of squared blocks lay adjacent to the reef. This suggests there may have been a building on this end of the reef in ancient times.

Underwater search of the bay disclosed that a line of large boulders ran for 320 metres from the small island at the extreme western end of the bay towards the reef. The top of this breakwater was one foot below the surface (and was plainly marked in rough weather by the surf breaking on it). The breakwater terminated 75 metres from the reef leaving a deep channel between the two. There were no signs of building or rock cutting on the small island.

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. These and other objects found were handed over to the superintendent of the ruins.

To the north of the Seaward Baths a complex system of rectangular blocks was discovered running 75 metres out towards the reef. Unfortunately, it was partly obscured in places by sand and

large growths of the Mediterranean sea-weed, *Poseidonia*, but the visible remains which were surveyed consisted of lines of blocks lying in six feet 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 suggested 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. Further east, below the Tuna factory, a circular structure lay at the water's edge. This could, perhaps, have been the foundation of a light tower.

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 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 causeway connected the eastern end of the reef to the land in the vicinity of the Temple of Isis. However, no indications were found underwater that the reef had been extended to the shore at the eastern end of the bay. The discovery of the breakwater considerably enlarges the area that would have been suitable sheltered for mooring boats. The positions of the two quays suggest also that boats could have been loaded and unloaded at both ends of the harbour.

LEPTIS MAGNA

Towards the end of the time at Sabratha the site of Leptis Magna was visited, and it was interesting to draw comparisons between this site and Sabratha. One of the features of these ruins is the magnificent harbour, which has been fully reported by Bartoccini. The foundations of the lighthouse were located in the water off the western side of the harbour entrance. The blocks which formed this were found to have been laid in 12 feet of water and keyed together.

AL JEZIRAH

From reports it seemed likely that harbour remains of some sort might be found on the coast due north of Gasr Chiar. A study of large scale maps suggested that the promontory of Al Jezirah was the most likely location in the area. This was approached from the village of Gasr Chiar by way of rough, sandy tracks which would have been impassable without four-wheel drive.

The promontory itself was about 200 metres long and 100 metres wide and was covered with the remains of small buildings. Pot sherds were numerous and many small coins were found. All that could be seen of any harbour works was a small quay of blocks on the eastern side of the promontory and scattered blocks on the western side. No further remains were found in the water.

This may have been the site of ancient Gaphara and as such is worth further investigation.

TUNISIA

MENINX

The exact location of this site on the Island of Djerba is doubtful. Local opinion held that the remains of the port were on the south-east coast where heavy silting has occurred. In this shallow area a small limestone feature was found 60 metres offshore and to one side of it were the eroded remains of blocks. Under-water search was unproductive.

GIGTHIS (Bou Grara)

The remains of a jetty projects into the sea 400 metres due east from the forum of the excavated Roman town of Gigthis. The bare outline, now only 90 metres long, was shown by a few blackened limestone blocks as reported by Constans (Gigthis 1916).

The jetty ended in a semicircle and there was no indication of what formed the central core. In the water nearby, two Corinthian capitals and four column drums were found. Maximum water depth was one foot. The whole of this area, the Gulf of Bou Grara, has suffered from heavy silting resulting in very shallow water. It was not possible to discover the original length of the jetty.

THAENAE (Thyna)

The Tunisians have recently built salt pans over what was reported to be the harbour area and consequently this was a very disappointing site. A series of rectangular foundations and a wall, both on the water's edge, were surveyed up to the point where they disappeared under the salt pans. Tissot reported that Thaenae had an elliptical port basin three-quarters filled with sand but serial photographs and local investigation showed no sign of this.

ACHOLLA (Rass Bou Tria) Map 4.

Reached by turning East off the coast road 9½ kilometres north of Djebeniana, the Roman site has only a partially collapsed cistern to mark its position by the shore. Further inland more remains were evident. The presence of a long structure in the water was indicated by the serial photograph but this initially proved difficult to find as all remains were discovered to be level with the sea bed. In many cases the differential tones on the photograph which showed the structure were found to be caused by changes in vegetation on the sea floor.

This structure which was the remains of a long pier extended 460 metres from the present shore line. It might originally have been longer since it is believed that the presence of the pier has caused sanding up and a consequent movement of the shoreline. For the majority of its length the pier was found to be 33 metres wide but at the end it widened to 100 metres. The depth of water at the end was five feet. The presence of a few cut blocks round the edge of the pier suggested that they had been used for facing and that its poor state of preservation had resulted from their being pillaged. Pillaging, erosion or subsidence are all possible reasons for the pier's submersion.

Many large fragments of amphorae were found underwater.

JUSTINIANAPOLIS (Chebba)

The area is extremely shallow and there are a number of small modern jetties and fish barriers. Nothing was found at the site.

SULLECTUM (Salakta)

The only remains of this site lie to the south-west of the modern fishing village of Salakta and among the excavations were some extremely well-preserved baths and a fine mosaic inscription.

The harbour area is divided into two small bays and the northern bay is protected by a modern L-shaped jetty built on a chain of small reefs. At the elbow of the jetty traces of ancient concrete were found.

At the northern end of the second bay a mole was discovered running 260 metres underwater from the shore and protecting the bay from the prevailing north-east wind. The mole was by no means continuous and was traced by outcrops of concrete on the limestone shelf. Water depth was 10 feet.

In many ways the shore proved more interesting than the seabed for along its length the remains of cisterns and foundations showed in the low cliff and the floors of many of these cisterns were below sea level.

In two places there were large rectangular foundations of buildings in the water. Cut in the rock, close to the concrete mole, a small submerged tank (8 x 8 metres) was found, whose interior was partially filled with beach-rock. This made determination of its original depth difficult. All these finds were surveyed.

Tissot reported an ancient breakwater on the site of the modern one and it may be fair to suppose that the ancient one has been built over. He also reported the beginnings of two "jetties" further south. One of these is most likely to have been the mole that was found but it must be assumed that the foundations in the water were mistaken for the other one.

It would appear from the extensive remains in the water, the distortion they have undergone, and the presence of sea water in the cisterns, which would normally have been built above sea-level, that there has been some local land sinkage at Salakta.

ALIPOTA (Mahdia) Map 6.

The cothon at Mahdia is well-known and it was easy to locate on the south side of the peninsular near the town. Completely cut out of solid rock, it joins the sea by a large channel. A smaller second channel for water circulation has been blocked off at a later date. Half of the harbour is now filled with sand but the remainder is still used by small boats.

Tissot, who attributes the building of the cothon to the Phoenicians, gives its dimensions as 70m x 50m; Whittaker gives them as 147m x 73m; but careful measurement by members of the expedition, using tapes, found that the dimensions were 125m x 62.5m. The reason for this discrepancy is not known.

One point of interest was the large number of mooring rings cut in the rock sides of the cothon. Between the cothon and the sea there were many rock cuttings which extended further east towards the end of the peninsula. These cuttings were most likely the foundation trenches for defences or sea walls, though many remain unexplained. There would seem to be little change of sea level at this site.

THAPSUS (Ras Dimasse) Map 3.

Thapsus is thought to have been one of the largest Roman towns east of Carthage. However, although the ruins were once very extensive, they have been pillaged over the years for the building of Sousse and Monastir. Pillaging continues, for during the

expedition's stay of a week, the few remaining ruins were being broken up and transported away for road building.

The only noteworthy feature of the site is the concrete mole which runs out from the shore for a distance of 130 metres. This was built with semicircular holes, on average 1.4 metres apart, running horizontally into the centre from each side and the holes were in two layers for most of the mole's length. During the survey of the mole, which was done in detail, 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 amazing fact that the mole continued for a further 870 metres beneath the surface. It extended in a sweeping arc, often 100 metres wide, from the end of the visible concrete, and consisted mainly of concrete and large squared blocks of average size 1.5 x 1 x 8 metres. 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 feet deep and the top of the mole lay between 10 and 15 feet beneath the surface. This is believed to be the longest freestanding Roman harbour mole ever discovered.

A further area, 60m x 80m, of large blocks was discovered beyond the sea-ward end of the mole, separated from the mole by a channel 180 metres wide.

The topography of the bay and the mole suggested that there might be a further mole to complete the harbour. A large area to the south was searched by towing a snorkeller behind the dinghy but nothing was found.

Two profiles of the mole were made and the perimeter was surveyed using a sextant.

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 metres when he measured it and he conjectured that it had originally been 413 metres, 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 possibly the remains of a lighthouse or fort.

The size of this remarkable structure is perhaps realised when it is noted that the estimated 1/5 million cubic yards of cut stone and rubble that it contains is about 1/4 the volume of the great pyramid at Gizeh.

LEPTIS MINOR (Lemta) Map 5.

The "quays" to the north-west of the village of Lemta which Cagnet (1893) reported were found and surveyed. At the end of the expedition's stay in Tunisia, however, further serial photographs of the site were obtained and traces of a long underwater structure were noticed on the photographs. Time did not permit investigations but Dr. Flemming was known to be planning a visit to Tunisia at a later date and kindly agreed to investigate for the expedition. Suspicions were well grounded for a jetty, 560 metres long, was discovered one and a half kilometres north-east of the village.

The jetty appeared to have had a rubble core and been faced with blocks of which two courses were still apparent in places. Only at the end, where the jetty changed direction, was the water more than four feet deep. This is a very good example of the pier or jetty built out on a shallow coast.

RUSPINA (Monastir)

This site was visited by Dr. Flemming. A very small cothon and a fish-tank were found on the largest island. On the small adjacent island another small cothon was found. Both islands lie 300 metres off shore from the modern resort of Monastir.

HORREA CAELIA (Hergia)

The coastal track which goes north from the town of Hergla meets the shore a short distance from the town. Along the beach, to the south of this point the remains of buildings can be seen in the cliff. Local history related that there had been extensive "Roman" harbour remains until 1905 when the French moved most of it to build part of the harbour at Bizerta.

Underwater investigation of the area off the town revealed two long lines of what can only be called 'lumps' of ancient concrete each measuring roughly 2m x 2m x 2½m. These were found in 12 feet of water and formed a double row in one of the lines. Near them there was a short line of scattered cut blocks parallel with the shore. These lines would seem to be the remains of two harbour moles.

A cothon had been reported at this site but none was found. Local tradition maintained that there had been a substantial shift of sand away from the area adjacent to the ruins which might explain the discrepancy with the observations of some 50 years ago.

NEAPOLIS (Nabeul)

The site lies in a long sandy bay about 10 kilometres north of Hammamet. The sea-bed shelves quickly down to about 10 feet where the bed is of coarse sand with outcrops of sandstone. A Wadi empties into the bay 2 kilometres south of Nabeul. 100 metres south of this wadi and 40 metres from the shore a number of cut blocks were found.

Closer inshore were the remains of concrete, in some cases with blocks still attached. No coherent formation was apparent but many blocks were covered by sand, perhaps indicating the possibility of further remains beneath the sand.

The presence of several Roman baths in the area indicate that this was the correct location of the ancient town.

AQUILARIA (El Haouaria)

The modern town of El Haouaria lies $1\frac{1}{2}$ kilometres from the sea and is well-known for the giant Roman quarries on the nearby shore to the west. The area near the quarries seemed to be unsuitable for harbour works.

MISUA (Sidi Daoud) Map 7.

Aerial photographs of the coast to the south of El Haouaria were closely examined for indications of harbour remains and the subsequent search revealed a "causeway" connecting a small island to the mainland near the point of Sidi Daoud.

The island which lay 140 metres offshore was covered with rock cuttings; some were below sea level and in some cases blocks had been half quarried out of the surrounding rock. On the mainland there were a few remains, attributed to the Romans, including some baths. The "Causeway" itself consisted of two parallel lines of blocks linked at intervals by further transverse walls. In places the walls were not continuous because blocks had been removed and in most cases they were only one course high. In the bay the water was relatively shallow with outcrops of rock at a depth of 2 or 3 feet.

It would seem likely that the island had been quarried for the construction of the local buildings and the "causeway". The purpose of the structure is not absolutely clear but the regular

linking walls suggest that it may not in fact have been a causeway but some form of tank system.

CARPIS (Mraissa)

The site lies in the gulf of Tunis at Sidi Rais and is easily approached by road. At week-ends it appears to be a popular resort.

The findings of Tissot were only partially substantiated as heavy silting has reduced what was probably the harbour area to a depth of two or three feet. To the north of this area, some 200 metres from the modern landing stage there was a line, about 300 metres in length, formed of rough stones, dropping off into 30 feet of water on the north side. This line was perpendicular to the shore. One kilometre further north a similar line of rocks ran parallel with the shore for 250 metres at a distance of 100 metres from it. Silting had also been heavy around this area, depths being of the order of a foot or two.

Local reports of further submerged features out to sea were investigated but not substantiated.

From the fairly extensive and as yet unexcavated ruins on land it may be conjectured that the town was of some importance. The presence of the artificial features mentioned seems to have interfered with the natural current and caused the deposit of a great deal of silt, and this made coherent interpretation of the findings difficult.

CARTHAGO (Carthage)

Carthage was visited right at the end of the expedition's stay in Tunisia and only a brief inspection of the remains off the coast was possible.

The area off the promontary some 500 metres to the south of the entrance to the southern cothon was investigated underwater. The water here was about 8 feet deep and the sea bed was found to be covered by large blocks. Because the water was dirty it was difficult to build up a picture of their layout but it is doubtful that this was at all coherent. The edge of the area of blocks was 60 metres from the shore and lay parallel with it; in two places, about 300 metres apart, lines of rough blocks extended at right angles from the shore above the surface of the water.

Quadrilaterals of masonry have been reported in the water off the shore but more detailed observations are clearly necessary to find out what really is off the coast at Carthage.

Ras ed Drek

The eastern side of the Cap Bon peninsular (The Cape Hermes of antiquity) is notorious for its rocky coastline.

The Antiquities Department in Tunis suggested that this might be a likely area for ancient wrecks. Indeed a modern cargo vessel lay in 30 feet of water close by the point of Ras ed Drek where it had foundered in 1963.

The whole peninsula is very mountainous; its steep cliffs making access to the sea impossible. Consequently the site was approached by boat from a sandy beach near the point, some five kilometres from El Haouaria. The underwater search was restricted to the area near the point.

Three Roman lead anchor stocks were discovered lying among the rocks in 70 feet of water. Their positions were noted, along with other traces of later iron anchors, and two were raised to the surface for identification by the Antiquities Department in Tunis. The anchors were left with the Antiquities Department. Since each anchor weighed over 110 lbs. they were lifted with the help of buoyancy tanks

(large empty food tins) which were filled with compressed air on the sea bottom.

Other than numerous pot sherds, no signs of actual wrecks were found but it seems probable that a wider search further north might reveal more of interest. The current round the point is often very strong, even at 70 feet, and could be the reason why so many ships lost their anchors. It seems unlikely that any fragile deposits could remain undisturbed for long in the strong current round the point.

SURVEY REPORT

Equipment

Telescopic Alidade	4 - 30 metre waterproof fibreglass tapes
Plane Table	1 - 50 metre " " "
Sextant	Formica underwater writing boards
100 ft. Steel Tape	1 - Prismatic Compass
	6 - Ranging Poles.

The general method of survey used at most sites, in particular Sabratha, was to measure a base line on the shore and take sights with the alidade from both ends of this line. If it was found necessary to extend the base line, this was done by simple triangulation.

In some cases the position of sites in Tunisia were in doubt and these were located, as stated previously, by reference to large scale maps, serial photographs and local directions.

At each site a preliminary systematic investigation of the sea area was made by divers who recorded all finds on Formica writing boards. From these a sketch map was drawn and all prominent features were numbered. For the final survey, each point in numerical order was visited by divers and their positions surveyed using the plane table and alidade. This method was extremely good for the overall survey, but individual underwater features such as foundations or columns were measured with tapes. For the survey of the blocks off the Seaward Baths at Sabratha a grid system of ropes and tapes was laid.

At most sites the underwater remains were close enough inshore to permit the use of a land based method of surveying. At Thapsus, however, the distances involved were too great. For this survey, the dinghy was moored at each of the buoys which had been laid round the perimeter of the mole, and sights were taken of

3 prominent land objects with the sextant. This method, usually so quick and simple, was made difficult by the continually rough seas which treated the dinghy like a cork.

The expedition experimented with an underwater photogrammetric survey at Sabratha but although the results were not very good, useful lessons were learnt. This method of surveying eliminates measuring on-site and consists of placing a known datum by the object and taking a photograph. All measurements are worked out from the photograph at a later date.

It was also hoped to experiment with a Proton Magnetometer built by David Davidson, which might have been useful for detecting buried foundations underwater. Unfortunately some of the electronics could not be made to function properly despite the aid of a portable oscilloscope and spare parts were not available in Tripoli.

Altogether seventeen sites were investigated and fourteen were either surveyed or sketched.

Photography

- | | | | |
|----|-------------|-------------|---------------------------------|
| 1. | Surface: | Pentax S.1 | 55 mm Takumar lens |
| | | | 100 mm Trioplan lens |
| | | | X2 Teleconverter |
| 2. | Underwater: | Calypsophot | 35 mm Berthiot lens |
| | | | Weston-meter in underwater case |

1. For a record of the expedition and its findings, 500 frames of Kodachrome II and 200 frames of black and white were taken. From these, 150 slides have been selected for general showing.

2. 140 frames of high speed Ektachrome were taken for the underwater colour slides. 430 frames of black and white were also taken underwater and many of these are mainly of archaeological interest.

On the whole the underwater photographs came out successfully but in some cases definition was reduced by light scattered from particles suspended in the water. So far one of these photographs has been published in the Observer Colour Magazine.

GENERAL

Travel

The expedition had originally planned to travel by minibus but the increasing amount of baggage and uncertainty about the state of roads made this inadequate. A 1961 Long wheelbase hard top Land Rover was purchased and the combination of this and a trailer was highly successful. No breakdowns were experienced in 5,000 miles except for a split wheel rim. Should spares have been needed these would have been readily available in Tripoli or Tunis. The main roads in Libya and Tunisia are reasonably well metalled but the Land Rover proved invaluable on the rough tracks to the diving sites for transporting heavy equipment to the water's edge.

Tents were seldom used except to provide shade and the usual custom was to sleep in the open around the Land Rover. Mosquito nets were excellent protection against the flies which infest most parts of the coast.

DIVING

The depth of water close inshore was never very great and consequently much of the diving and searching could be done with snorkels rather than aqualungs. However an air supply was useful even in only six feet of water for measuring masonry or taking samples. The prevailing N.E. wind made it far from calm at times and poor visibility often impeded work.

Rubber wet-suits were nearly always worn by divers as a protection against cold during long hours in the water. Washing-up liquid, suitably diluted, made an excellent lubricant for putting on suits.

Approximately 100 man-dives were made averaging about 45 minutes each in depths varying from 6 to 75 feet. It is probable that 500 man-hours of snorkelling were done, at the end of which members of the team were well practised at free swimming underwater.

FOOD

Cooking was done on a Primus and a twin burner Calorgas stove. Much must be said for the cook's ingenious use of the stores and the varied diet that resulted. Local produce such as vegetables, spaghetti and sardines was bought to supplement the food that had been brought out from England. Fish were shot, if time permitted, but generally they were not very abundant along the coast. Freshly caught Octopus was a delicacy but Sting Ray stew is not to be recommended.

The expedition ate well considering the circumstances and this was an important factor in maintaining efficiency when working long hours in the water.

MEDICAL

The intense heat was found very tiring but working in the water helped to minimise the effect of this. Unfortunately divers were afflicted with cuts and abrasions round the ankles which refused to heal. No form of dressing was found which could withstand repeated immersion in sea water; eventually Terramycin, obtained locally, proved the best cure. Any suggestions of a remedy for this blight of all diving expeditions would be invaluable.

Almost everyone suffered from a form of enteric "flu", with its usual uncomfortable symptoms, in spite of careful precautions to wash food and sterilise water. However, suitably treated, this was never serious and would only last a couple of days.

In general the health of the expedition was very good. What infections there were seem to have been unavoidable and gratitude must be expressed to Dr. Hawtrey May whose "magical box of tricks" proved invaluable to people whose knowledge of medicine was at best, rudimentary.

FINANCIAL STATEMENT

<u>Credit</u>		<u>Debit</u>	
Royal Geographical Society	£75	Fares: Channel	£53. 10. 0.
Yapp Charitable Trust	100	Mediterranean	160
Russell Trust	100	Insurance: Vehicle	22
Ford Dagenham Trust	75	Personal, Equip. Medical	58. 17. 0.
Worts Travelling Scholars Fund	50	Fuel	95. 5. 2.
Gilchrist Educational Trust	50	Vehicle spares and maintenance	59. 0. 6.
Albert Reckitt Trust	25	Maps and Aerial Photographs	10. 2. 3.
Rolls-Royce Ltd.	50	Visas and Carnets	11. 17. 6.
Geo. Wimpey & Co. Ltd.	50	Equipment: Diving (cost and hire)	45. 6. 4.
North Sea Diving Services Ltd.	26. 5	Surveying	8. 8. 9.
Divcon (Diving U.K) Ltd.	25	Camping	39. 0. 0.
Clare College	50	Photographic: Film and processing	49. 10. 0.
Peterhouse	40	Underwater camera and accessories	56. 18. 6.
Queen's College	14	Food	128. 0. 0.
C.U.O.T.C.	10	To cost of compressor	160. 0. 0.
J. Hawthorne Esq.	10	Depreciation on Land Rover	120. 0. 0.
Anonymous	25	Contribution to Cambridge Explorers and Travellers' Club journal	12. 0. 0.
Personal Contributions	400	Admin., Postage and Sundries	40. 0. 0.
		TOTAL	1129. 16. 0.
		Balance for report and circulation	45. 9. 0.
TOTAL	1175. 5. 0		1175. 5. 0.

ACKNOWLEDGMENTS

The Members of the expedition would like to thank the following:

For their valuable advice and assistance,

Lady Brogan, M.A., F.S.A.
Dr. K. Kenyon, Principal of St. Hughes College, Oxford.
Professor R.M. Cook, Professor of Classical Archaeology,
Cambridge.
Dr. N.C. Flemming, Commercial Oceanology Study Group,
London.
M.B. Wood Esq., Esso Oil Company, Tripoli.
R.G. Goodchild Esq., Dept. of Antiquities, Cyrene, Libya.
J.W. Hayes Esq., Department of Classics, University of
Newcastle.
Miss J.M. Reynolds, Cambridge University.
Miss J. du Plat Taylor, Institute of Archaeology, London.
C. Vita-Finzi Esq., University College, London.
Sir Mortimer Wheeler, Secretary to the British Academy,
Sir Arthur and Lady Dean London.
Dr. J.M. Morrison, Edinburgh University.
D.J. Blackman Esq., University of Bristol.
E.H. Noble Esq., Commercial Secretary to The British
Embassy, Tunis.
Dr. L. Hawtrey May, C.U. Health Service.

For their generous hospitality,

Mrs. E.H. Noble.
Dr. J. Anderson, University of California, Berkeley.
J. Huston Esq., Council of Underwater Archaeology,
San Francisco.
The Ramseys, Tripoli.
Sgt. Harshbarger, WHEELUS Air Base, Tripoli.
J. Haworth Esq., The British Embassy, Tripoli.
Mohammed Mustafa, Sabratha.

For loan of equipment and facilities,

The Royal Geographical Society, London.
C.U. Engineering Laboratories.
C.U. Officers Training Corps.
P.B. Davidson Esq.
Sheffield University Geography Department.
Department of Geophysics, Imperial College, London.
The Diving Club, Imperial College, London.

Cambridge University, Department of Geophysics.
Dr. E.T. Hall, Department of Archaeology, Oxford.
D.W. Page Esq.
Instrument Development Section, Terylene Works, I.C.I., Wilton.
Cambridge University Underwater Exploration Group.

M. Gibril, Department of Antiquities, Tripoli.
M. Majoubi, Institut National d'Archaeologie, Tunis.
Brahim Camuca, Superintendant at Sabratha.
Service Topographique, Tunis, for Aerial Photographs.
Eric Marland Fund, Marlborough College.
Sherborne School.
J.B. Ward Esq.
W.T. Dallas Esq.
Haagman Laboratories

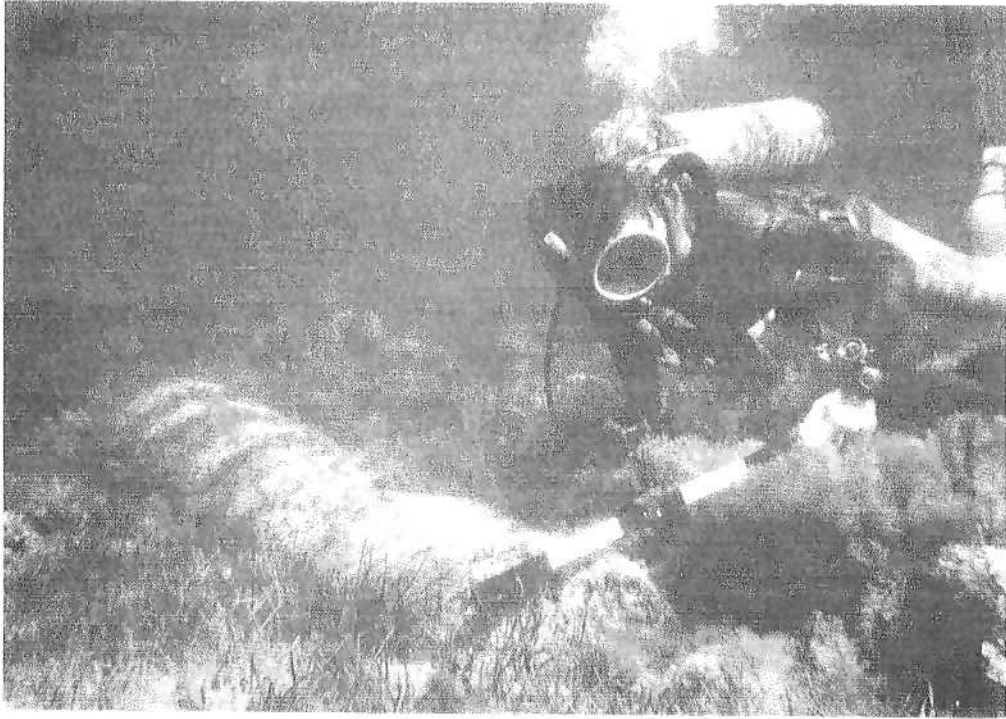
The many Trusts, firms, and individuals, listed above, whose generous support made the expedition possible.

Our thanks are due to the following people who gave their products free of charge or at reduced prices,

Automotive Products Ltd.	Tate & Lyle Ltd.
Batchelors Foods Ltd.	Thames Board Mills
Bovril Ltd.	The Observer
G. & E. Bradley Ltd.	Unilever Export
Bryant & May Ltd.	Vevet Crepe Paper Ltd.
Burroughs Wellcome Ltd.	A. Wander Ltd.
J. & J. Coleman Ltd.	Watney Combe & Reid
W. Crawford & Sons Ltd.	Weetabix Ltd.
Findlater, Mackie & Todd	Welch's Ltd.
Gillette Razor Co.	Whitworth Holdings Ltd.
Gordon Woodruff (Tripoli) Ltd.	
Glaxo Laboratories Ltd.	
H.J. Heinz Ltd.	
William Hollins & Co. Ltd.	
Jeyes	
Johnson & Johnson (GB) Ltd.	
Kalvi Ltd.	
Kodak Ltd.	
Lacy Hulbert & Co. Ltd.	
Lamix Ltd.	
Laycock Engineering Ltd.	
Maws Pharmacy Supplies Ltd.	
McDougalls Ltd.	
McVittie & Price Ltd.	
The Metal Box Company	
Morris & Jones Ltd.	
The Nestle Co. Ltd.	
Outdoor Centre, Cambridge	
Pearce Duff & Co. Ltd.	
Peak Trean & Co. Ltd.	
Philips Electrical Ltd.	
Proctor & Gamble Ltd.	
Quaker Oats Ltd.	
Rabone Chestervian Ltd.	
Reckitt & Sons Ltd.	
Rothmans (Pall Mall)	
Ryvita Ltd.	
C. Shippam Ltd.	
Smith & Nephew Ltd.	

For further information please write to

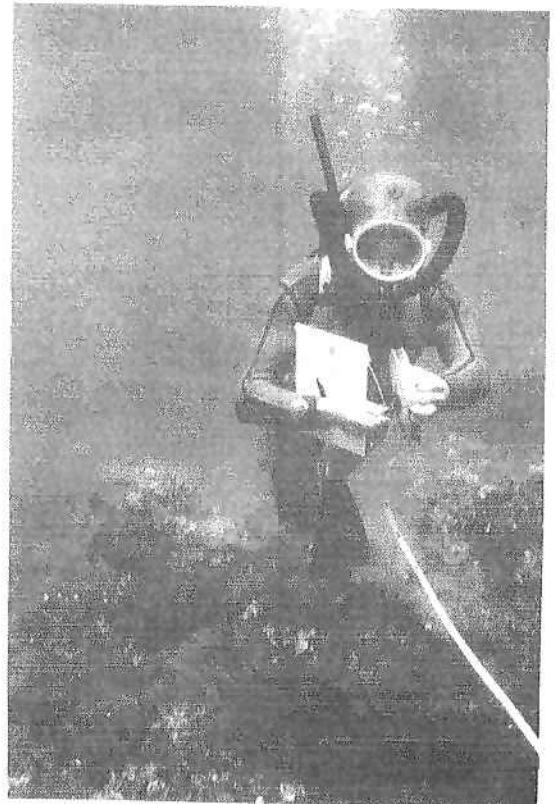
R.A. YORKE,
Clarendon,
East Lennox Drive,
Helensburgh, DUNBARTONSHIRE.



**Ancient
column
at
Sabratha**



A typical block at Thapsus



Taping the mole at Thapsus



**Surveying
at
Sabratha
(harbour
area in
background)**



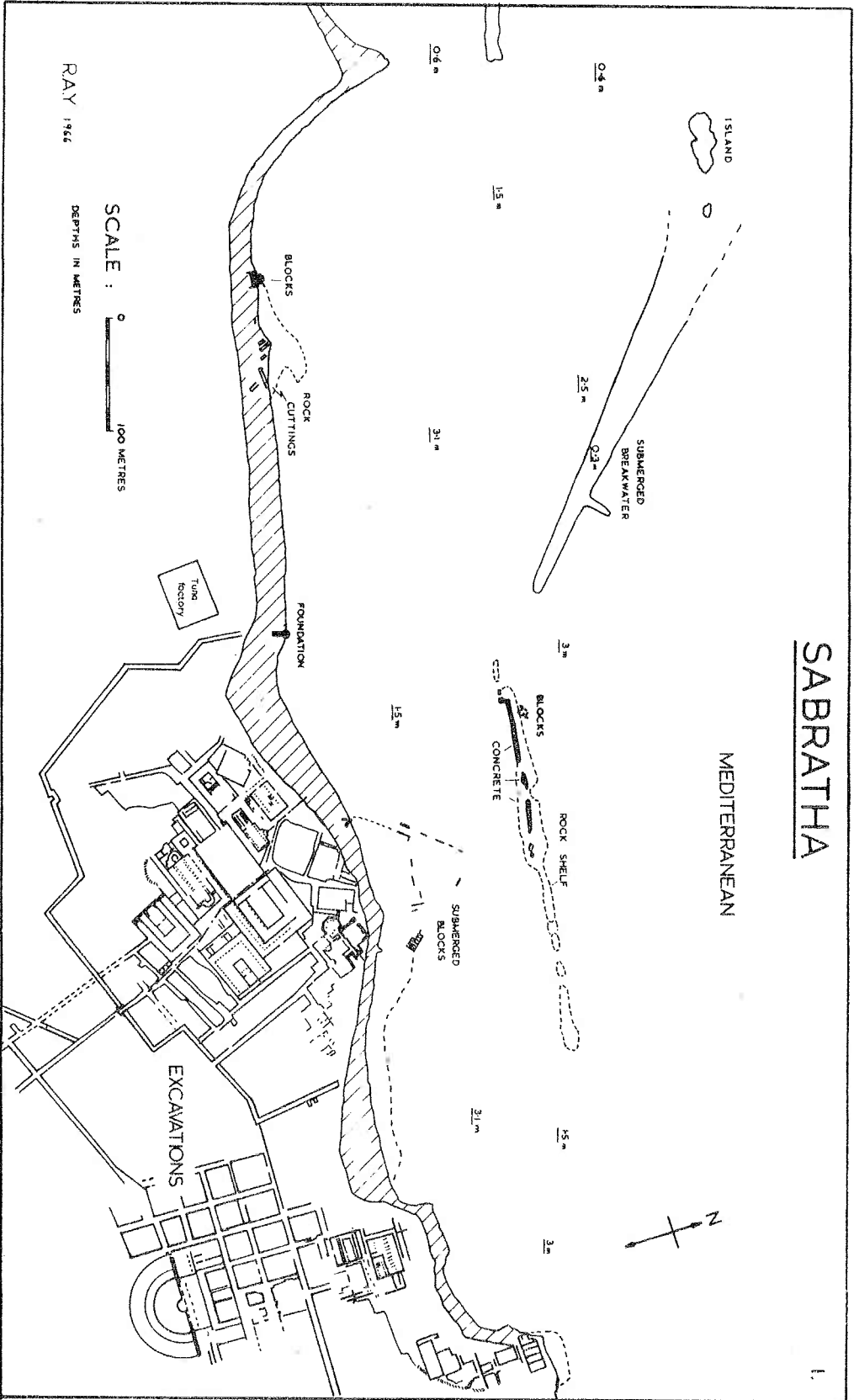
Lead anchor stock at Ras ed Drek



Surveying at Ras ed Drek

SABRATHA

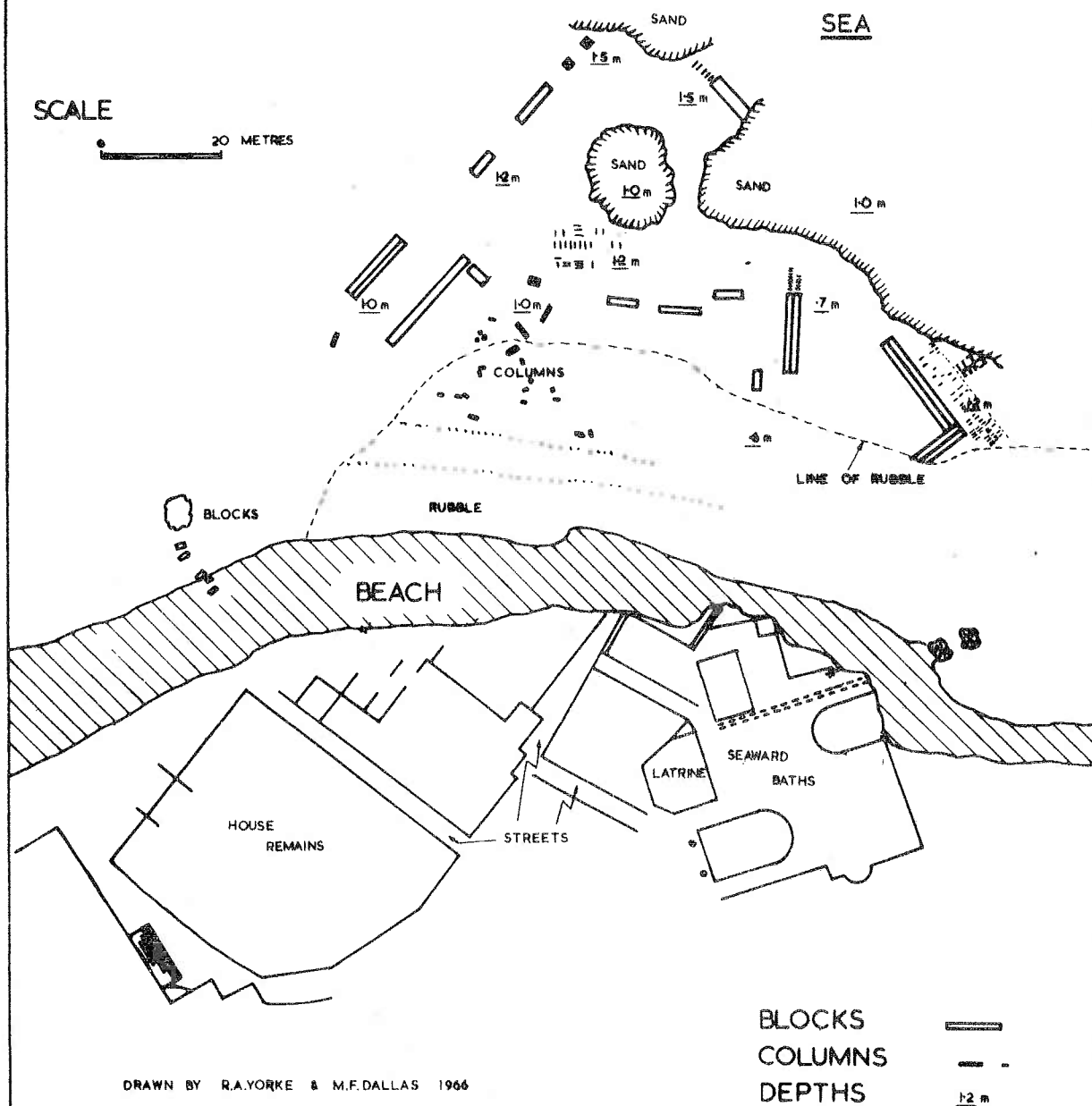
MEDITERRANEAN



SABRATHA

2.

DETAIL OF BLOCKS



DRAWN BY R.A.YORKE & M.F.DALLAS 1966

THAPSUS

3.

0 100 200 300 400 m.

Blocks



Submerged mole

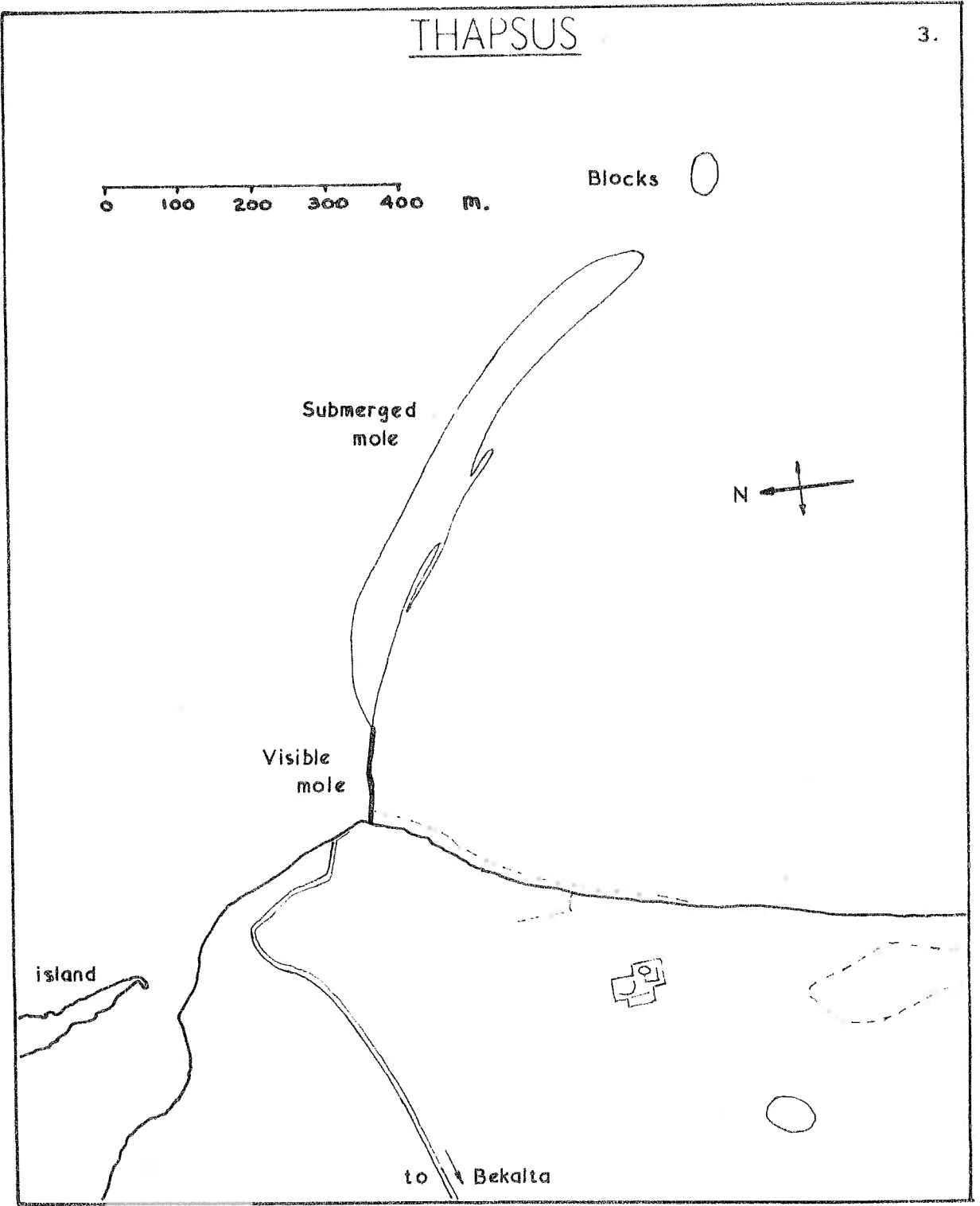


Visible mole

island

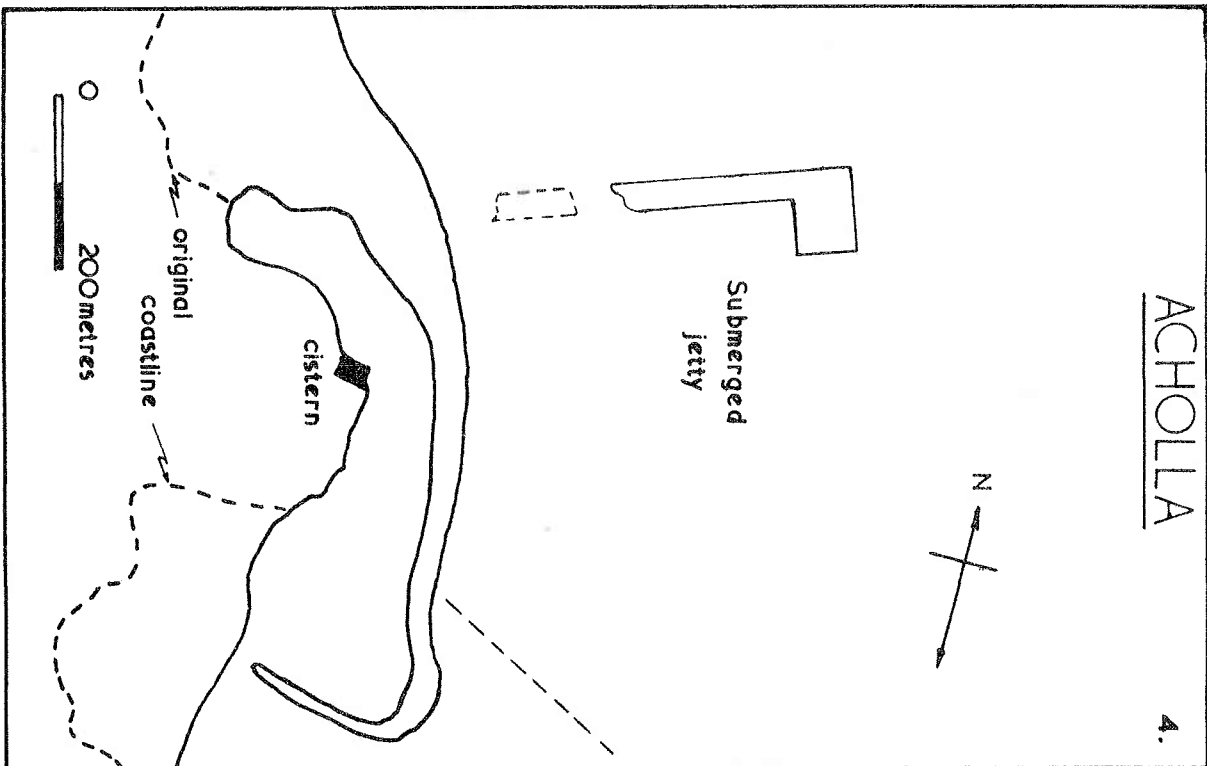


to Bekalta



ACHOLLA

4.



LEPTIS MINOR

5.

