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AUSTRALIAN AND NEW ZEALAND JOURNAL FOR THE ARCHAEOLOGY OF THE MEDITERRANEAN WORLD ancient times. However, none of the sources tell us that they were exported from Lipari in that era.

THE UNDERWATER SURVEY OF TORONE: A PRELIMINARY REPORT OF THE 1993 SEASON*

C. Samiou, N. Lianos, J. L. Beness, C. Coroneos, T. Hillard, T. Smith, A. Sprent
with
M. Goutzamani, E. Mantziou, V. Masoura, and G. Mavrophrides

Torone, sited at the south-western tip of Sithonia in the Chalkidike, facing the peninsula of Kassandra (Pallene), provides an unbroken archaeological sequence from the prehistoric period through to Late Antiquity with strong archaeological evidence also for the post-Byzantine period when the site served as a Turkish naval base and fortress, taken in 1659 by the Venetian Francesco Morisini.[1] A distinctive feature of the site is (and was) the 'Lekythos', a small peninsula presently rising some 13 m above sea-level and joined to the mainland by a narrow isthmus presently about 40 m wide. This peninsula served as one of the sites for the city's inner fortification in Classical times and also for the 17th-century Turkish fortress.[2] The Lekythos, its neck, and the peaks which rise to the south—the Anomomylos at 90 m (the acropolis of the Classical city) and the Vigla at 230 m (fortified in the Hellenistic period and providing sweeping views to the north, south, and west)[3]—command a number of small bays to the south of the Lekythos and the southern portion of a broad sandy bay to its east and north. Since 1975, sections of the site have been excavated, and the line of its Classical fortifications plotted, by the Australian Expedition to Torone conducted under the auspices of the Athens Archaeological Society and the Australian Archaeological Institute at Athens and directed by Alexander Cambitoglou with John K. Papadopoulos as Deputy Director.[4]

In 1990, J. Lea Beness and Tom Hillard of Macquarie University and Nikos Lianos of the Ephoria of Underwater Antiquities, Athens, independently inspected the offshore areas of the Torone site and observed submerged remains to the east of the Lekythos. In 1993, a *synergasia* was formed between the Australian Archaeological Expedition to Torone and the Ephoria of Underwater Antiquities. The Greek team was led by Chryssa Samiou and consisted of Lianos (architect), E. Mantziou, G. Mavrophrides, M. Goutzamani (archaeologists), and V. Masoura (geologist), with S. Nikolaides and E. Raftakes (technical assistants). The Australian team, led by Hillard, included Beness, C. Coroneos, T. Smith and A. Sprent (surveyor).[5]

* The photographs (**pl. 9**) are by J. L. Beness, the computer-generated images by A. Sprent, and the drawings by T. Smith.

[1] For an introduction to the site, see A. Cambitoglou, Praktika 1984, 40–65; A. Cambitoglou–J. K. Papadopoulos, Meditarch 1, 1988, 180–8. P. A. Catling is presently preparing a study of the later periods.

[2] Thuc. IV 113–16. Thucydides (116: 2) also mentions at this point a temple of Athena which would have further distinguished the small headland.

[3] For a plan of the site and an aerial photograph of the Lekythos, see respectively Cambitoglou art. cit. 41 fig. 1 and Ergon 1986, 63–7 photo 23. For views of the bay of Torone with the Anomomylos and Vigla peaks, see Meditarch 7, 1994, pl. 15.

[4] Preliminary reports have been published in Ergon since 1975. On the fieldwork conducted during the 1993 season, see A. Cambitoglou, Ergon 1993, 61–5.

[5] Fiona Crowe assisted in the infralittoral survey of the Lekythos. Considerable general assistance and local knowledge was provided by Alekos Zapros.

METHODOLOGY

Following a reconnoitre of the underwater environs of the Lekythos to a depth of 3 m, the first season's work concentrated on the area to the immediate north of the isthmus. Objectives were:

(i) to plot all underwater features lying between the present shoreline and a row of twenty *in situ* ashlar blocks observed in 1990 approximately 38 m offshore;
(ii) to investigate these—especially with a view to evidence for sea-level change and possible maritime function; and
(iii) in relation to the above, to map the underwater contours of the Lekythos to the north-east of the peninsula.

To allow systematic investigation, an area of 100 by 50 m to the east of the Lekythos and to the immediate north of the isthmus (Area 1: see **fig. 1**) was marked out using 50 m jackstays, laid on a north/south axis at every 10 m, and marked at every 5 m along their length by means of lead net-weights, threaded through and hammered, each with distances inscribed by means of an insoluble black marker pen. Both ends of each jackstay were then marked (with either a peg or a buoy), allowing its position and axis to be fixed. Ten 10 m wide strips of the area, individually labelled (a)—(j) from east to west, were then investigated seriatim by individual or paired members of the team, using a 10 m long swimline stretched between the two bordering jackstays at each 5 m interval. Walls and other features, artificial as well as natural, were assigned numbers, and the findings correlated to provide the basis for a rough working map of the area. All submerged features of the area thus observed were then plotted by means of an electronic theodolite, providing vertical and horizontal measurements—data which contributed directly to the more general underwater mapping of the Lekythos (on which see further below).

Initial exploration of the site was conducted by means of SCUBA and snorkel. When excavations began on three exploratory trenches (see below) the shallowness of the site allowed for extended hours of underwater work to be conducted by means of narghile (surface supplied air). Again, because of the shallowness of the site, excavation in the trenches was generally conducted by water dredge. With a feature such as Wall 7 (on which, see below) scarcely more than half a metre in depth, clearance was aided by the reversal of the water pump cycle and the use of a hose held just above the surface of the water as a high-powered water jet, used only for short bursts alternating with manual clearance (which allowed, at the same time, for a suitable level of visibility to be restored). All features of the site were photographed and, after excavations began, the course of excavation was monitored by underwater video camera with footage taken at the opening and closing of each working day. Taking advantage again of the shallowness of the site in general and the exceptionally calm conditions which were enjoyed on most days of the season, photographs for a photomosaic were taken of the outermost line of submerged beachrock and the 'collapsed pavement/tower' or spill of worked rectangular blocks to the western end of Area 1 (see below), using a camera suspended from a 5 m long telescopic pole with a long shutter-release cable.

The mapping of the underwater topography was conducted using a Sokkisha Set 3 electronic theodolite (total station) on loan from the University of East London. In all, 1992 points were recorded. The instrument was capable of measuring vertical and horizontal angles and the distance to a reflective target. The total station was interfaced with a PSION organizer which was programmed to act as a data recorder. Information related to each observation was stored in the recorder for subsequent down-loading into a lap-top computer. This information included the actual measurements together with details of the object or feature being surveyed.

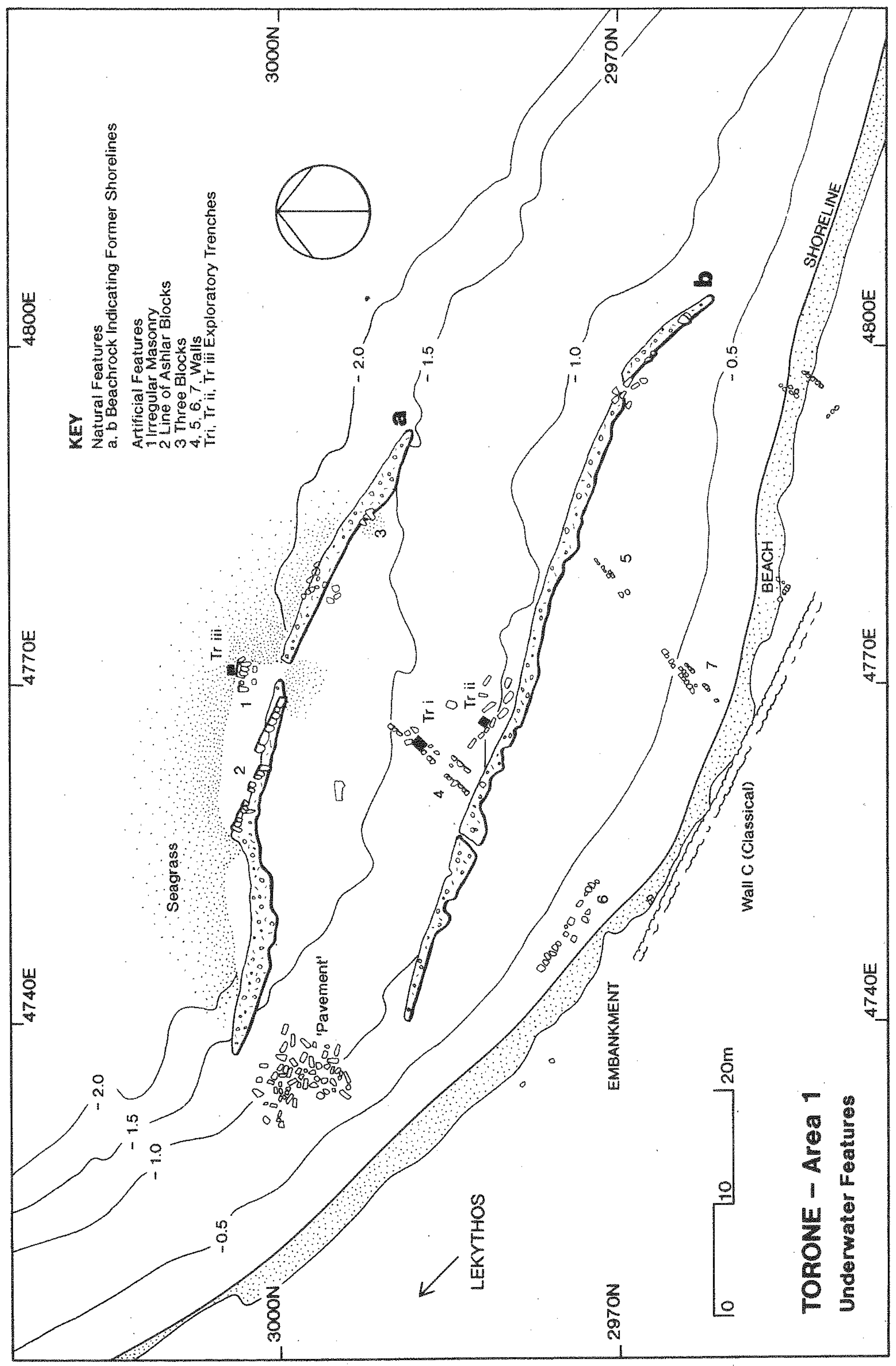

Figure 1. Torone, underwater features in Area 1 (T. Smith).

Prior to the commencement of the survey, two control points, consisting of steel rods set into concrete, were established near the survey area. These were tied into the existing Torone recording network so that survey information from the underwater survey was recorded on the same reference system. Data from the survey was entered into a lap-top computer on which preliminary editing was carried out and then passed to a survey processing package called LANDSCAPE.[6] This software takes the raw-data file and converts it to a series of three-dimensional co-ordinated points together with each point's field code. These field codes describe the feature being surveyed in terms of its entity, e.g. spot height, shoreline, wall, special item etc., and also the relationship of that feature to others. Thus points along a wall or shoreline may be considered to be parts of a linear or curved feature while a spot height would be a single point (or a point entity).

After computation of the co-ordinates, the software links the points in a logical manner so as to create a series of triangular facets. This then produces a digital terrain model from which a three-dimensional view can be generated and displayed on the screen. The orientation of this model can be controlled by the keyboard to obtain the optimum representation. This DTM (Digital Terrain Model) is also used to generate contours at intervals specified by the user. Information in the form of breaklines and creases can be imposed using specific field codes (to control the generation of contours)—i.e., to ensure the integrity of certain manifest features. Both curved and linear representations of contours can be generated. Using suitable fieldcodes, features can be represented in a logical manner; for example, points on walls have been in general joined by straight lines, points on a shoreline by a spline curve. Any feature can be represented by either curved or straight lines according to the field-code schema which has been prepared.

The program was used effectively to monitor the progress of the survey of the overall area, as (after each day) survey data could be processed and viewed. Any anomalies could be rechecked and counterchecked, and areas where sparse information had been gathered could be 'densified'. Individual blocks, walls, and other features could be represented and viewed on a progressive basis and inferences as to wall alignments and other relationships could be made. This facilitated further investigations or suggested other areas of investigation based on those indications. Output from the program could also be downloaded onto plastic sheeting, mounted on slates or clipboards, and form the basis for underwater drawings. The details of blocks and walls could then be drawn in on the site, based on the spatially correct computer-generated representation of significant features (such as edges and corners etc.). The program also established control points for the more conventional fine-detail drawings using a metre-square grid frame (such as the drawing in **fig. 4**).

The greatest number of survey points was taken within the gradually sloping area to a depth of 3 m below present sea-level, after which depth the drop-off was considerably sharper (**figs. 1–3**). Contour information using terrestrially-based observation was limited to points above that depth. Below 3 m, to extend the survey to a greater depth (and to confirm the nature of the shelf), 50 m long jackstays marked at 5 m intervals were laid seaward from the -3 m contour line. The horizontal position of both ends of these lines was determined using terrestrial means (i.e. by the total station). Depths were obtained for each of the points at 5 m intervals along the lines by means of a Suunto Solution dive computer.[7] This information was integrated with the other data to provide contour information down to 10 m below the present sea-level.

[6] This package was developed by Blue Moon Systems (Chichester, UK) who kindly made the software available to A. Sprent.

[7] Tidal variation (which is slight) has not been factored into this calculation. An error margin of up to ± 0.35 m should therefore be allowed.

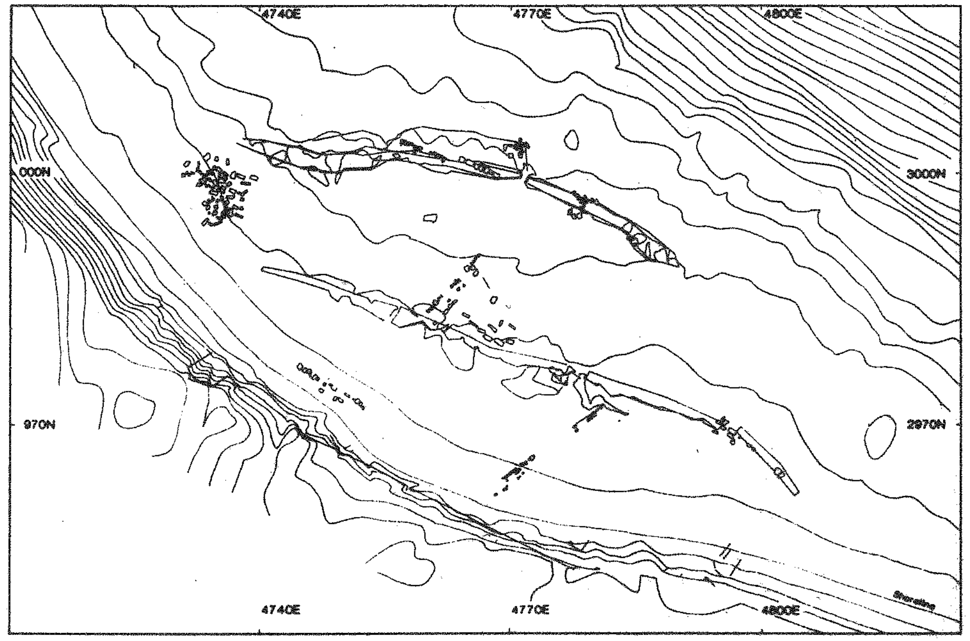

Figure 2. Computer-generated map of Area 1 and environs, showing 0.50 m contours and artificial features (A. Sprent).

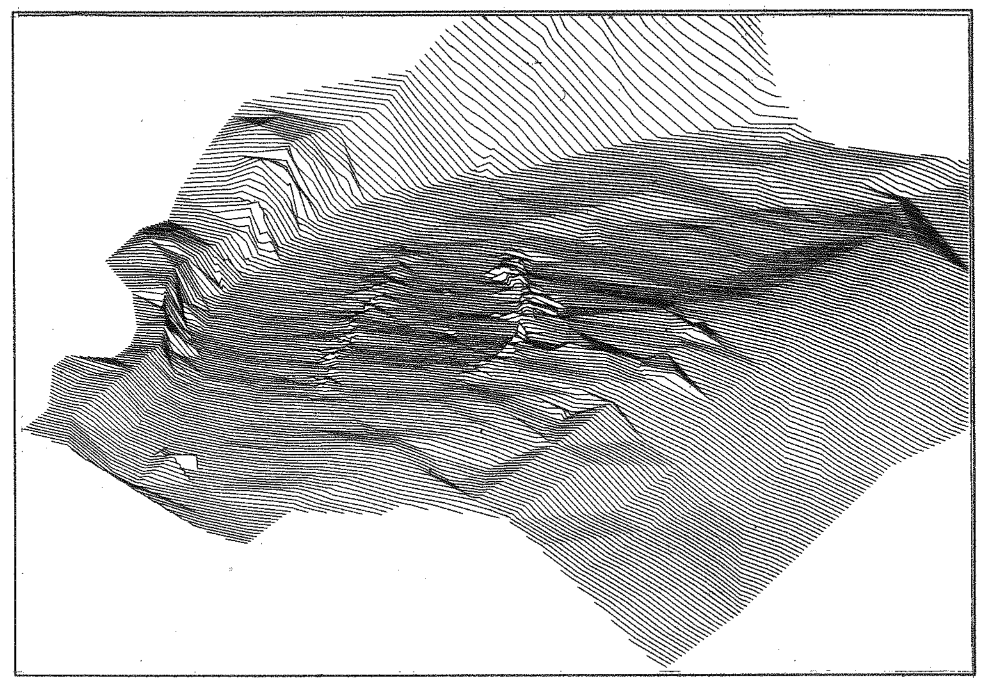

Figure 3. Oblique three-dimensional view of Area 1 looking west, with a height exaggeration of 2:1 (A. Sprent).

AREA 1

Several walls were found (see map **fig. 1**: Features 4, 5, 6, and 7), indicating a submerged terrestrial site; also, that the neck of the Lekythos was at one time wider than it presently appears, narrowed by a rise in relative sea-level. This finding is not a surprising one given the current proximity of the city wall (**fig. 1**: Wall C) to the present shoreline. The water's edge, with the prospect of waves lapping the foundations of the city's fortifications, is unlikely to have attracted its builders who would have anticipated the problem of water erosion, now manifest in the partial collapse of some of the remaining blocks of Wall C. On the other hand, evidence of a former shoreline, approximately 40 m north of the present one (see below) indicates that the isthmus to the Lekythos was at one time at least twice the width that it now is, contrary to expectations that might have followed from Thucydides' description of the peninsula's narrow neck. Future depth soundings will need to be taken north of the isthmus to establish the exact extent to which a change in relative sea-level would affect its width. Thucydides' observation may be based either on the narrowness of the fortified area of the isthmus or on a narrow pinch at its eastern end; or be governed by conditions prevalent in his day but not necessarily pertinent to the site throughout its history.

Feature 6 is a long line (9.5 m) of very irregular masonry which runs close to and roughly parallels the modern shoreline.

Features 4, 5, and 7 lie in the same (distinctive) north-west/south-east orientation as does the Classical housing of the city, suggesting that the area may have been in domestic or commercial use and that habitation may date to the Classical period if not earlier.

The remains of Feature 7 are *c*.6.7 m in length with a width of *c*.1.36 m. The wall apparently consisted of three lateral courses. The two north-westerly courses are closer and more substantial. Between those and the third course was room for loose fill. No bonding agent is apparent. The masonry is irregular.

The remains of Feature 5 are 4.4 m long and 0.58 m wide. The wall apparently consisted of two parallel courses of irregular stones with loose fill. Again, no bonding agent is apparent. Features 5 and 7 (the remains of which lie 5.5 m apart) were also in alignment (though seemingly belonging to different structures), perhaps suggesting that a thoroughfare or some sort of town plan (formal or informal) dictated the line of building here. They appear roughly to continue the line of a substantial Late Classical wall which flanked a pebble-surfaced street across the neck of the isthmus,[8] though city wall C would have interrupted that line.

Feature 4, the remains of which are 10 m long and, at their widest point, 2.3 m broad, was the most substantial of the walls discovered. Three lateral courses of substantial but irregular blocks were discerned. The wall appeared to have two faces carefully constructed with modestly-sized, now water-worn, worked granitic stones. The remains perhaps indicate a structure with a double face orientated to the south-east. A trial trench (Tr. i), 0.5 m wide and 2 m long, was opened within and towards the northern end of the remains of this wall with the intention of retrieving ceramic evidence from the interior of the wall and from its foundations that might provide an indication of its date. After a depth of 0.1 m (below site datum), a layer of concreted stone, sand, and ceramic was uncovered. Most sherds recovered were water-worn and for the most part not diagnostic, the oldest appearing to be from a tripod of the Early Bronze Age. Other sherds within this group are recognizable as Early Iron Age and as fragments of Protogeometric vessels, probably amphorae. The larger rubble fill that was encountered in the southern half of this trench at a depth of approximately 0.3 m beneath the

[8] On which see A. Cambitoglou–J. K. Papadopoulos, Torone 1 (forthcoming).

surface gradually gave way to looser fill until for the last 40-50 centimetres at the northern end a depth of one metre was reached before encountering apparent bedrock, the north face of the trench being formed by a large rock of which we are unable to say whether it is part of the bedrock or had been deliberately placed there in a vertical position.

The remains of at least 15 other walls (which appear to range in date from the pre-Classical to post-Byzantine periods) were discerned on the shoreward side of Area 1 (most projecting seaward from the eroding baulk of the isthmus). These were plotted and photographed for further investigation.

Another feature of the site is a spill of worked rectangular blocks in shallow water at the western end of Area 1 (labelled 'Pavement' on **fig. 1**; see also **pl. 9: 2**). This covers an area of roughly 8.7 x 8.3 m. All blocks, with the exception of a few in shallower water at the shoreward edge of the area, lie between a present depth of 0.5 and 1 m. This feature may be the result of a collapsed tower or small orthogonal building, though it is noteworthy that, while the position of the blocks is at present mostly haphazard, no block overlays another, which may suggest that their current situation is not completely accidental. The stones may have been moved to this position for some secondary purpose. Their present chaos may be the result of subsidence due to liquefaction and subsequent sea action.

The two outstanding features of the site are the outlines of what at first sight appeared to be, despite the considerable variation in height and breadth along each of their lengths, the remnants of two irregular walls of cement-like compaction, with ceramic fragments and occasionally larger blocks set irregularly into the matrix, running along a roughly east/west axis across the site, one (Feature b: see **pl. 9: 5**) approximately 20 m off the present shoreline, the other (Feature a) some 38 m offshore. They follow fairly closely the -1 m and -1.75 m contours of the site respectively. The outer (seaward) line runs for a distance of 55 m across the site. The inner line runs for a distance of 69.5 m. The distance between the two lines is 12 m at the western end of Area 1, 16 m at the centre, and 15 m at the eastern end. The line of ashlar masonry observed in 1990 lies on the outer line (see **fig. 1**).

The initial geological report suggests that these two lines are in fact a type of beachrock which forms naturally along shorelines in the intertidal zone.[9] Analogous formations, varying considerably in their composition, are to be found around the Chalkidike. If this identification of the two features proves to be correct, we appear to have here two distinct earlier shorelines (of as yet indeterminate date). The two lines run roughly parallel to one another and to the present shoreline, though the convex divergence of the outer line from the natural curve of the bay at this point (in apparent contradiction to the topography) echoed towards the eastern end of the inner line, is noteworthy—and will probably bear further investigation. Although the use of beachrock as an exact indicator of a shore-line needs to be treated with caution,[10] it is hoped that subsequent investigation of the materials encased in the compaction and/or of the cementing matrix will help to date those shore-lines. Samples of beachrock were extracted at three points, two from the outer line of beachrock, one from the inner. Time and the resources available, however, did not allow the removal of an uncontaminated section and no material retrieved during the 1993 season permitted conclusions about the absolute chronology of the site, although the small amount of diagnostic material found suggests that the inner shore-line at least may belong at the earliest to Late Antiquity—i.e. that any changes in sea-level may have occurred since Classical antiquity. For what it is worth, a 17th-century drawing of the

[9] On the formation of which see T. Alexandersson in: D. J. Stanley (ed.), The Mediterranean Sea: A Natural Sedimentation Laboratory (1972) 203–23; D. Hopley in: O. van de Plassche (ed.), Sea-level Research: a manual for the collection and evaluation of data (1986) 159–63.

[10] Ibid. 164–5.

site by Coronelli showing the Turkish fortress atop the Lekythos and considerable residential occupation of the isthmus appears to indicate that the present shore-line was in place by that time.[11] It also indicates no maritime facilities along the eastern shore-line of the Lekythos or its neck.

It should be noted that the southern end of the remains of Feature 4 appears to have been encased by the higher (i.e. later?) submerged shore-line, suggesting that the structure of which Feature 4 is a part pre-existed that shore-line and tentatively confirming the impression that Feature b post-dates Feature a. The apparent fact of two such distinct underwater shore-lines might further suggest that the change in relative sea-level was episodic rather than gradual.

Further answers may lie in future excavations to the immediate north of the inner line of submerged beachrock (Feature b)—in particular an answer to the question of whether or not there is a distinct northern edge to that feature or whether the beachrock extends northward under the presently visible sea bed/beach deposits, which might thereby indicate a more gradually trangressive shore-line, i.e. a shore-line which steadily encroached on the landmass as a result of a regular rise in relative sea-level. The northern (i.e. outer) edge of the inner line of beachrock was less distinct than the southern (i.e. shoreward) edge. The seaward dip of the northern edge could, however, be explained as a distinctive feature of beachrock formation, and indeed has been regarded by some as a characteristic of beachrock.[12]

In a preliminary attempt to answer these questions, an exploratory trench (Tr. ii) was opened along the northern face of the inner submerged line of beachrock but within a depth of about 0.3 m, measured from the upper surface of the lithified shore-line which formed the southern wall of the trench, the excavation met with rock; whether bedrock or a northern extension (or lower stratum) of beachrock will need to be determined by further excavation. The diagnostic ceramic material retrieved was negligible. With the added difficulty of establishing and maintaining strict context, even within this shallow trench, that which was found (and this included one Late Roman sherd) could not be utilized.

Both lines of beachrock end indistinctly at their visible extremities, appearing simply to peter out at their eastern ends, but even less distinctly at their western ends where they seem to disappear under the loose rock spill and sand which characterise the general surface deposits of Area 1. At one point, a narrow but quite distinct break occurs in the inner line. It cuts sharply through the beachrock in a seemingly parallel direction to that of Feature 4 to which it is proximate and appeared to have been faced with stone on its western side. At this point also the inner line widens markedly.

Approximately midway along the outer line of beachrock there is an even more substantial break in the cementation for which there is no apparent explanation. If erosion is the cause, it is unlike any other degradation found along either of the two lines. At that point there is an intrusion of *poseidonia* (sea grass) which is found extensively along the outer face of the rock, but rarely shoreward.

A line of ashlar blocks lies along a 12.3 m stretch of the outer beachrock. Called 'Feature 2', this is the most remarkable artificial feature of the site so far uncovered (**figs. 1, 4; pl. 9: 1, 3**). Two lines remain, the eastern line being 5.2 m long, the western (set back a little to the south but on a parallel course) 5.6 m long. The blocks are shaped but irregular. The lines are mostly of header construction. Only one course remains and appears to have been built into the beachrock. A distinct layer of beachrock has apparently formed to the

[11] The drawing, now in the Gennadeion Library in Athens, shows the Turkish fort but nothing of the remains of the Classical site. It is expected that the drawing will be published in Catling's forthcoming study of the later periods at Torone.

[12] Alexandersson art. cit. 207.

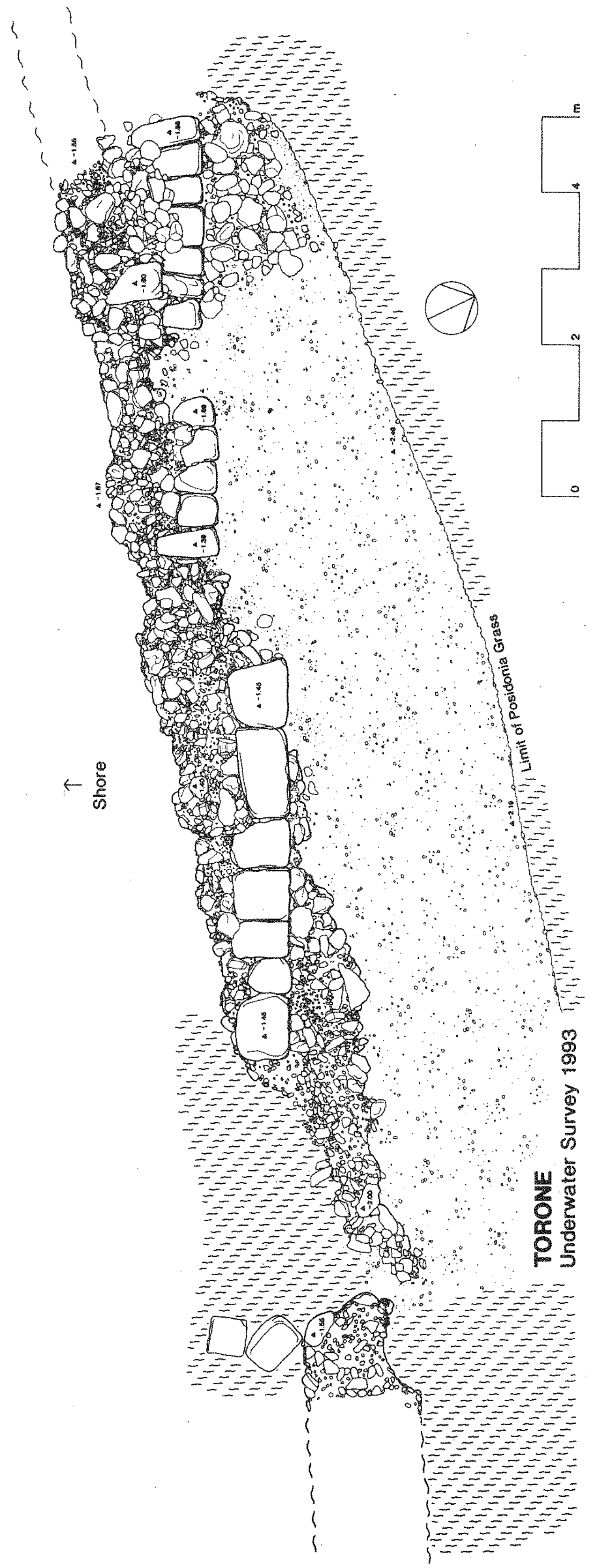

Figure 4. 'Feature 2': ashlar masonry in outer line of beachrock (T. Smith).

landward side of this feature after its construction. The upper surface of these blocks was level, though it was a distinct impression of the member of the team who drew this feature that another course may have overlain the present remains. Currently, only a single block sits atop the present structure (towards its western end) but in a significantly recessive position and is likely to be the result of an accidental spill. Certainly the existence of any other lateral course to shoreward seems ruled out by the cementation of beachrock which has occurred directly behind the remaining line of blocks, and there is nothing to suggest that any other lateral course ran seaward of the remaining structure. Given the relatively rapid rate at which beachrock forms (10–15 years), it is hoped that future samples extracted from each of the matrices behind and below the ashlar masonry will provide some indication of its date. Topography suggests a maritime facility, but the isolated nature of the remains makes confident interpretation difficult.

A further line of irregular masonry (Feature 1) was found 2.4 m to the north (seaward) of the outer line of beachrock at a point directly north of the eastern end of the ashlar blocks described above. A clearing of the sea grass revealed a confused line of irregular but worked stones. A trench (Tr. iii) was opened to its north to explore the foundations of this masonry, without significant result. Concreted to the top of one of the blocks was found what appeared to be an iron cannonball, possibly to be associated with Morosini's siege and capture of the Turkish naval station here in 1659. This was recovered and given field conservation. It was observed that the slightly flattened surface of the sphere (perhaps a point of impact) lay opposite the point of concretion.

Approximately 10 m further east of the line of ashlar blocks masonry is visible apparently embedded in the beachrock. Its upper course appears to be set at an angle of approximately 45° to the line of the beachrock at that point. The line(s) of any artificial structure here is/are obscured by what appear to be faults in the cementation of the beachrock. Clearing of the sea grass revealed a lower course (or platform) to the seaward side, seemingly set at right angles to the upper. This feature will be the subject of further investigation in subsequent seasons.

Ten metres further east again, three large worked blocks protrude from (or abut) the inner (southern) face of the beachrock (**fig. 1**: Feature 3). Although the blocks are irregular, their faces abutting the beachrock seem to present a consistent face and the angular cuttings of the blocks might hint at an intended concentricity which might in turn suggest that they once formed part of a rounded structure (no other sign of which has yet been observed). Again, this is a feature which awaits further investigation.

The clearing of sea grass at various points along the outer (seaward) face of the northern line of beachrock revealed, during this first season, no indicators of former sea-level, such as marine notches (other than the beachrock itself).[13] Both to the seaward, and more markedly to the shoreward, of this northern line of beachrock note was taken of a general scatter of isolated worked blocks, and individual items were electronically plotted. Some of them may be *in situ*, others—for example the rudder-shaped stone shown in **pl. 9: 4**—probably not.

Few artefacts were found in Area 1. To the immediate south of Feature 7 within a metre of the shore-line in a few centimetres of water was found a squat, roughly triangular but badly

[13] On sea-corrosion notches (or 'nips'), see P. A. Pirazzoli in: van de Plassche (ed.) op. cit. 361–400. Fossilized organisms such as gastropods would not be expected in this submarine environment (J. Laborel ibid. 281–310, see esp. 294–5) and molluscs are in any case problematic (K. S. Petersen ibid. 129–56). Cf. D. J. Blackman in: Blackman (ed.), Marine Archaeology. Colston Papers 23 (1973) 115–39; P. A. Pirazzoli, World Atlas of Holocene Sea-Level Changes (1991) 10–21.

eroded block of porous limestone weighing approximately 35 kg with a perforation towards the apex but to one side (with its diameter varying from *c*.9.5 to 12 cm). The length of its base is approximately 45 cm; its thickness at the base approximately 26 cm; at the apex approximately 11 cm; and it is approximately 34 cm from its base to apex. Whether it should be identified as an anchor is a moot point.[14]

General Observations and Discussion

The inference to be drawn from the underwater mapping of the contours of the Lekythos is that a change of no more than two metres in relative sea-level would produce a low plain to the east of the Lekythos almost doubling the width of the present isthmus. The findings within 'Area 1' suggest that this submerged area was once a terrestrial site, possibly occupied according to some rough town plan; also that its submersion occurred in stages. It is not possible to offer an absolute chronology at this point. Further investigation of the shore-line transgression that has occurred at Torone may shed valuable light on the history of the settlement in general, and hopefully also on the coastal processes and coastal change in the Chalkidike (an area from which further data is generally sought).[15]

The degree of relative sea-level change suggested by the evidence found at Torone, approx. 1.75 m, is not extraordinary. (Nor is it now generally anticipated in oceanographic studies that the evidence coming from archaeological sites will conform to a particular pattern.). Confident explanations as to the cause of change at Torone must be deferred. Measurable changes that have occurred during the Holocene period are unlikely to have been eustatic to any significant degree (that is to say, are unlikely to represent world-wide synchronous alterations in the level of the ocean relative to the centre of the earth).[16] Considerable local variation in the rise of relative sea-levels at different sites has now been recorded, and is now expected.[17] In the Aegean, two factors predominate: vulcanism and continental drift.

[14] If it ever served as an anchor, it would belong to one of the most primitive types and fall somewhere between Types 1, 2, and 3 in the typology established by G. Kapitän, 'Ancient anchors—technology and classification', IntJNautA 13, 1984, 33–44; or to E. Ciabatti's Type A: L'archeologo subacqueo, Manuale di ricerca e di scavo (1984) 44, 46 Table 16. This does not rule out the possibility that the piece was commissioned and used in modern times. Suggesting identification as an anchor are two grooves to be observed on the surface of the stone, possibly from rope grips, both approximately 4 cm wide and 10 cm long, one vertical and dropping from the perforation, the other horizontal and forming a notch wrapped around the thickness of the stone on one side. Weighing against the identification is its very irregular shape and the fact that its (natural) cavity shows no sign of having been smoothed by use. It should be noted that its locus would not have been a submerged one prior to the last major rise in relative sea-level.

[15] N. C. Flemming–C. O. Webb in: A. Ozer–C. Vita-Finzi (eds.), Dating Mediterranean Shorelines. Zeitschrift für Geomorphologie Suppl. vol. 62 (1986) 26. Note the relative absence of available data from this region in Pirazzoli's coverage of the Aegean (op. cit. 93–9). Numerous relevant sites, as yet unpublished, are known to those working in the area.

[16] N. C. Flemming–N. M. G. Czartoryska–P. M. Hunter in: Blackman (ed.) op. cit. 1–66; cf. N. C. Flemming, Science Journal 4, 1968, 51–5; Flemming–Webb art. cit. For a general discussion of the reasons for sea-level change, see Pirazzoli, op. cit. 6–10.

[17] The accumulating evidence being gathered in the Mediterranean of considerable local variation in the rise of relative sea-levels suggests that the explanation is to be found in earth movement. Well over 1000 relevant Mediterranean sites have now been analysed (Flemming–Webb art. cit.); probably less than half provide reliable data (ibid. 2). This is especially the case if the rise is in excess of 30–50 cm (Flemming–Czartoryska–Hunter art. cit.). Evidence gathered, particularly in the southern Aegean, shows 'areas of complex tectonism, with closely-spaced discontinuities in their geological structure' (Pirazzoli op. cit. 88–9).

If a more common pattern is to be observed, it is that land movement is downwards, and this is more or less true throughout the Mediterranean basin (N. C. Flemming, Archaeological Evidence for Eustatic Change of Sea Level and Earth Movements in the Western Mediterranean During the Last 2,000 Years. The Geological Society of America Spec. Pap. 109 [1969]). This will particularly be the case in the Chalkidike, where—if a pattern is to be observed—it is that fault lines tend to run east-west with a likely subsidence to the south (B. Papazachos–C. Papazachou, Οἱ Σεισμοὶ τῆς Ἑλλάδας [1989] esp. 95–111).

Earthquakes are frequent.[18] It must be stressed again, however, that these effects can be highly localized.[19] Within the range of evidence for such phenomena provided by other Mediterranean sites, the rise of relative sea-level at Torone is not extreme, though (an) isolated contemporary trauma (or traumas) cannot be ruled out.

[18] Frequent earthquakes are a product of the situation where the Aegean overlies the plate boundary running between the African and Eurasian land mass; note, with significance for the present study, the plate boundary underlying north-west Turkey and the Hellespont (J. M. Peters, Neogene and Quaternary vertical tectonics in the south Hellenic arc and their effect on concurrent sedimentation processes, Gua Pap. Geol. Ser. 1 No. 23 [1985]; cf. the simplified map provided by Flemming–Webb art. cit. 25 [fig. 13]). For recent discussion, Papazachos–Papazachou op. cit.

[19] Two sites, only 100 km apart, may provide radically different evidence, the one submerged by 2 m, the other uplifted by 5 m (N. C. Flemming, BICS 21, 1974, 155–7). For various (selective) examples of the submersion of sites in Greece and the Aegean, see M. Cosmopoulos, IntJNautA 18, 1989, 273–6; A. Harding–G. Cardogan–R. Howell, BSA 64, 1969, 113–42; S. Marinatos, Archaeology 13, 1960, 186–93; P. A. Pirazzoli, IntJNautA 16, 1987, 57–66; N. Scoufopoulos-Stavrolakes in: A. Raban (ed.), Harbour Archaeology, BAR Int. Ser. 257 (1985) 49–62; N. C. Scoufopoulos–J. G. McKernan, IntJNautA 4, 1975, 103–16; T. H. van Andel–N. Lianos, IntJNautA 12, 1983, 303–24; T. H. van Andel–N. Lianos, Quaternary Research 22, 1984, 31–45 (and the bibliographies contained therein).

'BOXING ON' A LUCANIAN RED-FIGURED SKYPHOS IN THE UNIVERSITY OF MELBOURNE*

P. J. Connor

The second volume of this journal (1989) was dedicated to A. D. Trendall. On the occasion of its launching at the University of Melbourne, Professor Trendall surprised and delighted those present by making a gift to the University Collection of an early Lucanian red-figured skyphos.[1] In discussing this skyphos here (**pls. 10; 11: 1**), I am clearly indebted to the scholarly work of its donor, who laid the foundation for and built a towering edifice in the study of South Italian pottery.

The skyphos is of Corinthian type;[2] its decoration is influenced by the Attic motifs of boxing—popular in middle to late black figure, of less interest in red figure, and becoming rare in South Italian fabrics.[3] Skyphoi are not common in Attic red-figure, although on Late Archaic vases they are often shown in the hands of revellers: non-painted skyphoi are the commonest of everyday and festive drinking vessels.[4]

The lozenge pattern beneath each handle and the lattice panels that flank it on each side prompt the placing of this skyphos in the Intermediate Group.[5] Here the lattice frames the single-figure scene of each side as well as the lozenge beneath the handles.[6] The lattice pattern to the right of side A and to the right of side B are not regular quadrangles since both taper markedly towards the bottom, the latter especially. The lozenge pattern to the right of side A finishes at the bottom with black diamonds; at the left the diamonds are full, at the right, since the pattern is not placed strictly horizontally, there are half diamonds.

The significance of the lozenge was demonstrated by Trendall himself in his discussion of the Aura skyphos in Sydney.[7] On the Aura skyphos, reported to have been found at Conversano near Bari along with an Attic red-figured column-krater by the Painter of Munich 2335 (ARV 1166, 98), the lattice-work panels, bordered by a very fine reserved band on all sides (including just under the rim), are key-shaped since the lozenge pattern extends beyond the width of the handle on each side.[8] It was a pattern favoured by the Marlay Painter, a minor artist of the last quarter of the 5th century BC,[9] who must therefore be reckoned an Attic (near)

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[1] Inv. MUV 75: 1989.0070. Ht. 12; diam. without handles 13.5, with handles 21 cm. Trendall, LCS Suppl. 3 (1983) 26 no. 353b; K. Schauenburg, JdI 103, 1988, 84 figs. 28, 29. The skyphos has been put together in modern times from several large fragments, with a few small patches of restoration: for example, the patch across the thigh of the figure on side B. On the underside the centre is reserved; the stand-ring is black with a fine reserved ring running around it.

[2] J. H. Oakley, The Phiale Painter (1990) 56; MuM Sonderliste N (1971) 48–50 no. 66. A Paestan skyphos of Corinthian type: CVA Bonn 3 pl. 61: 1–4.

[3] See, for example, the index s.v. athletes in A. D. Trendall, Red Figure Vases of South Italy and Sicily (1989) 286.

[4] See E. R. Knauer, Ein Skyphos des Triptolemosmalers (1973) 5.

[5] For the Intermediate Group, see Trendall, LCS 62ff.; LCS Suppl. 2 (1972) 160ff.; Suppl. 3 (1983) 23ff.

[6] Trendall, LCS pl. 33: 1–3.

[7] In: K. Schauenburg (ed.), Charites. Festschrift für E. Langlotz (1957) 165ff., esp. 167–9. For an illustration, see Trendall op. cit. (n. 3) 64 fig. 66.

[8] The lozenge pattern is found on a nestoris by the Amykos Painter: M. E. Mayo (ed.), The Art of South Italy. Vases from Magna Græcia (1982) 59ff. no. 4, where Trendall is cited for his comments on both the Intermediate Group and the Marlay Painter and his group. This nestoris is Trendall, LCS Suppl. 3 (1983) 81 no. 71 pl. 2: 2–4.

[9] Trendall, LCS 69; Beazley, ARV 1276ff., esp. nos. 33 and 35.