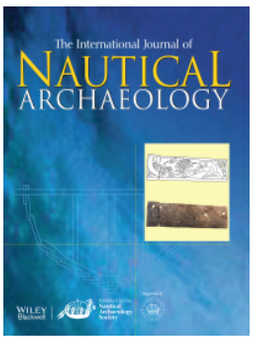

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Archaeological Investigations in the Harbours of Burgaz, Turkey: 2011–2015 field seasons

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Between 2011 and 2015 archaeological fieldwork was conducted in the Archaic through Late Antique harbours associated with Burgaz on the Datça Peninsula in south-west Turkey. This work focused on survey and documentation of built features associated with the four harbours, limited stratigraphic excavation, and identification of shipwrecks and seafaring activity outside the harbours. The results offer new insights into the growth, expansion, and eventual abandonment of the port complex, its development alongside the urban settlement, and its changing maritime dynamics in light of economic shifts across the peninsula and the eastern Mediterranean.

Key words: Ancient harbours, Old and New Knidos, maritime networks, port-city relationships, coastal adaptation, eastern Mediterranean.

Archaeological investigations were conducted annually between 2011 and 2015 at the Archaic through Late Antique harbours associated with Burgaz on the Datça Peninsula in south-west Turkey (Fig. 1). With its strategic location at the juncture of the eastern Mediterranean and Aegean basins, the Datça Peninsula offers an ideal vantage point for exploring the intersection of long-term trends in seaborne contacts with the ebb and flow of a locally prospering maritime economic landscape. The site of Burgaz, situated midway along the southern shore of the peninsula, was identified by Bean and Cook (1952: 202–204) as 'Old Knidos', or the early settlement of the Knidians before the intensive development of the city at Tekir at the tip of the peninsula. With the expansion and reorganization of Knidos from the 4th century BCE, Burgaz sees a crucial shift in its local social fabric and economic fortunes. While in many instances such towns experienced decline with the rise of a new regional centre, Burgaz seems rather to have capitalized on its traditional agricultural base while integrating alongside Knidos into expanding maritime networks across the Hellenistic and Roman eastern Mediterranean (Tuna *et al.*, 2009). Fieldwork in the harbours at Burgaz aimed to shed new light on the growth, expansion, and eventual Late Antique abandonment of the varied port complex, its co-dependent long-term development with the urban settlement, and its changing maritime dynamics in light of shifting patterns of economic activity across the peninsula and region more generally.

Long-term maritime activity at Burgaz

From at least the Archaic period, Burgaz played an active role in regional sea trade driven by its strategic location within the Gulf of Hisarönü and its proximity to the peninsula's only low-lying agricultural lands. That the sea was central to the settlement's urban and economic development is evident from the layout of its four harbours, located to the north and south of the acropolis (Fig. 2). In order to understand this maritime complex and its evolving relationship to activity at Burgaz and across the peninsula, these submerged and coastal remains were explored by a team from Brock

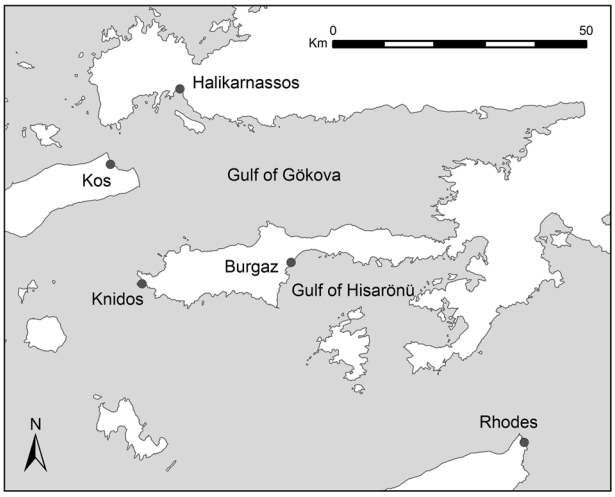

Figure 1. Map of the south-east Aegean showing locations of Burgaz, Knidos, and other important sites (J. Leidwanger).

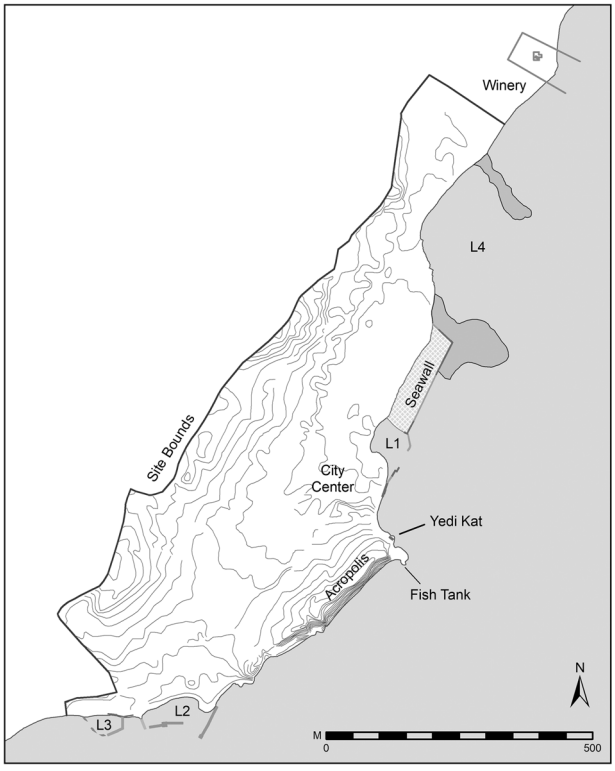

Figure 2. General plan of Burgaz showing location of the settlement, harbours, and other relevant features (J. Leidwanger and N. Riddick).

University and Stanford University in collaboration with Middle East Technical University and the Institute of Nautical Archaeology (Tuna *et al.*, 2013; 2014; 2015; 2016). Investigations of the harbours and shoreline features question how the changing maritime landscape of Burgaz reflects a series of fundamental socio-economic shifts along the Datça Peninsula, from the city's rise as an Archaic maritime centre, to the Late Classical shift, Hellenistic industrialization, Late Antique resurgence, and ultimate decline. Looking seaward, the project examines questions at the heart of long-term explorations by the Institute of Nautical Archaeology along the Bodrum and Datça peninsulas, where decades of underwater survey have revealed shipwrecks from the Archaic through the Byzantine period and beyond (Leidwanger, 2017). The south-east Aegean was for centuries an important point of transit, where ships carried goods for distribution around the region and internationally, particularly between the eastern Mediterranean and Aegean worlds. Remains from the harbours at Burgaz offer a fine-grained window into the role played by one strategically located settlement within an increasingly connected ancient maritime economy.

Five seasons of research between 2011 and 2015 focused on three primary areas: Harbour 1 (Liman 1 in Turkish, or L1), the closest harbour to the settlement site, and the nearby seawall area; Harbour 4 (L4), the site's largest and latest harbour, located farther to the north of L1 and the seawall; and Harbours 2 and 3 (L2 and L3), situated together just south of the acropolis. The work was based upon three primary objectives: 1) exploration, mapping, and documentation of the built architectural features that comprise the extant remains of the harbours both under water and on shore; 2) exploration, documentation, and sampling of the ceramic record from stratigraphic excavation in and around these harbour basins; and 3) identification of shipwrecks and other evidence for seafaring activity throughout and immediately outside the harbour bounds. Fieldwork consisted of recording visible remains at each harbour, as well as limited excavation in L1, the seawall area, and L2. A season of topographical survey and mapping in 2011 was followed by excavation, using shallow-water dredges, between 2012 and 2015. Upon the completion of work each season, trenches were covered with permeable fabric, then backfilled with a mix of sandbags, pebbles, gravel, and sand. Each focal area in this study shed light on the nature and chronology of the harbour complex and its association with settlement activity. Results from these different sectors reveal the long-term development of the maritime landscape at Burgaz, although the results presented here should be considered preliminary, with ultimate testing dependent on further excavation and geophysical prospection in the future.

Harbour 1 (L1) & adjacent seawall area

Located a short distance to the north-east of the settlement, L1 is an excellent natural harbour, probably used by the city from its foundation (Figs 3 and 4). Opening to the south-east, the inlet offers good mooring during the prevailing *meltem* (etesian) winds (Fig. 5). Built features extended this natural protection

Figure 3. Aerial view of L1 and the seawall area (Middle East Technical University).

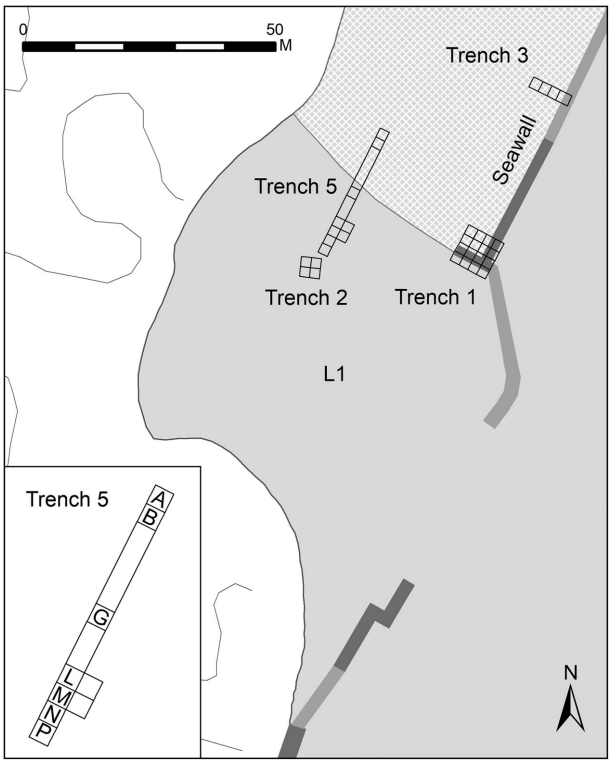

Figure 4. Plan of L1 showing major features and trenches (J. Leidwanger and N. Riddick).

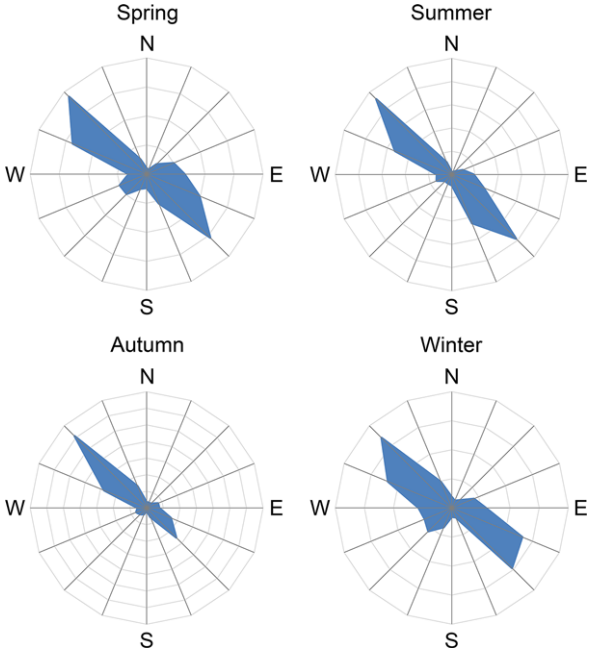

Figure 5. Seasonal wind roses for the modern port of Datça, about 1km to the west of Burgaz (J. Leidwanger, using data from www.windfinder.com).

against the southerly/south-easterly *lodos*, creating an enclosed basin that today measures just 65m across and about 60m from the current shoreline to the entrance channel. While these dimensions might suggest a fairly

small harbour, sedimentation from agricultural activity and the enclosure of the area with built structures seems to have reduced a basin that once extended farther into the low-lying land on shore. Geophysical survey conducted several decades ago around the site supports this assessment (Kayan, 1988a; 1988b), though more extensive work would be required to outline precisely the boundaries of this early port. In the water, visible harbour structures consist of a mix of polygonal masonry, large rock, and smaller rubble. The north edge is delineated by a broad area of compacted pebbles that extends perpendicularly from shore for more than 40m before joining a low line of polygonal masonry for another *c.*7m. From this point, the stone construction turns to the south to create the protective arm of the L1 mole. While cut blocks can be seen here only for the first few metres, large rough rocks extend this feature for more than 30m. On the opposite, southern edge of the harbour, a row of large rocks projects some 35m from shore to create the second protective arm, leaving an entrance channel between the two moles some 10–15m wide.

From this intersection of two walls that form the northern limits of L1, a second and longer construction extends to the north-east. Marked by one—and sometimes two—rows of large rock, this seawall runs parallel to shore at a distance of about 45m and over a total length of approximately 190m (Figs 2 and 4). The rocky boundaries are most visible at the southern and northern extremities, and although no clear remains can be traced for the central 75m, the seawall certainly extended across the full distance between L1 and L4. Reinforced with a rubble mound facing the sea, this wide feature served to protect the low-lying ground behind from the *lodos* winds, and may also have offered a mooring point for ships during *meltem* breezes. The boulders that comprise most of the seawall are quite heavily degraded by the continuous force of the sea and no traces of worked surfaces can been seen. The seaward edge features a calcified ledge just below the waterline that would have formed in the intertidal zone, likely indicating an earlier sea level that extended the shore an extra few metres. Although most of the area inside the seawall is currently submerged, with depths ranging from a few centimetres to about 0.75m during mid-tide, the area was surely protected for much of antiquity before this subsequent sea-level rise (see below).[1] This low-lying space inside the seawall may have been used for general maritime activity: though no remains of built structure survive, hypotheses include loading and off-loading of vessels as well as ship supply and repair.

Excavation in L1 and the adjacent seawall was conducted between 2012 and 2015 focusing on three primary areas: 1) along the northern mole of L1 and toward the interior of the harbour; 2) across the pebble area that marks the visible division between L1 and the area behind the seawall; and 3) inside the seawall area. A series of trenches were placed to allow exploration of these architectural features and the depositional history of the basin and adjacent areas (Fig. 4). The first trench, undertaken in 2012 and 2013, crossed the seaward end of the northern harbour mole in L1 (Trench 1); it comprised 16 units, each 2 × 2m in size with some excavated to a maximum depth of about 1.3m below the seafloor. Work here in 2013 centred on limited exploration of two smaller areas: four 2 × 2m units were excavated running from the shoreward edge of the seawall (Trench 3), and a single 2 × 2m unit was established in the shallow water (*c.*0.3–0.5m deep) near the middle of L1 (Trench 2). Finally, in 2014 and 2015, a long trench (Trench 5) was established to intersect the full length from the area inside the seawall, across the pebble mound, and deep into the L1 basin. Two units (2 × 2m) were excavated within the seawall area (A, B) and another two units within L1 (L, M), later extended to include two additional adjacent units (N, P). Units A and B at the northern end of the trench were excavated to a depth below the current seabed of *c.*0.85–1.35m (0.95–1.45m below the water level), while the southernmost part of the trench (N and P) was excavated to 2.5–3.1m in full, and on a partial basis to a maximum depth of 3.37m, reflecting a depth below the current sea level of more than 4m. While diagnostic ceramics provided the basis for dating of features and levels, all ceramics were collected regardless of preservation to allow full quantification by ware and fabric. Through comparison with finds from the longstanding excavations of the city centre and explorations across the Datça Peninsula (Tuna and Atıcı, 2009; Sakarya, 2016), quantitative studies offer a chance to look at both the probable function of different areas, their association with the urban centre, as well as various local and farther-flung seaborne connections.

Trench 1 offered a glimpse into the construction of the harbour wall as well as a depositional sequence (Fig. 4). Excavation showed at least three rows of masonry, all with surfaces facing the basin interior, but no further signs of carefully cut blocks. Finished materials that stood atop these water-level features were likely repurposed for other construction after the harbour fell into disuse. No surface traces of this cut stone line are visible closer to shore, suggesting a preference for different modes of construction for the exposed seaward end and the more protected areas closer to shore. Along the interior of the wall were recorded both apparent wall fall and in some places roof tile fragments that may point to the collapse of the harbour-side structures. The underlying dense rubble mound is best interpreted as foundation. On the opposite, northern edge of this stone line, concentrations of rubble fill suggest the interior of a platform, pier, or wide wall. Such roughly built harbour structures are difficult to date from architectural features alone; the eroded rock that marks the ends of the two L1 harbour moles could reflect construction from virtually any period, but are hardly the sorts of monumental harbour fortifications scholars tend to associate with major

Hellenistic and Roman sites (Marriner *et al.*, 2014). The short stretch of better-preserved masonry generally resembles Classical construction on land at Burgaz, and in harbour structures preserved elsewhere in the eastern Mediterranean, such as at Lycian Patara (Tuna *et al.*, 2009; McNicoll, 1997; Dündar and Rauh, 2017).

While the northern part of the excavation area inside the basin was marked by greater concentrations of dense rubble, the opposite southern part contained more ceramics and other cultural material, particularly at deeper levels, which probably reflect the routine build-up of smashed detritus along the harbour limits. This basin material is in a poor state of preservation but can be dated primarily to the Late Classical and Early Hellenistic eras and later. A fragment of a likely Classical Cypriot basket-handle amphora and Hellenistic black-gloss wares provide some of the earlier datable finds from this context. Ceramic counts reveal a high proportion of amphora material within the basin, as would be expected from an active harbour context (Tomber, 1999). A cursory view of the fabrics from finds on either side of this wall feature, however, suggest some contrast in origin, with a generally higher percentage of non-local wares appearing within the basin than from the opposite area behind the seawall. Along with a significant quantity of ceramics, bones and teeth from cow and probably other domesticated animals were observed, perhaps hinting at consumption patterns on board ships and around the harbour.

With Trench 1, excavation along the edges of the harbour basin helped to define the major features, but both the construction and the finds supported a later date than might be expected in the harbour of an important Archaic site. At the same time, the shallow depth and clear sedimentation suggested that the coastal topography had changed considerably since the Archaic period, and complementary work might productively focus on the deeper central area of the current basin. Based on the submergence of coastal architectural features outside L1 (see L4 below), local sea-level rise since antiquity of perhaps 0.6–0.8m appears reasonable in and around Burgaz, and agrees with the proposal from preliminary geophysical analysis by Kayan (1988a; 1988b). Limited air probing within the northern half of the L1 basin aimed to test the depth of the sediment and the possibility of the L1 northern wall extension through the pebbly area toward shore, but this venture met with little success due to the heavily compacted layers. Investigations were therefore followed up with a single 2 × 2m exploratory trench (Trench 2) in the shallows (*c.*0.3–0.5m deep) near the middle of L1. Excavation to a depth of approximately 1.1m below the seabed required removing the thick mat of Posidonia grass and its sandy root layer, beneath which was recorded a sediment consisting of multi-coloured pebbles, medium brown sand, and shell. This 0.30–0.50m-thick layer contained a mixed collection of amphoras, common and cooking wares ranging from probably the Classical period into the Ottoman period and beyond. Beneath this initial 0.50m the soil is largely comprised of dense medium-grey clay and black pebbly silt. A small core taken at the lowest point of the trench allowed inspection of sediments for another 1.40m, revealing black silty soil and concentrated medium-grey clay that suggests the ancient harbour floor here may have been at least 2.50m below the current seabed, or *c.*3.00m below the current sea level, a depth that (even accounting for sea-level rise) would have been suitable to accommodate most shallow-draughted ancient merchant vessels.[2]

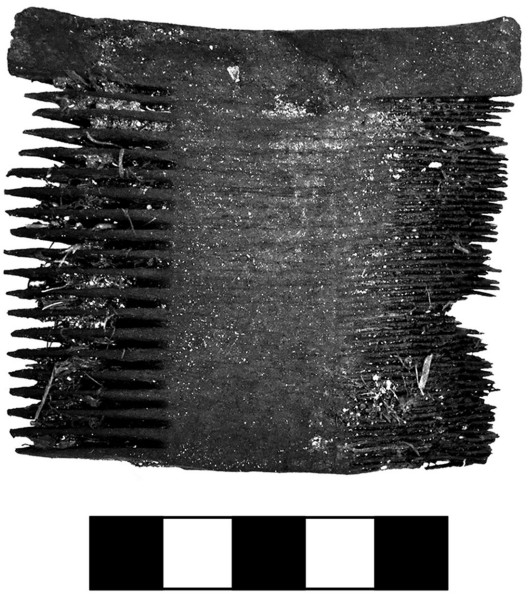

Figure 6. Wooden comb found in the upper levels of Trench 5 (E.S. Greene).

Following this preliminary work, the 2014 and 2015 seasons saw a concerted effort to establish the full stratigraphic sequence of the L1 harbour basin alongside that of the adjacent area behind the seawall. Excavation at either end of the long, narrow Trench 5 provided complementary insights that shed new light on both of these areas. While upper levels here revealed the same general mix of worn Late Classical to modern material, the deeper layers explored (Units L, M, N, P) brought a generally lower ceramic density and higher proportions of diagnostic and more intact examples that suggest primary deposition. The wide variety of material remains included not only ceramics but also metal and, thanks to the dense sediments at these lower levels, wood and other organic remains. The discovery of a double-sided comb (Fig. 6) with good parallels to one found in the 11th-century-CE shipwreck at Serçe Limanı, Turkey, thought to be part of a personal grooming kit (Bass *et al.*, 2004: 275–79), promised anaerobic contexts and well-preserved archaeological finds starting at only approximately 0.50m below the seabed, and excavation from 2014 onward revealed earlier finds below.

Figure 7. Excavating wooden ship elements in L1 (E.S. Greene).

Situated beneath several roughly contiguous architectural blocks of uncertain purpose were the clearest indications of ancient nautical activity yet. In association with frequent Hellenistic ceramics, including a pan and casserole, were wooden remains comprising timbers of various sizes (up to 1.30m in length) and orientations; at least one preserves a scarf or repair, another a pegged mortise-and-tenon joint, and many show tool marks, square nails or nail holes (Figs 7 and 8). Their stratigraphy suggests a date in the Hellenistic era. Though no obvious patterns in the timber layout could be ascertained, the joinery along with rigging elements, various copper and iron tacks, nails, concretions, and small pieces of folded or twisted lead—most likely bits of hull sheathing—probably indicate that many of these once belonged to ships, with likely evidence for a mix of hull planking, frames, and ceiling planks preserved. Others may have derived from a simple pier or other rudimentary mooring features. In the deeper units of Trench 5 were recorded various wooden posts of varying length but generally 0.045m in diameter and with slightly tapering lower ends. Some of these lie scattered about and others remain driven vertically into the seabed and preserved up to a level that would likely indicate their use in the Early to Mid-Hellenistic period.

The two adjacent units of Trench 5 (N, P) allowed more precise exploration to greater depths over a limited area toward the centre of the present basin. Despite low visibility here, work extended in full to *c.*2.5–3.0m below the seabed and on a partial basis to a maximum depth of nearly 3.4m in one corner of Unit P, creating an opportunity to sample the stratigraphy for paleo-environmental analysis and dating; four calibrated radiocarbon dates now allow some anchoring of this sequence.[3] The resulting profile provides the clearest record presently available for the depositional history of this part of the harbour (Table 1). The uppermost layers, down through the 0.30m-thick Stratum 3, are primarily marked by post-antique and haphazard use as well as secondary deposition of material from shore. The layers below, by contrast, seem to reflect a better-preserved stratigraphic sequence of activity (Fig. 9). Stratum 4 can be dated thanks to a range of diagnostic finewares from the 2nd century BCE into the 1st century CE. The Hellenistic period saw considerable accumulation of cultural material from the 3rd into the 2nd century BCE, corresponding to a nearly 0.40m-thick Stratum 5. The ensuing Stratum 6 yielded well-preserved material of the late 4th and early 3rd century BCE. This is preceded by a comparatively thin 4th-century Stratum 7. A final Stratum 8 has been defined by its sediments, but the presence of ceramics in only the upper part and the wide chronological range evident from radiocarbon dates allow it to be split broadly into two smaller layers. Stratum 8a includes limited but well-preserved 5th- and 4th-century ceramics and, still further down, a radiocarbon date of 785–540 BCE. Stratum 8b, by contrast, appears devoid of cultural material and, just 0.20m below the Archaic date, can be assigned by radiocarbon to at least two millennia earlier. The lowest defined layer (Stratum 9) continues without cultural material.

Together, this sequence of finds and corresponding radiocarbon dates offer several key clues about the lifespan of activity in this particular area of L1. First, this part of the harbour basin appears not to have been heavily used before the Classical period. This is not to say that other parts of L1 did not see Archaic activity, but the ceramic record and dates indicate a lack of cultural deposition here until perhaps the 5th and 4th century BCE. Evidence for Archaic harbour activity might therefore be more productively sought in the low-lying fields inland from the current harbour, where early ceramic material, both locally produced and imported, has been discovered on the interior of a wall that may have bordered the early harbour area (Tuna *et al.*, 2014). Second, the significant increase in the rate of deposition from these initial cultural levels onward, particularly from the 5th and 4th centuries (Stratum 7), likely indicates an altering of sediment circulation along this point of the coast. The most obvious suggestion is that new harbour enclosures disrupted the natural flow of sediments through the inlet, causing more rapid infill

Figure 8. Wooden ship elements found in Hellenistic layers at L1 include a likely toggle as well as two partial planks. One preserves a pegged mortise-and-tenon joint; the other, perhaps used for repair, was fastened with three iron nails (E.S. Greene).

that fortuitously offered good preservation for ceramics and organics.

Two factors help to narrow the likely date for this uptick in sedimentation firmly to the Classical period: 1) the fact that late Classical pottery was recovered immediately above the level (1.90m) that produced a radiocarbon date of 785–540 BCE; and 2) the comparatively thick deposits that include a variety of diagnostic finds from the Late Classical period onward. Accounting for sea-level rise of perhaps 0.60–0.80m and the current water depth in this part of the harbour of 0.60–0.70m reveals that in its initial phases of use (Strata 8a and 7), the harbour depth here of 1.50–2m would have been sufficient for at least routine craft in calm weather given minimal tides and the protection afforded by the L1 walls. Measuring the pace of sea-level rise more precisely requires further indicators in the future (Kızıldağ *et al.*, 2012; Morhange and Marriner, 2015), but it seems likely that within a short few centuries, this modest depth was reduced still further. The wooden posts noted above are concentrated in Strata 5, 6, and 7, probably placed during the 3rd and 2nd century (that is Stratum 5). Such an effort may reflect an easy solution for simple mooring of small craft late in the lifespan of the basin (McGrail, 1981: 19–23). Eventually, however, this siltation would have rendered the basin too shallow to function effectively as a shelter of any significance.

The other, northern end of Trench 5—Units A-B in the area behind the seawall—exhibits marked differences in both stratigraphy and material finds (Fig. 4). No signs of structures were recorded in the trench, nor were any visible from intensive surface survey across this entire shallowly submerged area. The density, nature, and preservation of the finds at different levels within these units helps to shed light on the formation of this feature. Beneath a surface layer of 0.10–0.15m rests a 0.50m-or-more-thick, hard-packed pebble layer with large concentrations of pottery, the densest uncovered in the Burgaz harbour explorations. These include high proportions of small and non-diagnostic transport amphora fragments marked by highly worn edges as well as a near-complete dearth (until the very lowest part) of shell and marine vegetation. Below this layer is a thinner (*c.* 0.25m) layer of clay-like sediments with larger and often intact shell. The density of finds here is lower but contains a higher proportion of better-preserved material, both amphoras as well as finewares. Subsequent limited investigations through this silt revealed a thin series of packed stones at nearly 0.90m below the seabed; if these continue across the larger area, they may reflect a simple surface, in which case a slightly greater sea-level rise, closer to 1m, might be in order. The dense, clay-like layer underlying them offered no significant or diagnostic material finds, and there is no firm evidence to suggest that deeper excavation would reveal earlier cultural remains.

It seems likely that the lowest sediment layer in Units A-B points to a marine origin, possibly augmented by a man-made stone surface for activity once on land. Given the dates of pottery in what appears to be a primary deposition in the 0.25m of silt, such stone paving may date to the Classical period and give evidence for the nearby residents deliberately developing an area to support maritime activity. While

Table 1. *Stratigraphic sequence for Trench 5, drawing primarily on Units N and P (J. Leidwanger)*

Stratum	Depth	Sediments	Finds	Date	Interpretations
1/2	<0.35m	Grey silt, much sea grass toward top, replaced by less seagrass and more shell below	Mixed and poorly preserved ceramics, some better-preserved Medieval, Ottoman, organics, some metal and concretions	Mixed, modern	Casual post-antique use, limited shelter and slow sedimentation, with probable infill/erosion from shore
3	0.35–0.65m	Grey silt, many pebbles as well as some medium and larger rocks	Worn Classical through late antique and later (Medieval), some better-preserved late antique and medieval finds, including organics, some metal and concretions	Classical through late antique and Medieval; C14 date of 405–545 CE (at *c.*0.60 m)	Limited activity through late antiquity and beyond, limited protection, slow sedimentation, with infill/erosion from shore
4	0.65–0.78m	Thick, dark-grey silt, little seagrass or pebbles	Well-preserved material, lots of late Hellenistic and early Roman fine wares, some metal and concretions	2nd century BCE into early 1st century CE	Final stage of regular activity, some shelter, but reduced mooring from sedimentation
5	0.78–1.17m	Thick brown clay with seagrass, much shell, few rocks or pebbles	Generally well-preserved Hellenistic ceramics, organics including ship timbers and wooden posts, metal and concretions	Early 3rd century. into 2nd century BCE	Major period of activity, good shelter, but reduced mooring from sedimentation
6	1.17–1.38m	Thick brown clay with seagrass, fewer shells, more pebbles	Well-preserved early Hellenistic ceramics, ship timbers and wooden posts, metal	End 4th into 3rd century BCE	Major period of activity, good shelter and mooring, and rapid sedimentation
7	1.38–1.54m	Loose sand with small, medium, and some larger rocks	Sherds, and rarely some more diagnostic pieces, wooden posts, metal and concretions	4th century BCE	Growing activity, good shelter and mooring, and rapid sedimentation
8a	1.54–~2.00m	Light-grey, hard-packed coarser sand with seagrass	Rare pottery throughout, mostly concentrated in uppermost part, some organics, metal bits or concretions	5th to 4th century BCE; C14 date of 785–540 BCE (at *c.*1.90m)	Initial activity, good shelter and mooring, increasing sedimentation
8b	~2.00–2.21m	Light-grey, hard-packed coarser sand with seagrass	No cultural material	Prehistoric, including C14 date 3265–2910 BCE (at *c.*2.10m)	No cultural use, slow sedimentation
9	>2.21m	Coarser sand, some clay, many small and some medium tightly packed pebbles, rarer larger rock	No cultural material	Prehistoric, including C14 date of 3650–3385 BCE (at *c.*2.70m)	No cultural use, slow sedimentation

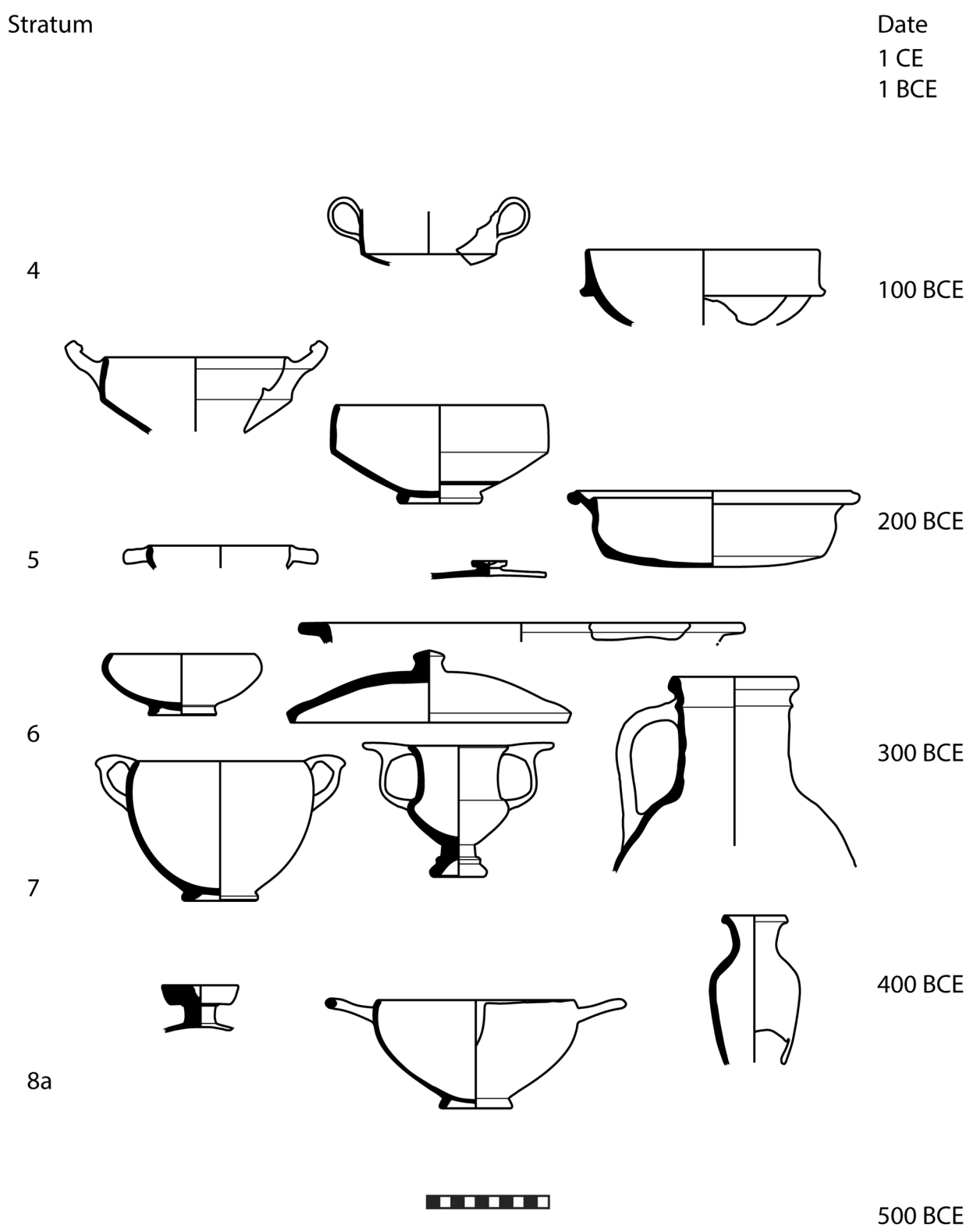

Figure 9. Selected diagnostic pottery illustrating the stratigraphic sequence from Trench 5, drawing primarily on finds from Unit P (J. Leidwanger, M.J. Daniels, S.T. Wilker, M. Collier and B. Guneşdoğdu).

excavation to this level was limited to a very narrow area, the lack of obvious foundations could then point to it having served as an open activity area for loading, unloading, ship repair, and other casual harbour activities. The subsequent 0.25m of marine sediments and casual deposition may indicate a period of minimized or altered use that, together with local sea-level rise, allowed encroachment of the water. A form of reclamation seems to have then taken place using fill from onshore, accounting for the dense and worn ceramics with no intermixed shell. Presumably such an effort was to facilitate continued use of this as an open activity area. The broad dates assigned to this mixed material offer a *terminus post quem* of the Late Hellenistic or very early Roman period, and the recovery of clearly later material at lower levels confirms the identification as fill. How long this period of disuse was, and whether its reclamation was an instantaneous event or took place as part of regular maintenance is not clear. Brief test excavation in Trench 5 Unit G served to confirm a similar upper stratigraphy some 8m closer to the pebble feature that borders the north-east edge of L1 (Fig. 4).

How this low-lying area was protected became clearer during brief excavation in 2013 in an area (Trench 3) immediately abutting the seawall some 30m north of Trench 1 (Fig. 4). Comprising four 2 × 2m units, the small Trench 3 was excavated moving shoreward from the seawall, revealing that the massive structure was built with a rubble foundation for a superstructure of large stones, of which only one course is still preserved sporadically along its 190m length. The foundation is largely comprised of compact, dark-grey stones; farther away from the wall, the stones are more loosely organized, suggesting either fall or a buttressing against the impact of sea swells and winds. A layer of concreted rock and pebble appears at 0.40–0.60m beneath the modern floor and continues at least 0.15–0.20m. This layer may reflect a use surface prior to the gradual sea-level rise that was countered with a massive fill project just to the west. The ceramic remains here date to the Late Classical and Early Hellenistic periods, although the lowest excavated levels also yielded a fragmentary lamp and an amphora toe possibly dating earlier in the Classical period. Additional work is clearly necessary to evaluate the more precise chronological development of this seawall area, but the generally earlier dates of the material in Trench 3 compare to that in Trench 5. A-B may again point to one or more fill events aimed at shoring up this important feature. The expanded harbour facilities in the seawall enclosure seem to correspond with the well-attested uptick in the production and export of local wine after the mid 4th century (Koparal *et al.*, 2014; Tuna and Sakarya, 2017).

As a counterpart to the investigations within L1, visual survey was conducted across the seabed outside the harbour, with transects parallel to the shoreline between the northern mole of L1 and Dalacak Burnu, at the tip of the acropolis; a distance of 75m from the entrance to L1 was explored. The ceramic record can be seen as broadly indicative of the various tasks and tidying undertaken by merchants lying at anchor: for example, routine food preparation in the form of a thoroughly worn Archaic or Classical mortarium (Greene *et al.*, 2008; 2011). Datable ceramic remains, including a 6th-century-BCE Cypriot basket-handle amphora, attest to activity from the Archaic into the Hellenistic era. A lead anchor-core just outside the harbour entrance is certainly Classical or very early Hellenistic in date (see parallels in Trethewey, 2001; van Duivenvoorde, 2012), while fragments of the typical Hellenistic black-gloss wares are again well represented. Two additional sediment cores were taken from this area in an effort to aid understanding of the geomorphology of the site, environmental reconstruction, and the identification of abrupt events (such as earthquakes and tsunamis: see Goodman *et al.*, 2009; Dey and Goodman-Tchernov, 2010).[4] A fragmentary mooring stone with a well-cut rope hole is visible in the shallows near the base of the acropolis wall. This stone, similar in form to examples preserved around the harbour of Knidos (Büyüközer, 2012: 57–58; Doksanaltı, 2007), may have been removed from an earlier structure, perhaps in L1, or it may suggest that this area just outside the harbour proper also served as a mooring point for ships in calm weather. Although the survey evidence outside L1 is limited, it offers a complementary view of long-term activity from the perspective of a roadstead.

Harbour 4 (L4)

Located toward the northern end of the seawall area, L4 offers protection during both seasonal *meltem* and *lodos* winds (Fig. 10). The two breakwaters that transformed this indented coastline into a protected harbour are now both submerged, but once enclosed an area more than 300m in width and extending perhaps as much as 200m from shore. A line of rough trapezoidal stones defines the seaward end of the seawall-L4 boundary; these stones seem generally larger and more carefully cut than those marking the southern seawall-L1 border. The technique may reflect a slightly later date of construction, maintenance, or rebuilding as the seawall was developed as a connection between L1 and L4. Conversely, it may simply suggest a lower impact area, or less robust construction, in which a single row of heavier stones was sufficient. Though no excavation has been carried out here, this construction features at least two visible layers and more may be buried in the sand, possibly indicating better preservation than its counterpart farther south. A massive breakwater abuts the seaward end of this seawall-L4 junction, curving toward the east in the form of a large rubble mound over 100m long (Fig. 11). If a more carefully constructed upper level once topped this feature, there is no longer visible evidence beyond what may be a few cut blocks

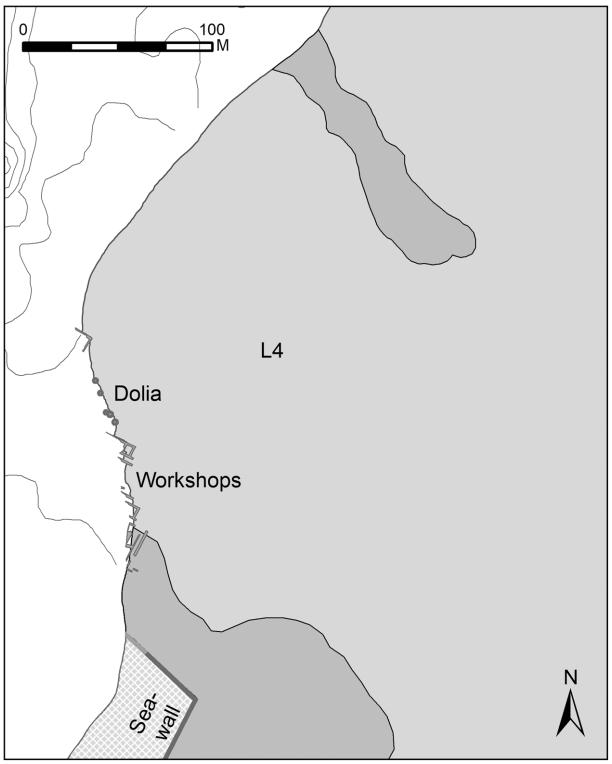

Figure 10. Plan of L4 showing major features (J. Leidwanger and N. Riddick).

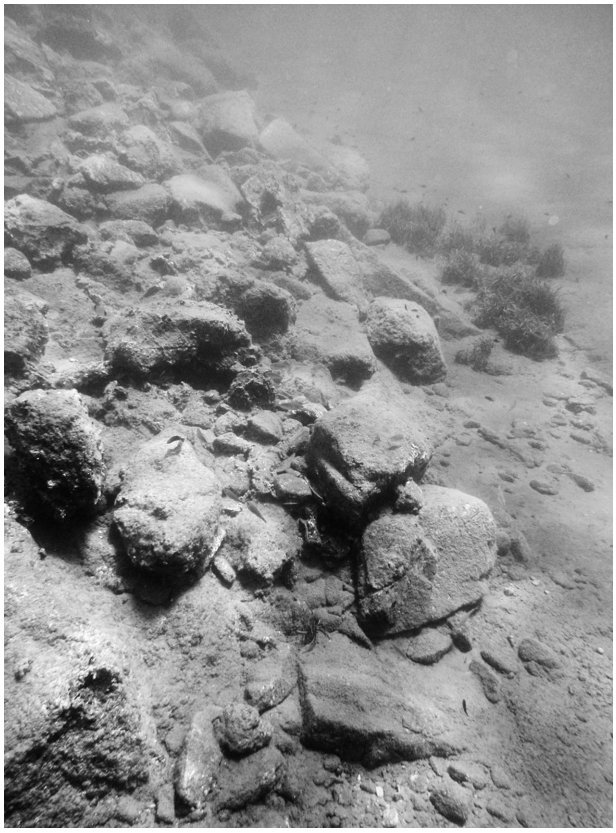

Figure 11. View of the exterior of the large rubble breakwater at the southern end of L4 (J. Leidwanger).

near the seaward end. The wider diameter of the rubble mound at this point would seem to indicate that it was fortified more heavily to stand up to rough waves and wind. This simple approach to creating a basic but robust harbour construction is paralleled by the second breakwater at the north-east edge of L4, another wide rubble mound that extends more than 140m from shore.

Construction features are best viewed alongside the pottery from underwater survey within and around the basin to determine a chronological range for use of the area. The earliest ceramic materials recorded in L4 appear to date to the Early and Mid-Hellenistic periods (3rd–2nd centuries BCE). Substantial later Hellenistic and some Early Roman pottery is also evident, as are significant quantities of Late Roman material. A similar temporal distribution is visible in ceramics observed during survey in the northern sector of the adjacent shallowly submerged area behind the seawall, where finds as late as the 6th century CE can be seen. This stands in contrast to the lack of concentrated later material farther south toward L1. Strewn across the seabed at 4–5m of depth inside the northern breakwater, a limited assemblage of Late Roman 1 (LR1) and Late Roman 2 (LR2) jars probably reflects all that remains of a small shipwreck of the 6th or 7th century CE (Leidwanger *et al.*, 2015). Drawn from a number of production centres around the Aegean as well as Cyprus or Cilicia, this mixed cargo is best connected to short-haul secondary distribution, but offers important evidence for ongoing maritime activity in L4 up to the end of Late Antiquity. The ceramic record suggests a use period for the port of at least 800–900 years. Given this long lifespan, excavation in the future might expect to find evidence for several phases of construction and rebuilding in the associated harbour architecture.

Clustered along parts of the L4 perimeter can be seen a series of agricultural production facilities. Toward the south-west, near the basin's intersection with the seawall area, are the remains of at least five large dolia (Fig. 12). Their internal diameter is on average *c.*1.5m, and most are preserved for a total exterior height of *c.*1.5m (interior height of *c.*1.3 m). Built not from ceramic but from mortared stone lined with a layer that includes crushed ceramic, these were once sunk into the ground before rising sea levels and wave action eroded the soil away to expose them and their associated buildings. Toward the south, walls and other features extend into the water and seem to include a series of long structures, most likely serving for storage and other workshop needs and covering an area more than 100m in length along the coast. Part of a press stone resting in the shallows is similar to those employed in another workshop for wine previously investigated just to the north of L4 (Fig. 2). Excavations

Figure 12. Facilities for production and storage of wine along the southwest edge of L4, including large built dolia eroding from the scarp and a fragmentary press stone in the water (E.S. Greene).

by the METU team in 1995 and 2003 revealed that this facility was in operation from the very late Classical through the Hellenistic era (Tuna *et al.*, 2010; Koparal *et al.*, 2014; Tuna and Sakarya, 2017). A well-built but small quay of large, roughly squared limestone blocks allowed easy loading and unloading right at the facility. A similar solution might be expected in association with the southern workshops, which likewise seem to have had a major period of use during the Hellenistic era. Natural erosion along the scarp behind the dolia allowed for recording of the stratigraphic sequence in 2014. A strong Hellenistic presence was noted down to the lowest layers, some of which likely precede the installation of the dolia, and later Hellenistic activity is evident in subsequent levels. Unless the Classical period is represented by still lower layers not yet visible, it stands to reason that this workshop area, like its neighbour to the north, underscores a booming Hellenistic and later phase in the local maritime economy. Similar facilities featuring stone-built and ceramic mortar-lined dolia have been found frequently at harbour-side production sites along the Datça Peninsula (Tuna, 1983). The choice to build stone dolia rather than using fired ceramic containers may reflect a regional phenomenon.

A second, Late Antique layer can be observed above in the scarp section, particularly moving toward the seawall area farther south. The various diagnostic amphora and fineware sherds here agree broadly in type, date, and origin with the picture provided by the surveyed underwater remains. This scatter, while seemingly less dense than the earlier Hellenistic material, indicates a period of renewed agricultural processing activity in this area during Late Antiquity. Whether the intervening middle Roman centuries also saw production remains unclear, as does whether the originally Hellenistic dolia were again put into service.

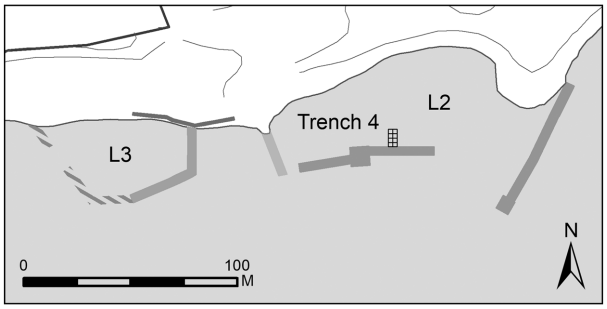

Figure 13. Plan of L2 and L3 showing major features and Trench 4 (J. Leidwanger and N. Riddick).

Harbours 2 & 3 (L2 & L3)

To the south-west of the town and its acropolis, harbour facilities continue in the area designated as L2 and L3 (Fig. 13). A small headland marks the eastern terminus of these basins, which are situated along an otherwise generally straight stretch of modern coastline. Mostly submerged structures, distinguishable even from the air or acropolis, demarcate one clear basin (L2) to the east, and traces of a possible second one (L3) to the west (Fig. 14). The major L2 features are two moles nearly identical in diameter (4.2–4.5m) and length (*c.*65–70m), which enclose a harbour that today measures approximately 100m across and about 50m from shore to the entrance channel. A short stretch (*c.*20m) of compacted small stone extends perpendicularly from

Figure 14. Aerial view of the L2/L3 area (Middle East Technical University).

the beach to enclose the third, western edge of L2, leaving only a small (*c.*6m) gap at its seaward end near the juncture with the western mole; this simple rubble feature compares functionally and in material to the north-east boundary of L1 near Trench 1 described above. The original ancient harbour was clearly much deeper than the present basin—only approximately 0.5–0.6m deep just inside the moles—and likely extended into the low-lying area along and inland from the beach. Construction from 1988–1991 of the Elit Otel just inshore from the L2 structures has unfortunately obscured any architecture or material remains in this area.

Each of the two carefully articulated harbour constructions incorporates a tower along its length: one at the seaward end of the eastern mole, and the other near the middle of the western mole (Fig. 15). Both are approximately square in plan, with dimensions ranging from 7.5m to nearly 9.0m. Neither tower appears directly incorporated into the structure; the eastern mole's tower forms an addition to the wall; on the west, the tower divides the wall with a visible jog. Winter (1971: 167) dates the introduction of such unbonded towers no earlier than the late 5th or first half of the 4th century, connecting their development to the introduction of the siege ram and the necessity of protecting the stability of towers in the event that a wall was breached.[5] The preserved base of the tower is comprised of quarry-faced stones surrounding a rubble core. Parallels may be seen to the Late Classical fortification walls and towers at Patara (Dündar and Rauh, 2017). Other similarities can be drawn to Early Hellenistic maritime structures in Greece and coastal Asia Minor, including harbours fortified with round or rectangular towers documented at Phalasarna (Hadjidaki and Frost, 1990) and Halieis (Jameson, 2005), which preserve faced stone courses around a rubble core. Together, the east and west moles of L2 work to protect the harbour from the prevailing local weather; the eastern L2 mole faces more directly into the occasionally strong south/south-east wind and wave action, and its structure and tower are accordingly less well-preserved.

Just 30m to the west, the final construction in Burgaz's harbour complex (L3) is comparatively less well-preserved and more difficult to outline from surface survey. Local residents indicate that the larger stones jumbled on the surface here have been displaced in recent times for the construction of paths and moorings. Infill from shore is likely to have occurred in association with nearby development. Both factors contribute to difficulty in establishing the limits and

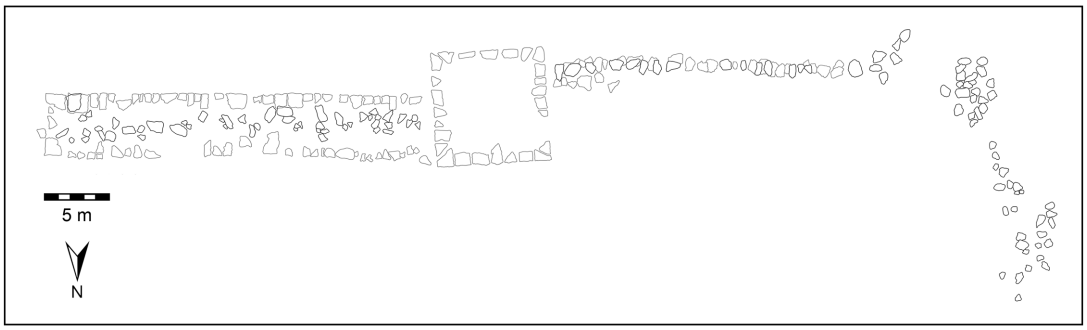

Figure 15. Plan of the western wall and tower of L2 (M. Collier, T. Csaszar and L. Radloff).

layout of L3, let alone its chronology and construction technique. Visible stones lie only a few centimetres below the water level, with parts exposed during low tide. Even so, the broad outlines of a likely harbour feature can be traced along the eastern edge extending some 20m from shore before turning westward for another 30m. A loose scatter of stones is more difficult to outline around the western half of the basin, but observations several decades ago suggest that the seaward mole or breakwater feature once continued farther west, serving with another feature that extended from shore to partially enclose L3. Along the beach, a better-preserved wall is visible for 50m near the eastern edge of L3, raising the prospect that the broad harbour complex here may have been integrated into the urban fortifications. If this shoreline feature reflects part of the city circuit, the small L3 basin could not have extended much inland from the current coast.

Visual survey in 2011 and 2012 was also undertaken of the surface ceramics inside L2 and L3 as well as the surrounding beach area, yielding evidence for Hellenistic and Late Antique use of this part of the site. The 2013 and 2014 field seasons included more detailed recording and excavation in L2 in an effort to investigate how these features relate chronologically, technologically, and functionally to those of the other harbour structures at Burgaz. Trench 4, which comprised a series of eight 2 × 2m units, was excavated over two seasons along the interior of one of the better-preserved sectors of the western L2 mole, approximately 8m east of the central tower (Fig. 13). To gain a proper stratigraphic record and details of the mole construction, certain units were excavated up to a depth of more than 1.5m below the current harbour floor, or more than 2.1m below present water level. The surviving remains reflect the foundation and construction courses of the mole, as well as clues to the lifespan of the basin.

The mole is built on a compacted rubble foundation comprising similarly sized friable grey stones totalling more than 1m thick along the mole's northern face (Figs 16 and 17). This foundation course (Stratum 4) extends for nearly 3m from this exterior surface, suggesting a total width of at least 11m if the seaward

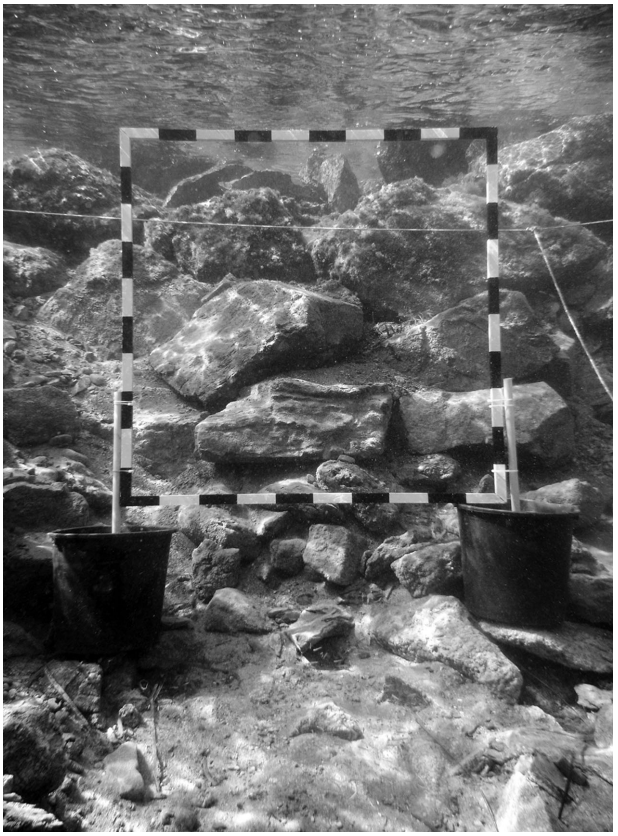

Figure 16. View of the lower courses and foundation level for the western mole in L2 during excavation of Trench 4 (T. Nowak).

side of the mole is similarly fortified; it seems likely that this exposed side of the foundations would have been at least as reinforced as the near-shore side, if not more so. Targeted removal of the foundation rubble in part of two units revealed not only the thickness of this layer, but encrustation covering some of the upper stone that suggests exposure to an aerobic shallow marine environment for some period. This sondage offers clear evidence that the natural depth of the harbour in antiquity was at least 1.5–2m, a depth certainly sufficient for small or shallow-draughted vessels in

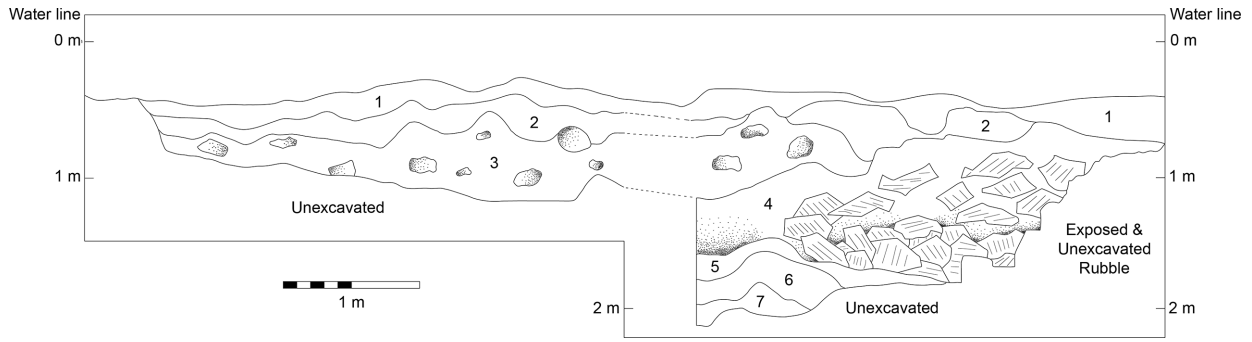

Figure 17. Schematic section across L2 Trench 4, showing the stratigraphic sequence and rubble foundations leading up to the wall on right. North and shore are to the left; for the location of Trench 4, see Figure 13 (T. Nowak and M. Collier).

these protected waters. Underlying this foundation were layers of small conglomerate, cobbles, and pebbles—all lacking marine encrustation—within sand and shells (Strata 5 and 6), below which was found a layer of dark marine clay (Stratum 7). The dense construction of uniform stone with no intervening ceramic or other debris suggests that the foundations were deposited as a large-scale effort in a single phase to break the strength of the waves, and to provide a compact and level surface for the wall courses. Though excavation beneath this foundation was limited, the complete lack of pottery or any other cultural material likely indicates that this area did not see major maritime activity before the installation of the mole.

Three levelling courses of cut limestone blocks were recorded above this foundation rubble, providing a footing that tapers from a width of 5m to 4.2m at the uppermost preserved course (Fig. 16). The exterior surfaces of the mole are comprised of roughly cut stones, on average 0.6–1.3m up to 1.6m in length, while the interior is largely filled with rubble. The blocks from higher courses of this mole and tower were likely removed and reused in other structures after the abandonment of the harbour. A scatter of stones throughout the basin, excavated at a depth of 0.5–0.9 m below the present seafloor (Stratum 3), may reflect debris from this rubble interior. Upper courses of this wall and its associated towers might be best compared to the well-preserved fortification wall bordering the sea at the base of the acropolis, noted even by C.T. Newton in his 1865 travelogue. The wall is known locally as Yedi Kat (seven levels) for the seven courses of quarry-faced pseudo-isodomic masonry preserved for a length of about 14m (Figs 2 and 18).

The foundation and lower courses of the mole are today buried under sediment and debris that reflects scour and secondary deposits of ceramics and other finds (Fig. 17, Stratum 1). These range in date from perhaps as early as the Late Classical period, with significant Hellenistic material, a few Late Roman sherds, and various modern material. The dynamic marine environment and debris from the construction of the adjacent hotel onshore almost certainly contributed to this infill; conversations with local residents suggest that soil and associated material remains were dumped into the sea to make room for the development. It is therefore impossible at present to distinguish between ceramics deposited in the harbour through maritime activity and those that originated from onshore. Excavation beneath this mixed upper level revealed several additional stratigraphic layers, including a thin (0.1–0.2m) one containing grey sand and silt with vegetation, small stones, and few ceramics (Stratum 2). A thicker (up to *c.*0.4m) level (Stratum 3) of heavy grey sand below, reveals similarly few ceramics but contains the scattered stone debris that may point to the dispersal of the mole's upper wall fill. This rests on top of another thick grey clay layer dominated near the mole by the dense foundation mound. While some ceramics in these levels outside the mound attest to maritime activity, no diagnostic finds are sufficiently preserved to allow a more precise view of the chronological development of the facility. The uppermost layer of heavily mixed but more diagnostic ceramics therefore provides chronological brackets for use of this general area from perhaps the Late Classical period onward. The lack of a dense build-up of ceramics at greater depths against the wall foundations may indicate that the facility saw only restricted use or a limited period of use even if some seafaring activity continued at a reduced level into Late Antiquity. Still today the moles serve to protect small motorboats moored inside the ancient harbour.

Also adjacent to the acropolis around the southern tip of Dalacak Burnu, a rectangular cutting was observed in the rocky outcrop (Fig. 19). The inner basin measures *c.*3 × 8m. An ancient freshwater supply has been noted in the area along with likely remains of a recess for a closing mechanism.[6] Access to this area would have been from the acropolis and urban areas of the settlement. Parallels to similar structures around the Aegean, including at Akyaka (near the head of the Gulf of Gökova north of the Datça Peninsula), suggest that the space served as a seawater tank for the storage of caught fish (Davaras, 1974; Francis, 2010), perhaps during the Hellenistic or Roman era.

Figure 18. Remains of the acropolis wall (Yedi Kat) (E.S. Greene).

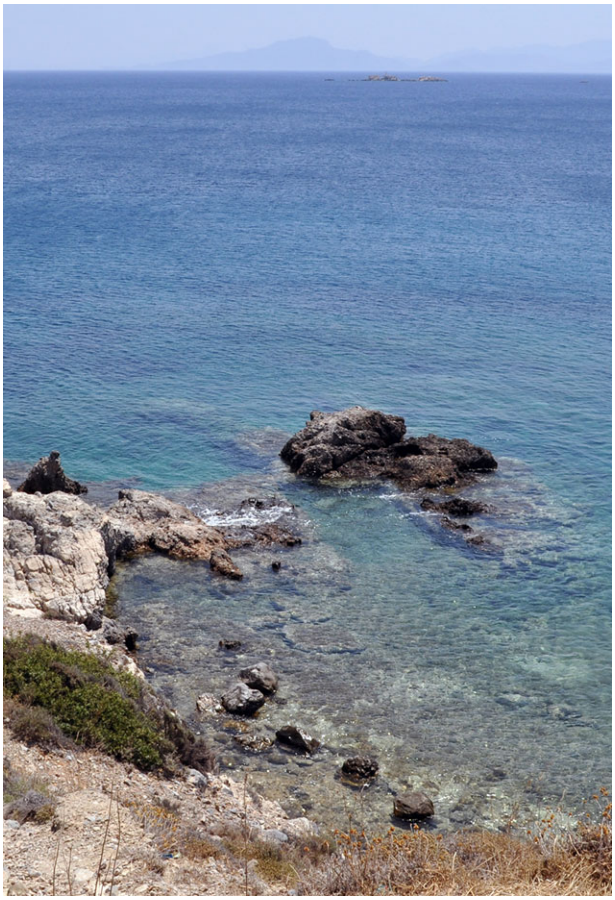

Figure 19. View of the probable fish tank from the acropolis above (E.S. Greene).

The evolving maritime landscape of Burgaz

From the broad coastal and underwater survey and targeted excavation undertaken between 2011 and 2015, three general phases can be proposed in the development of Burgaz's harbour complex: 1) use of the inshore, now-silted part of L1 as a shelter close to the acropolis and city centre, probably from the earliest local habitation and continuing into the Classical period; 2) expansion of the maritime infrastructure during the Classical period, including a new series of features around L1 and perhaps the seawall area, as well as the construction of a large new port complex (L2/L3) at the other edge of the settlement south-west of the acropolis; and 3) general reduction in major maritime activity throughout the Early Hellenistic period in the various L1 and L2/L3 facilities in favour of a larger, deeper port at L4, involving the construction of simple breakwaters and new installations for agricultural processing on shore.

Phase 1

The settlement at Burgaz was inhabited since at least the early 8th century BCE and perhaps earlier (Tuna *et al.*, 2009: 519–523). Due to its proximity to fertile agricultural land as well as its ready access to the sea, the settlement expanded throughout the Archaic period, when the silted area adjacent to the current L1 basin likely served as the major facility, a convenient natural bay adjacent to the city centre. Limited use may have been made of the low, sandy beach to the south-west of the acropolis—the area that would later be developed as L2/L3—but no indication of port development here appears along the coast or

under water at this early date. Since this initial area of use is almost certainly situated beneath what is now low-lying farmland, it remains unclear whether the city developed artificial protection or extensive infrastructure along the coastal perimeter of L1. Even without added harbour walls, such an inlet would have offered reasonable protection in most weather conditions that characterize the major sailing season. Over the Archaic and into the Classical period, gradual siltation probably reduced the dimensions of the inlet and pushed the coastline slowly south-east.

Phase 2

Environmental progradation, the expansion of the Classical city, and broadening seaborne economic connections combined to create pressure on the still-limited harbour capacity of Burgaz. At this point a series of large maritime infrastructure projects was initiated. At some point probably around 400 BCE, L1 was augmented with a pair of artificial moles of roughly shaped stone atop broad rubble mounds, giving new life to the shrinking natural port and extending its protected waters toward the east. The new paving of the adjacent seawall area may also have taken place at this time or shortly after in an effort to expand the city's nearby port facility. But the largest efforts focused on the south-west, where the ceramic record and shared architectural style suggests that the L2/L3 complex was built around this time in an effort to ramp up port capacity, perhaps for diverse functions. These efforts were probably contemporaneous with the new fortification circuit installed around Burgaz (Tuna *et al.*, 2009: 518); some integration of the features and the installation of towers along L2 suggest that the wall and harbour projects may have been part of the same broad planning programme. Thucydides (8.43) and Diodorus (14.85) record the presence of a Spartan naval base at Knidos, which Tuna (2012) and Bresson (1999; 2010) locate at Burgaz. The peninsula as a whole surely held strategic and economic importance worthy of increased protection in a world that saw more threats from the sea than from the interior. The simultaneous use of two separate harbours, one fortified at L2, may lend support to the idea of military seafaring in the region and the separation of naval from commercial functions as suggested for Knidos' later and famous double port (Blackman, 1982; Büyüközer, 2012; 2013; Doksanaltı *et al.*, 2016; 2018). Although no evidence of shipsheds or other obvious warship facilities survives in L2, the walls and defensive towers suggest an interest in protection and surveillance.

Phase 3

By the Early Hellenistic period, a marked shift had taken place in Burgaz's maritime landscape. In the face of ongoing siltation and a changing political and economic order across the peninsula, the residents of Burgaz opted not to invest heavily in maintenance or expansion of the L1 and L2/L3 facilities, but rather to develop a wholly separate area farther removed from the city centre. Several hundred metres to the north, a pair of massive breakwaters were tossed into the sea to help transform a gently undulating coastline into a properly functioning harbour. The simple architectural solution contrasts starkly with earlier approaches at Burgaz, such as the more carefully articulated and visually impressive Classical walls and towers of L2. As a focus of new economic activity, L4 was well-suited for development, offering a deeper and larger inlet with ample space on shore for a variety of agricultural processing installations; these focused on producing, packaging, collecting, and exporting wine and perhaps other goods across the region from a series of harbour-side warehouses. Down the coast, in the old city centre, civic and residential spaces were transformed into industrial quarters, as maritime activity in the increasingly silted L1 and L2/L3 contracted to occasional or small-scale traffic. The installation of a fish tank near the base of the acropolis might point to new opportunities for industry, and the reclamation of the area behind the seawall attests to the persistent need for space to handle volumes of cargo and to maintain the ships that transported it. This series of changes at Burgaz runs parallel to the rapid expansion of Knidos as the preeminent political—and probably economic—centre for the peninsula from the mid to late 4th centuries (Bruns-Özgan, 2013; Doksanaltı *et al.*, 2016; 2018). Still situated along the best agricultural land around the Datça region, though, Burgaz remained crucial to the economy of the peninsula. Its harbour complex reflected the city's new utilitarian reality rather than the trappings of a symbolic civic centre, for which pride of place now belonged firmly with Knidos' elaborate double port.

The promising results of the 2011–2015 field seasons underscore the potential of further research. No doubt the most glaring lacuna comes from the dearth of Archaic and Early Classical material that might indicate the earliest maritime activity. Scattered survey finds of earlier material outside the harbour entrance, and the extent of evidence on land for a well-networked early site (Sakarya, 2016) both make it clear that Burgaz enjoyed busy port activity at an early date, but this earliest facility is almost certainly relegated to the area behind the present beach in the low-lying silted context adjacent to the urban centre. The intact stratigraphy and high degree of preservation observed in the submerged part of L1 (Trench 5, N/P) offers significant promise, particularly in coordination with systematic prospection and coring. Likewise, the more precise chronology of sedimentation and other coastal change remains to be clarified, with important implications for the place of environmental challenges within the broader discourse of shifting urbanism and development along the peninsula. Farther offshore from L2 and L3, at a distance of about 75–100m from the current coast, a series of long rectangular shelves of biogenic rock may shed new light on the early phases of

sea-level rise along this dynamic coastline. Additional study of the fish tank at the base of the acropolis alongside other recently submerged or buried features may likewise offer a more precise marker of sea-level change (Evelpidou *et al.*, 2012).

The long-term history of Burgaz's harbours is intimately bound together with the fate of the urban core, from its foundation and expansion to its eventual transformation and partial abandonment (Greene and Leidwanger, 2018). Local maritime infrastructure development thus reflects a more complex series of factors and community responses than any straightforward arc narrating rise and decline might allow. It seems clear, for example, that two to three harbour basins were operational for at least some window in the latter Classical period. Even with the much-discussed 'abandonment' of this site in favour of Knidos (Berges, 1994; Bresson, 1999; Tuna *et al.*, 2009; *cf*. Demand, 1989), maritime exchange and investment clearly continued at Hellenistic Burgaz, but with shifts that underscore the persistence of certain economic activities in the context of changing local and regional challenges and opportunities (Tuna *et al.*, 2010). The low-lying fertile lands near Burgaz still offered the most productive agriculture on the peninsula, and the Hellenistic centuries saw peak activity on these terraces and in the ceramic workshops at nearby Reşadiye, one of the largest amphora production centres known from antiquity (Empereur *et al.*, 1999; Tuna and Atıcı, 2009). On the other hand, broad reorganization of cultural and economic activity in the region resulted in Knidos presenting keen advantages in connectivity if not agricultural production. Its location straddling increasingly trafficked lines of communication between the eastern Mediterranean and the Aegean made it desirable as a cultural and probably also a business hub.

Without the pull of a major city centre at Burgaz to maintain L1, the ongoing challenge of siltation no longer demanded the community's investment here, rendering this early harbour suitable only for small-scale activity. Rather, Burgaz's large but simple L4 offered a better solution, allowing the site to continue flourishing as part of a local economic engine, now integrated more fully into broader currents of interregional exchange. These opportunities meant that goods from the Datça Peninsula could feature regularly in markets across the Hellenistic world (see Grace, 1985: 6–7; Koehler and Matheson, 1990; Rotroff, 1997: 233–234; Kögler, 2005), even if Knidos now served as the main network hub, with Burgaz itself involved only in short-distance exchange. The changing fortunes of the harbours at Burgaz offer a window into how maritime infrastructure investment both reflects and affects the complex intersection of economic, political, and social phenomena across local, regional, and interregional scales.

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Notes

1. Tidal ranges are small in the south-east Aegean and more broadly across the eastern Mediterranean at no more than 0.3–0.5m (United Kingdom Hydrographic Office, 2016: 21; Heikell and Heikell, 2013: 34); while generally irrelevant for mariners, these small changes are noticeable at very shallow depths.
2. Thanks to Beverly Goodman for her preliminary observations on these sediments.
3. Radiocarbon dating was undertaken at the Center for Radiocarbon Dating (CDRC) of the Université Lumière Lyon 2 – CNR, and at the Centre for Isotope Research (CIO) of the University of Groningen. All dates are calibrated. This work is part of the project's ongoing geomorphological study led by Jean-Philippe Goiran.
4. This aspect of the site is under study by Beverly Goodman.
5. Thanks to Lana Radloff for this observation. Such a date might match the association of Burgaz with the Spartan naval base used in the Battle of Knidos in 394 (Diod. 14.85), developed from the unwalled (*ateixhistos*) station used during the Peloponnesian war (Thuc. 8.35). See Bresson, 2010 and Ruzicka, 2012 for the Battle of Knidos.
6. Thanks to Jean-Philippe Goiran and Gilles Brocard for the observations of this feature, undertaken as part of their broader ongoing geomorphological work in the Burgaz area, as well as to Güner Özler for drawing our attention to the Akyaka parallel.

References

Bass, G.F., Matthews, S.D., Steffy, J.R. and van Doorninck, F.H., 2004, *Serce Limanı: An Eleventh-Century Shipwreck. Volume I, The Ship and Its Anchorage, Crew, and Passengers. College Station, TX*.

Bean, G.E. and Cook, J.M., 1952, The Cnidia. *Annual of the British School at Athens* **47**, 171–212.

Berges, D., 1994, Alt-Knidos und Neu-Knidos. *Istanbuler Mitteilungen* **44**, 5–16.

Blackman, D.J., 1982, Ancient Harbours in the Mediterranean: Part 2. *IJNA* **11**.3, 185–211.
Bresson, A., 1999, Cnide à l'époque classique: la cité et ses villes. *Revue des études anciennes* **101**, 83–114.
Bresson, A., 2010. Knidos: Topography for a Battle, in R. van Bremen and J.-M. Carbon (eds), *Hellenistic Karia*, 435–451. Paris.
Bruns-Özgan, C., 2013, *Knidos: Ergebnisse der Ausgrabungen von 1996–2006*. Istanbul.
Büyüközer, A., 2012, *Knidos Limanları*. PhD Dissertation, Selçuk University.
Büyüközer, A., 2013, Some Thoughts on the Military Harbour of Knidos, in Y. Morozova and H. Öniz (eds), *SOMA 2010: Proceedings of 14th Symposium on Mediterranean Archaeology. Taras Sevchenko National University of Kiev, Kiev, Ukraine, 2325 April 2010, 1116.* Oxford: BAR-IS 2555.
Davaras, C., 1974, Rock-Cut Fish Tanks in Eastern Crete. *Annual of the British School at Athens* **69**, 87–93.
Demand, N., 1989, Did Knidos Really Move? The Literary and Epigraphical Evidence. *Classical Antiquity* **8**.2, 224–237.
Dey, H., and Goodman-Tchernov, B., 2010, Tsunamis and the Port of Caesarea Maritima over the longue durée: a Geoarchaeological Perspective. *Journal of Roman Archaeology* **23**, 265–284.
Doksanaltı, E.M., 2007, Knidos-Kap Krio yerleşim alanı. *İDOL: Arkeologlar Derneği Dergisi* **9**.33, 2–11.
Doksanaltı, E.M., Karaoğlan, İ., Tozluca, D.O. 2018, *Knidos: Denizlerin Buluştuğu Kent*. Ankara.
Doksanaltı, E.M., Sevmen, D., Karaoğlan, İ., Özgan, C., Aslan, E., 2016, Knidos kazı ve araştırmaları: 2014. *Kazı Sonuçları Toplantısı* **37**.3, 57–81.
Dündar, E., and Rauh, N.K., 2017, The North Bastion on the Tepecik Acropolis at Patara: Dating 'Early Hellenistic' Fortification Walls in Southwestern Anatolia. *Hesperia* **86**.3, 509–581.
Empereur, J.-Y., Hesse, A. and Tuna, N., 1999, Les ateliers d'amphores de Datça, Péninsule de Cnide, in Y. Garlan (ed.), *Production et commerce des amphores anciennes en Mer Noire*, 105–115. Aix-en-Provence.
Evelpidou, N., Prazzoli, P., Vassilopoulos, A., Spada, G., Ruggieri, G. and Tomasin, A., 2012, Late Holocene Sea Level Reconstructions Based on Observations of Roman Fish Tanks, Tyrrhenian Coast of Italy. *Geoarchaeology* **27**, 259–277.
Francis, J., 2010, A Re-evaluation of Rock-cut Fish Installations in Roman Crete. *Creta Antica* **11**, 255–277.
Goodman, B.N., Reinhardt, E.G., Dey, H.W., Boyce, J.I., Schwarcz, H.P., Sahoğlu, V., Erkanal, H. and Artzy, M., 2009, Multi-Proxy Geoarchaeological Study Redefines Understanding of the Paleocoastlines and Ancient Harbours of Liman Tepe (Iskele, Turkey). *Terra Nova* **21**, 97–104.
Grace, V.R., 1985, The Middle Stoa Dated by Amphora Stamps. *Hesperia* **54**, 1–54.
Greene, E.S., Lawall, M.L. and Polzer, M.E., 2008, Inconspicuous Consumption: The Sixth-Century B.C.E. Shipwreck at Pabuç Burnu, Turkey. *American Journal of Archaeology* **112**.4, 685–711.
Greene, E.S. and Leidwanger, J., 2018, Maritime Networks and Port Development in the Ancient Mediterranean: A Model of Coastal Adaptation and Socioeconomic Connectivity from the Datça Peninsula (Southwest Turkey). *Mediterranean Historical Review* https://doi.org/10.1080/09518967.2018.1535396.
Greene, E.S., Leidwanger, J. and Özdaş, H., 2011, Two Early Archaic Shipwrecks at Kekova Adası and Kepçe Burnu, Turkey. *IJNA* **40**.1, 60–69.
Hadjidaki, E. and Frost, F., 1990, Excavations in the Harbour of Phalasarna in Crete: The 1988 Season. *Hesperia* **59**.3, 513–527.
Heikell, R. and Heikell, L. 2013, *Turkish Waters & Cypriot Pilot*. 9th edition. Cambridgeshire.
Jameson, M. H., 2005, Submerged Remains of the Town and Its Immediate Vicinity, in M. H. McAllister (ed.), *The Excavations at Halieis, Vol. 1. The Fortifications and Adjacent Structures*, 85–97. Bloomington, IN.
Kayan, İ., 1988a, Datça yarımadasında 'Eski Knidos' yerleşmesini etkileyen doğal çevre özellikleri. *Ankara Üniversitesi Dil ve Tarih-Coğrafya Fakültesi Dergisi* **11**.11, 51–70.
Kayan, İ., 1988b, Late Holocene Sea-Level Changes on the Western Anatolian Coast. *Palaeogeography, Palaeoclimatology, Palaeoecology* **68**, 205–218.
Kızıldağ, N., Özdas, A.H. and Uluğ, A., 2012, Late Pleistocene and Holocene Sea Level Changes in the Hisarönü Gulf, Southeast Aegean Sea. *Geoarchaeology* **27**, 220–236.
Koehler, C.G. and Matheson, P.M.W., 1990, Popularity of Knidian Wine at Corinth. *American Journal of Archaeology* **95**, 336.
Kögler, P., 2005, Import, Export, Imitation: Trade and the Economic power of Late Hellenistic and Early Imperial Knidos According to the Fine Pottery, in M. Berg Briese and L. E. Vaag (eds), *Trade Relations in the Eastern Mediterranean from the Late Hellenistic Period to Late Antiquity: The Ceramic Evidence. Sandbjerg Manorhouse*, 12–15 February 1998, 50–62. Halicarnassian Studies 3, Odense.
Koparal, E., Tuna, N. and İplikçi, A.E., 2014, Hellenistic Wine Press in Burgaz/Old Knidos. *METU Journal of the Faculty of Architecture* **31**.2, 93–107.
Leidwanger, J., 2017, From Time Capsules to Networks: New Light on Roman Shipwrecks in the Maritime Economy. *American Journal of Archaeology* **121**.4, 595–619.
Leidwanger, J., Greene, E.S. and Tuna, N., 2015, A Late Antique Ceramic Assemblage at Burgaz, Datça Peninsula, South-west Turkey, and the 'Normality of the Mixed Cargo' in the Ancient Mediterranean. *IJNA* **44**.2, 300–311.
Marriner, N., Morhange, Ch., Kaniewski, D. and Carayon, N., 2014, Ancient Harbour Infrastructure in the Levant: Tracking the Birth and Rise of New Forms of Anthropogenic Pressure. *Scientific Reports* **4**, 5554. https://doi.org/10.1038/srep05554.
McGrail, S., 1981, Medieval Boats, Ships, and Landing Places, in G. Milne and B. Hobley (eds), *Waterfront Archaeology in Britain and Northern Europe*, 17–23. London.
McNicoll, A., 1997, *Hellenistic Fortifications from the Aegean to the Euphrates*. Oxford.
Morhange, Ch. and Marriner, N., 2015, Archeological and Biological Relative Sea-Level Indicators, in I. Shennan, A.J. Long and B.P. Horton (eds), *Handbook of Sea-Level Research*, 146–156. Hoboken, NJ.
Newton, C.T., 1865, *Travels & Discoveries in the Levant, Vol. II*. London.

Rotroff, S.I., 1997, *The Athenian Agora XXIX. Hellenistic Pottery: Athenian and Imported Wheelmade Table Ware and Related Material*. Princeton, NJ.

Ruzicka, S., 2012, *Trouble in the West: Egypt and the Persian Empire 525–332 BCE*. Oxford.

Sakarya, İ., 2016, *Trade Relations of Ancient Burgaz from Archaic to Mid of 4th Centuries: The Amphorae Evidence within the Domestic Contexts*. PhD Dissertation, Middle East Technical University.

Tomber, R., 1999, Pottery from the Sediments of the Inner Harbour (Area I14), in K.G. Holum, A. Raban and J. Patrich (eds), *Caesarea Papers 2: Herod's Temple, the Provincial Governor's Praetorium and Granaries, the Later Harbour, a Gold Coin Hoard, and Other Studies*, 295–322. *JRA Supplementary Series* 35, Portsmouth, RI.

Trethewey, K., 2001, Lead Anchor Stock Cores from Tektaş Burnu, Turkey. *IJNA* **30**.1, 109–114.

Tuna, N., 1983, *Batı Anadolu Kent Devletlerinde Mekan Organizasyonu: Knidos Örneği*. PhD Dissertation, Dokuz Eylül University.

Tuna, N., 2012, *Knidos Teritoryumu'nda Arkeolojik Araştırmalar / Archaeological Investigations at the Knidian Territorium*. Ankara.

Tuna, N. and Atıcı, N., 2009, Reşadiye ve Burgaz arkeolojik kazı çalışmaları verilerine göre Knidos pişirme kaplarının gelişimi, in A. M. Özer (ed.), *Türk Arkeolojisinde Seramik ve Arkeometrik Çalışmaları: I. ODTÜ Arkeometri Çalıştayı, Mayıs 2009*, 61–72. Ankara.

Tuna, N., Atıcı, N. and Sakarya, İ., 2010, Burgaz yerleşimindeki M.Ö. 4.–3. yüzyıl zeytinyağı ve şarap atölyeleri üzerine değerlendirmeler, in Ü. Aydınoğlu and K.A. Şenol (eds), *Antik Çağda Anadolu'da Zeytinyağı ve Şarap Üretimi*, 199–212. Istanbul.

Tuna, N., Atıcı, N., Sakarya, İ, Greene, E.S. and Leidwanger, J., 2013, Burgaz 2011 Yılı Çalışmaları. *Kazı Sonuçları Toplantısı* **34**.3, 5–24.

Tuna, N., Atıcı, N., Sakarya, İ, Greene, E.S. and Leidwanger, J., 2014, Burgaz (Palaia Knidos) 2012 Yılı Çalışmaları. *Kazı Sonuçları Toplantısı* **35**.1, 60–75.

Tuna, N., Atıcı, N., Sakarya, İ, Greene, E.S. and Leidwanger, J., 2015, Burgaz (Palaia Knidos) 2013 Yılı Çalışmaları. *Kazı Sonuçları Toplantısı* **36**.1, 299–318.

Tuna, N., Atıcı, N., Sakarya, İ, Greene, E.S., and Leidwanger, J., 2016. Burgaz (Palaia Knidos) 2014 Yılı Çalışmaları. *Kazı Sonuçları Toplantısı* **37**.1, 175–194.

Tuna, N., Atıcı, N., Sarkaya, İ. and Koparal, E., 2009, The Preliminary Results of Burgaz Excavations within the Context of Locating Old Knidos, in F. Rumscheid (ed.), *Die Karer und die Anderen, Internationales Kolloqium an der Freien Universitat Berlin, 13–15 Oct. 2005*, 517–532. Bonn.

Tuna, N. and Sakarya, İ., 2017, Stamped Amphora Handles from Hellenistic Wineries at Ancient Burgaz. *Epigraphica Anatolica* **50**, 149–166.

United Kingdom Hydrographic Office, 2016, *Admiralty Sailing Directions: Mediterranean Pilot Volume 5 (Coasts of Libya, Egypt, Israel, Lebanon and Syria, South Coasts of Greek Islands from Kríti to Ródos and Turkey with the Island of Cyprus)*, 13th edition. Somerset.

van Duivenvoorde, W., 2012, The Anchor of the 3rd-Century-BC Ship from Kyrenia, Cyprus: A One-Armed Wooden Anchor with a Lead-Filled Stock. *IJNA* **41**.2, 397–407.

Winter, F.E., 1971, *Greek Fortifications*. Toronto.

