

An underwater photograph of an archaeological site. A diver with two blue and white scuba tanks is visible on the left, working on a large, rusted metal artifact. In the foreground, a large, orange, rusted metal object, possibly a ship's prow, is prominent. Other artifacts, including a small red and white striped fish, are scattered around. The water is clear blue, and the scene is illuminated by artificial light.

# UNDER THE MEDITERRANEAN I

*Studies in Maritime Archaeology*

edited by

STELLA DEMESTICHA & LUCY BLUE

WITH KALLIOPI BAIKA, CARLO BELTRAME,  
DAVID BLACKMAN, DEBORAH CVIKEL, HELEN FARR  
& DORIT SIVAN



# **UNDER THE MEDITERRANEAN I**

*Studies in Maritime Archaeology*

edited by

**STELLA DEMESTICHA & LUCY BLUE**

**WITH KALLIOPI BAIKA, CARLO BELTRAME,  
DAVID BLACKMAN, DEBORAH CVIKEL, HELEN FARR  
& DORIT SIVAN**

© 2021 Individual authors

Published by Sidestone Press, Leiden  
[www.sidestone.com](http://www.sidestone.com)

Imprint: Sidestone Press Academics

Lay-out & cover design: Sidestone Press

Photograph cover:

- Main image: Mazotos shipwreck, Cyprus (photo: Al. Erdozain © MARELab)
- Inset: Mandirac 1 near Narbonne France (photo: C. Durand, CNRS, UMR 7299-CCJ)
- Inset: *Ma'agan Mikhael II* before being launched in Haifa, Israel (photo: A. Efremov)

ISBN 978-90-8890-945-0 (softcover)

ISBN 978-90-8890-946-7 (hardcover)

ISBN 978-90-8890-947-4 (PDF e-book)

Series editor: Miranda Richardson

Copy editor: Alva MacSherry

Text preparation: Bob Holtzman

# Contents

<b>'Under the Mediterranean' in the 21st century: constants, trends, and perspectives in Mediterranean Maritime Archaeology</b>	<b>9</b>
Stella Demesticha and Lucy Blue	
<b>SHIPS AND SHIPWRECKS</b>	
Editors: Carlo Beltrame, Deborah Cvikel and Stella Demesticha	
<b>The Arduous Voyage of Underwater Research on the LBA Shipwreck off Modi Islet</b>	<b>23</b>
Christos Agouridis and Myrto Michalis	
<b>The Mazotos Shipwreck, Cyprus: a preliminary analysis of the amphora stowage system</b>	
Stella Demesticha	
<b>Final Report on the Remains of Four Vessels Found in the Ancient Harbour of Naples, Italy, Dating to the Late 2nd Century BCE and the Late 2nd-Late 3rd Century CE</b>	<b>59</b>
Giulia Boetto, Chiara Zazzaro, and Pierre Poveda	
<b>The Mandirac 1 Shipwreck, Narbonne, France</b>	<b>75</b>
Marie-Pierre Jézégou , Patrick Andersch Goodfellow, Jonathan Letuppe, and Corinne Sanchez	
<b>A late-12th-century Byzantine Shipwreck in the Port of Rhodes: a preliminary report</b>	<b>91</b>
George Koutsouflakis and Eric Rieth	
<b>The Construction of the <i>Ma'agan Mikhael II</i> Ship</b>	<b>111</b>
Deborah Cvikel and Avner Hillman	

## HARBOURS

Editors: Kalliopi Baika, David Blackman, Lucy Blue, Helen Farr, Dorit Sivan

**Patara's Harbour: new evidence and indications with an overview of the sequence of harbour-related defence systems** 127

Erkan Dündar and Mustafa Koçak

**The Harbour(s) of Ancient Torone: the search for their location and reflections on Honor Frost's hypothesis concerning shipbuilding in the area** 147

J. Lea Beness and Tom Hillard

**The Hellenistic-Early Roman Harbour of Akko: preliminary finds from archaeological excavations at the foot of the southeastern seawall at Akko, 2008-2014** 163

Jacob Sharvit, Bridget Buxton, John R. Hale, and Alexandra Ratzlaff

**The Submerged Monumental Complex of the Roman Harbour of Fossae Marianae, Gulf of Fos, France: an overview of preliminary results** 181

Souen Fontaine, Mourad El-Amouri, Frédéric Marty, and Corinne Rousse

**The First Marine Structures Reported from Roman/Byzantine Ashkelon, Israel: do they solve the enigma of the city's harbour?** 195

Ehud Galili, Baruch Rosen, Asaf Oron, and Elisabetta Boaretto

**Fortified Crusader Harbours of the Syro-Lebanese-Palestinian Coast** 205

Patricia Antaki-Masson

**The Port of Ishbiliyya and its Shiphsheds: Islamic-period transformations of the Guadalquivir River, the port of Seville and the 12th-century Almohad dockyard** 217

Carlos Cabrera Tejedor and Fernando Amores Carredano

## MARITIME LANDSCAPES

Editors: Kalliopi Baika, David Blackman, Lucy Blue, Helen Farr, Dorit Sivan

**Mariners, Maritime Interaction, and the 'Ritual' of Sea Travel in Early Neolithic Cyprus** 239

Duncan Howitt-Marshall

**The Effects of Coastline and River Changes on Anchorages, Harbours, and Habitation Patterns: the case of Akko** 267

Michal Artzy, Harry Jol, Matthieu Giaime, Yossi Salmon, Amani Abu-Hamid, Gloria I. López, Christophe Morhange, David Kaniewski, Paul Bauman, and Anne K. Killebrew

**Aegean Navigation and the Shipwrecks of Fournoi: the archipelago in Context** 279

Peter B. Campbell and George Koutsouflakis

<b>Istros, Black Sea Coast, Romania: a geoarchaeological perspective on the location of the harbour(s)</b>	<b>299</b>
Alexandra Bivolaru, Valentin Bottez, Andrei Asăndulesei, Andreea Vladu, Tiberiu Sava, Matthieu Giaime, and Christophe Morhange	
<b>Navigating Perceptions: Mariners and geographers of the Roman Levant</b>	<b>321</b>
Carmen Obied	
<b>The Rock-Cut Shoreline Features of Dana Island and the Maritime Landscape of the Taşucu Gulf, Rough Cilicia</b>	<b>343</b>
Michael R. Jones	
<b>Appendix: List of presentations and posters exhibited at the Under the Mediterranean Nicosia Conference</b>	<b>363</b>

# The Rock-Cut Shoreline Features of Dana Island and the Maritime Landscape of the Taşucu Gulf, Rough Cilicia

*Michael R. Jones*

Dana Island in Mersin province, Turkey, was the focus of the Boğsak Archaeological Survey's fieldwork in 2016 and 2017. Cilicia's ancient inhabitants used Dana Island as a site for a port, quarries, and a fortress; activity peaked in the Late Antique period (4th-6th century CE). Rock-cut features along the island's northwestern shore include building foundations, cisterns, quarries, and sloped features initially suspected to be slipways for ships – however, these last features more closely resemble well-preserved quarries further inland. This paper examines shoreline features on Dana Island and neighbouring coastal sites, and their relationship to ancient maritime activity.

*Keywords: Boğsak Archaeological Survey (BOGA), quarries, slipways, Byzantine trade, Isaurians, Late Antiquity, Cilicia.*

The Boğsak Archaeological Survey (BOGA), directed by Günder Varinlioğlu of Mimar Sinan Fine Arts University, focuses on a 20 km section of the coast of eastern Rough Cilicia (Mersin Province, Turkey). The survey area consists of the shoreline and hinterland of the Taşucu Gulf from ancient Aphrodisias in Cilicia to the west (modern Ovacık) to ancient Holmoi (modern Taşucu) to the east. Although a mountainous ridge blocks access to the interior from the sea along 16 km of this coastline (Figs 1-2), ancient settlement remains are concentrated at several mainland harbours, including the double harbour on the Ovacık peninsula (ancient Aphrodisias), Tahtalimanı (possibly ancient Palaia), and the bays at Boğsak (ancient Asteria) and Ağa Limanı (Varinlioğlu *et al.*, 2017: 50).

During the 1st millennium CE, Holmoi, at the mouth of the Göksu (ancient Calycydus) River, was likely the most significant port in the region: it was the sea access route for Seleucia *ad Calycadnum*, some 8 km upriver, which was the province's main military and administrative centre (Vann, 1998: 309; Varinlioğlu, 2007: 291-294). Seleucia may have served as a regional supply base (perhaps including naval installations for warships) in the Byzantine-Persian war, when a mint was briefly located in the city in 616-617 CE (Foss, 1975: 743-744). Unfortunately, the remains of ancient Holmoi are likely located under layers of silt and possibly under the modern town of Taşucu. Although several smaller sites have also been identified on the coast, it has not been fully explored (Varinlioğlu, 2017: 245).

*Department of Archaeology and  
History of Art, Koç University,  
Rumeli Feneri Yolu, Sarıyer,  
34450, Istanbul, Turkey;  
mjones@ku.edu.tr*



Figure 1. Dana Island viewed from the mainland (Photo M. Jones).

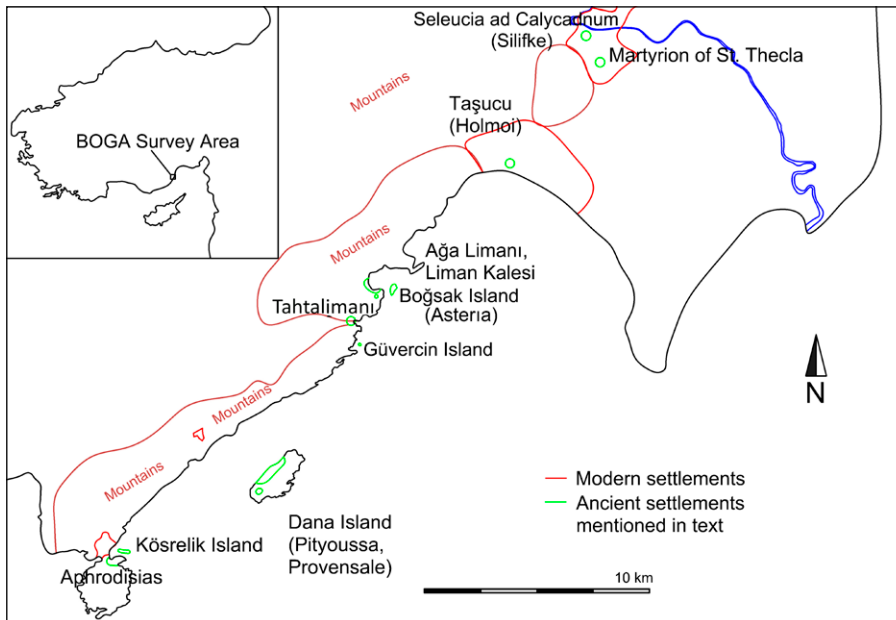


Figure 2. Map of the BOGA survey area with sites mentioned in the text (After Varinlioğlu *et al.*, 2017: 51, fig. 1).

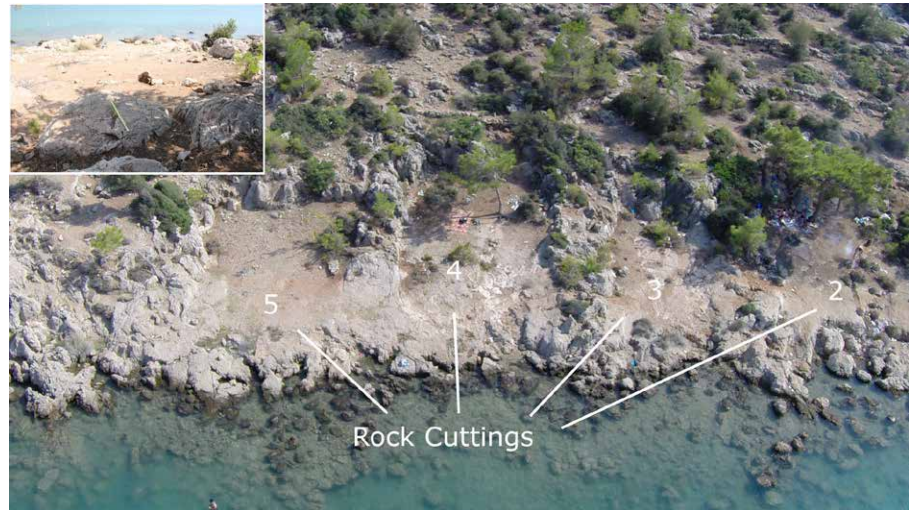
The BOGA survey area includes four islands close to the mainland: Boğsak, Dana, Güvercinlik, and Köşrelilik, all of which feature archaeological remains dating primarily to the Late Antique period (c.4th-6th century CE). While Güvercinlik and Köşrelilik are small islands that were perhaps used as Byzantine ecclesiastical sites, the larger islands of Dana and Boğsak sustained larger populations (Varinlioğlu, 2017: 245-248, 250-251). Such dense settlement, particularly on islands, fits the pattern seen across the Cilician coast and indeed much of the coast of southern Asia Minor during Late Antiquity (Foss, 1994: 45-48; Hohlfelder and Vann, 2000: 133-134; Varinlioğlu, 2007: 304-308; Rauh *et al.*, 2009: 285).

Ships carrying cargoes from Egypt and the Levant to points further west frequently sailed along this route, taking advantage of the prevailing westward-flowing currents, the diurnal cycles of land and sea breezes near shore, and the many islands and visible landmarks of the coast (Pryor, 2000: 12, 14, fig. 2, 15, 20-21, 24). This route was likely followed by the Bronze Age Uluburun ship from a Levantine port, and finds of anchors, amphorae, and other artefacts located during underwater surveys attest to seafaring along the Cilician coast from pre-Classical

through post-Byzantine times (Evrin *et al.*, 2004; 2005; Toskay Evrin and Evrin, 2005; Ward, 2005: 124-125; Pulak, 2008: 297, 298, fig. 97, 299). The coast of eastern Rough Cilicia was a contested region at various points during the 1st millennium BCE: the Babylonian king Neriglissar defeated the Cilician king Appuašu in the area during a raid in 556 BCE, and the region later became a centre of Persian military activity (Rauh *et al.*, 2009: 270-271; Autret *et al.*, 2014: 597-599). During the Hellenistic era, Cilicia was a frontier region dividing the Ptolemaic and Seleucid empires, and its rugged coastline was later famous as a haven for the Cilician pirates defeated by Pompey the Great in 67-66 BCE (Mitford, 1980: 1235-1238). There are at least nine major fortified sites, ranging in date from the 1st millennium BCE to the Medieval period, along the coast in the BOGA survey area (Varinlioğlu *et al.*, 2017: 51). They were likely used both by the indigenous population – which had a reputation for banditry in antiquity – and garrisons from larger states and empires seeking to control the region (Lenski, 1999: 452-453; Hohlfelder and Vann, 2000: 133-134; Rauh *et al.*, 2009: 262). Meanwhile, local forests were an important strategic resource for navies: several common timber species in Cilicia, including



Figure 3. Overhead view of Boğsak rock-cut features photographed using a drone during the 2014 BOGA research season; inset, a suspected bollard in the back walls of the rock cuttings (Images BOGA Project).



cedar (*Cedrus libani*), fir (*Abies cilicica*), and (most likely) black or Calabrian pine (*Pinus nigra*), were felled for the construction of naval galleys, in addition to forest-related products such as pitch (Theophr. VII: 1-3, trans. Hort, 1999; Rauh *et al.*, 2009: 264-268; Akkemik *et al.*, 2012: 2; Akkemik, 2015: 53, 63, 95, 137-139; Pulak *et al.*, 2015: 45, fig. 5; Eger, 2017: 257).

After the Roman conquest, Rough Cilicia saw increased economic development and the establishment of new settlements. In the BOGA survey region, most ancient settlement remains date to the Roman and Early Byzantine periods, with activity reaching a peak in the 4th-6th century CE. Ships transporting *annona* cargoes of grain, wine, and oil from Alexandria and the Levantine coast to Constantinople sailed along the Cilician coast, in addition to sea-traffic with Cyprus and between local ports (Decker, 2001: 70-71; Iacomi, 2010: 27-28; Autret *et al.*, 2014: 610-611). Olive oil and wine production for export intensified, as shown by increased numbers of olive presses and threshing floors at Roman sites and the large-scale regional production and export of LR 1 amphorae from Cilicia and neighbouring regions (Decker, 2001: 76-78; Varinlioğlu, 2007: 304-308; Iacomi, 2010: 24-28; Demesticha, 2013: 170-173, 176-177; Autret *et al.*, 2014: 595, 604-612).

An important Christian pilgrimage route ran through eastern Rough Cilicia. The Martyrion of St Thecla in Seleucia *ad Calycadnum* and the complex at Alahan further inland were significant pilgrimage destinations: Varinlioğlu (2007: 293-294; 2017: 260-262; 2019) notes that churches in settlements along the sailing routes (including those in the BOGA survey area) would have attracted pilgrims in transit to more famous shrines. In addition to serving as demonstrations of piety, late antique church construction displayed the wealth and status of individuals in local communities, many of

whom were connected directly or indirectly to maritime trade. A number of new churches were built in the BOGA survey area during the 5th and 6th centuries CE (Budde, 1987: 28; Varinlioğlu, 2007: 309; 2017: 246-250, 252-253).

Boğsak Island has been intensively surveyed since 2010, alongside terrestrial surveys of sections of the coast and its hinterland and limited underwater surveys in Boğsak Bay (Harpster and Varinlioğlu, 2015; Varinlioğlu, 2017). Although Boğsak is only 500 m long and 300 m wide, the late antique settlement, called Asteria in a documented 5th-6th-century inscription, covered virtually the entire island: its most intensive period of occupation was between the 4th and 7th century CE, when seven churches were built in the settlement, but pottery finds indicate continuing limited activity into the Middle Byzantine period (10th-12th centuries) (Varinlioğlu, 2017: 245, 258-259; Wohmann *et al.*, forthcoming). Remains on the mainland across from the settlement include a rubble wall enclosure, likely pre-Hellenistic in date, and late antique buildings, pottery and other small finds (Varinlioğlu, 2017: 252).

Dana Island's shoreline became a particular focus of interest after the documentation in 2013 of inclined rock-cut features on the southwestern shore of Boğsak Bay (Fig. 3a). These features range in length 12-16 m, 4.6-10.1 m in width and were initially identified as probable slipways for vessels (Harpster and Varinlioğlu, 2015: 23, 25). Their original lengths are likely preserved due to their location behind Boğsak Island, which offered some protection from wave erosion. Ridges in the bedrock were clearly cut down in the features, and rounded channels (100-200 mm wide, with similar depths) were cut behind at least four and perhaps all five (Fig. 3b); these cuttings might have been used as bollards although other explanations (such as millstone quarrying) are possible. Similar suspected bollards were documented in

a rock cutting and possible slipway at Tersane Bay on the Lycian coast (Blackman, 2013b: 563-564, fig. B25.3-4).

At least 16 square holes (approximately 100-180 mm in cross-section and 110-200 mm deep) were cut into the bedrock further upslope. Although they do not appear to fit any clear pattern, they might have been related to quarrying activity or were perhaps used to hold wooden posts, bollards, or capstans. Alternatively, the site could perhaps be identified as a shoreline quarry area, based on worked faces in the features and several well-preserved quarry trenches delineating rectangular blocks documented upslope in 2018. Quarrying of the irregular limestone outcrops in this area would perhaps not have required the stone bollards at the site, unless they were added later. Nonetheless, some of the people of Boğsak village call the sloped shoreline features *çekkek* or 'slipways', which could perhaps describe a later adapted use of the features (G. Varinlioğlu, pers. comm.).

The lack of rock cuttings for sleeper- and groundway timbers could indicate that loose timber sleepers or rollers were sufficient for hauling out smaller vessels. The location of the features near the shortest stretch of water between Boğsak Island and the mainland was likely suitable for hauling out or mooring small vessels used as ferries to and from the island or for other purposes: one of the main landing areas for the island, a flat natural formation with two sets of rock-cut stairways leading to it, is located on the south side of Boğsak Island, not far from the rock-cut features on the mainland (Varinlioğlu, 2017: 254, 255, fig. 7). Unfortunately, the Boğsak Bay features are difficult to date without further evidence.

Ancient Mediterranean slipways are generally identified as installations for naval vessels; no slipways for civilian vessels have been positively identified at other sites, although a few possible examples have been proposed (for example, Emporeio Bay at Alimnia) (Blackman, 2010: 16; Rankov, 2013a: 45; 2013b: 96). This association is due in part to the more frequent hauling out and maintenance required for naval vessels, although how often this was required in practice has been re-examined by some scholars in recent years (Harrison, 1999: 169-171; 2003: 78-79; Coates, 2012: 139-140; Lipke, 2012a; 2012b; Votruba, 2017). Documented Mediterranean slipways and shipsheds were built mainly in the Classical and Hellenistic periods, many for triremes and perhaps larger warships, although examples for smaller vessels are also known (Rankov, 2013a: 48; 2013b: 96-99). Classical-period triremes were at least 37-40 m in length and required slipways that were significantly longer; up to 140 men were required to safely haul out a trireme into its shipshed and 120 were required to launch one (that is most of the 200-man crew of such a vessel) according to a regulation from 5th-century BCE Piraeus (Blackman, 1987: 35-37; Casson, 1995: 302-306; Coates,

2012: 138; Rankov, 2013c: 117-118). Smaller rock-cut slipways may have been made for smaller Hellenistic-period *hemioliae*, reconstructed as 18-20 m long and about 3.5-4.5 m wide, which is longer and narrower than the Boğsak features (Baika, 2010: 75; 2013b: 342; Rankov, 2013b: 98). Shipsheds and slipways made of perishable materials were perhaps most common in antiquity, which may explain why few archaeological examples have been found. Textual references as well as excavated slipways built of materials such as earth and timber, sand, cobbles, and packed earth provide some idea of the variety of ways in which such installations were built (Blackman, 1988: 15; 2010: 13-15; 2013a: 124-129; Hurst, 2010: 32-33; Rankov, 2013c: 102-105; Baika, 2013a: 234; Gerding, 2013: 309-315; McKenzie, 2013: 382-384; Lentini and Blackman, 2014: 76-78). Ancient sources indicate that ships were sometimes hauled out on sandy beaches by digging a trench and lining its bottom with wooden groundway timbers carried on board for this purpose (Rankov, 2013c: 102).

### **Rock-cut features and other archaeological remains on Dana Island**

Dana (ancient Pitusu or Pityoussa), is the largest island in the Taşucu Gulf, located 2.5 km from the Turkish mainland and approximately 20 km west of Silifke. It is a rocky island, 3 km long, 1.2 km wide, and 250 m in elevation. Although Dana's ruins have been reported on and visited for many years, the Boğsak Archaeological Survey is the first systematic archaeological study of the entire island: fieldwork began with reconnaissance visits in 2011 and 2014, followed by intensive surveys in 2016, 2017, 2018 and 2019; the results of the 2016 and 2017 surveys are presented here (Varinlioğlu, 2017: 248).

The island is occasionally mentioned in textual sources, including the Babylonian Chronicle, the *Stadiasmus Maris Magni*, and the *Acts of St Barnabas* (5th century CE), which mentions that the saint and his companions stayed at Pityoussa for three days due to foul weather. Dana Island is called Provensale in late medieval portulans, presumably after Provençal merchants or members of the Hospitaller crusading order: the latter was granted land in the region in the 13th century (Varinlioğlu *et al.*, 2017: 52). In the *Kitab-ı Bahriye* (*The Book of Navigation*, 1521), Piri Reis recommends anchoring at the north end of the island (advice repeated by at least one modern yachting guide) and obtaining water from cisterns there (Ökte, 1988: 1587; Heikell, 2006: 302). On the southern summit of the island there is a diamond-shaped, walled enclosure, 300 x 200 m, possibly Archaic period in date, and constructed of irregular, unmortared stones (Varinlioğlu *et al.*, 2017: 57; Rauh and Kaye, forthcoming).



Figure 4. Overview of Dana's shoreline, facing roughly north-east from the centre of the island's northwestern shore (left) and towards the southwestern end (right) (Photos M. Jones).

Small numbers of pre-Roman sherds were documented here, particularly in the rubble-fill of the walls, including Cypriot basket-handled amphora sherds (8th-3rd century BCE), the toe of a Hellenistic Rhodian amphora, and possible Late Classical (4th century BCE) Chian amphora fragments. Late antique construction is also represented in the southern citadel, contemporaneous with the vast majority of pottery finds at the site: structures from this period include fortress walls of mortared rubble masonry, a basilical church with an adjoining eastern chapel, two large, rectangular, vaulted cisterns (one 4-5 m x 2-2.5 m and several metres deep), and what appear to be mortared repairs

to sections of the older walls (Varinlioğlu *et al.*, 2017: 57-58; Rauh and Kaye, 2017, forthcoming; G. Varinlioğlu, pers. comm.). A stone stairway leading from the summit to the lower slopes may also date to this period (Varinlioğlu *et al.*, 2017: 58).

A settlement up to 1.5 km long and 150 m wide covers the lower slopes of the island's northwestern side, below quarries in which groups of rock-cut tombs were later made (Figs 4-5). Some of the most prominent archaeological remains are the rock-cut features along this shore, surveyed in 2016 and 2017 with the goal of identifying maritime installations. Such features could include shore-side buildings and quarries, break-

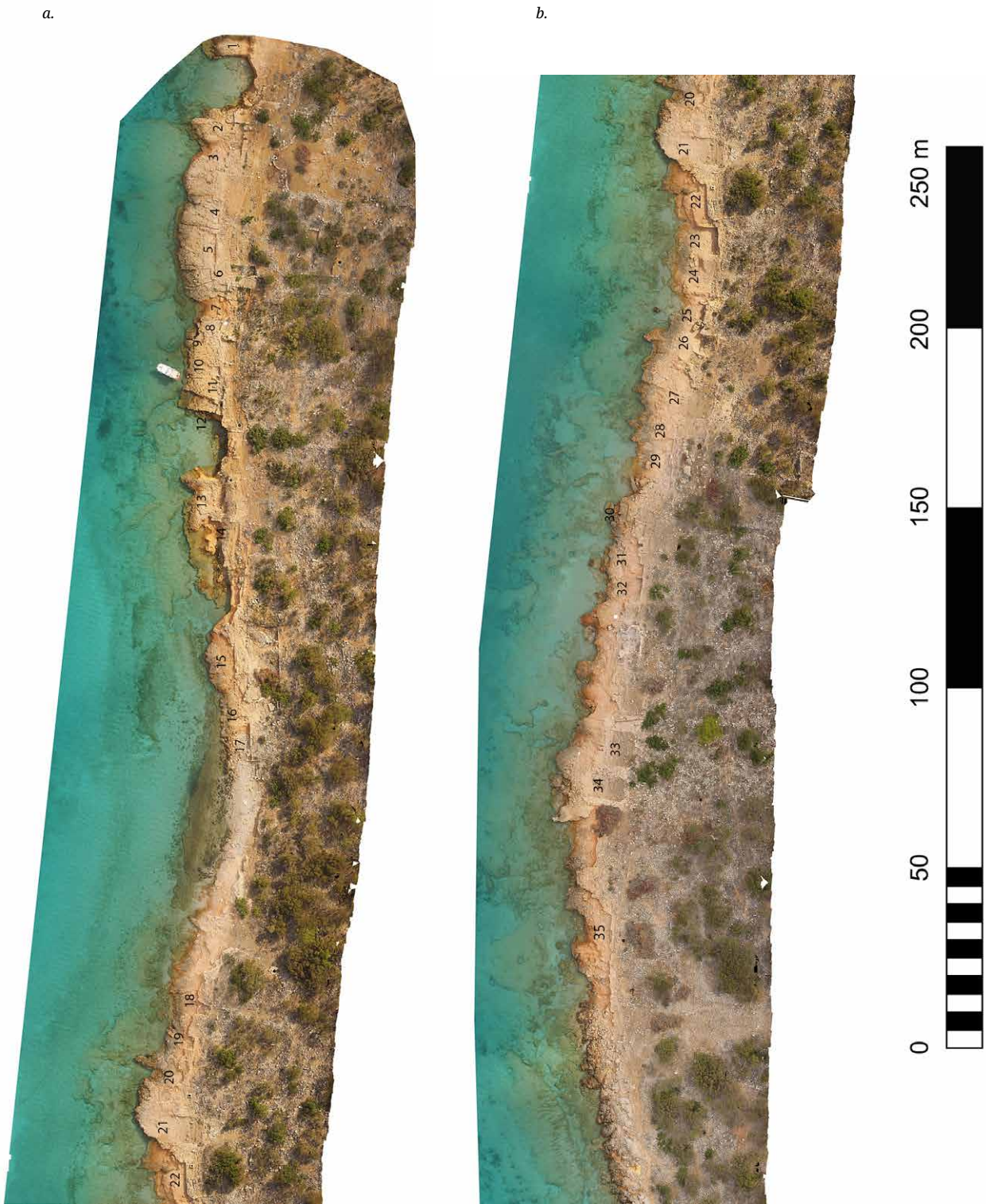
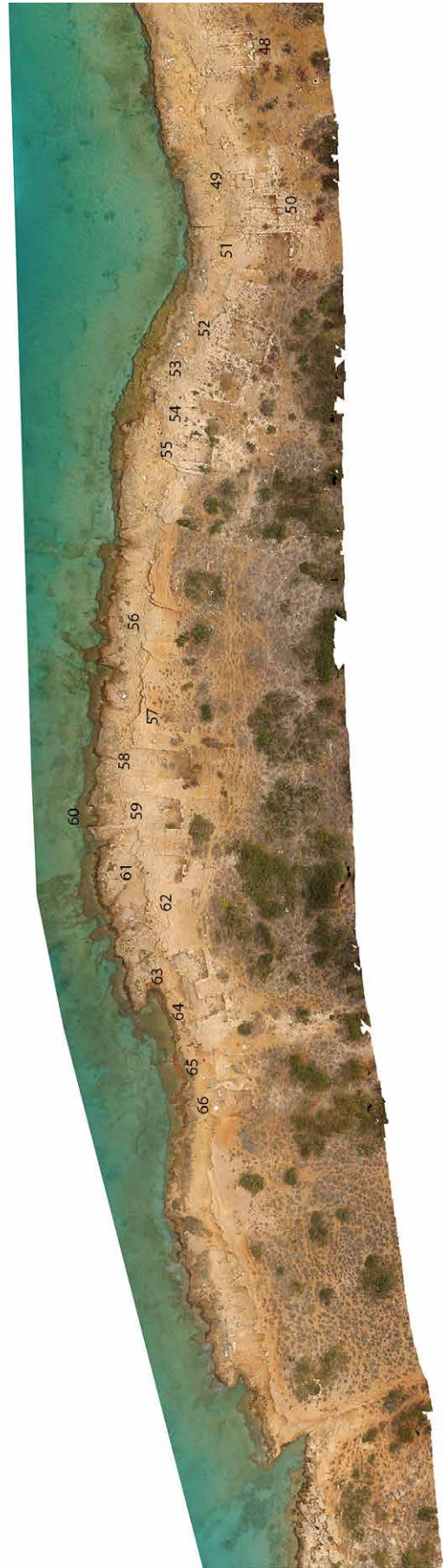


Figure 5. a-d) Photomosaic of rock-cut shoreline features along the northwestern shore of Dana Island. Major rock-cut features are numbered from north-east to south-west (Original image Tuğrul Oktas/BOGA Project; adapted by M. Jones).

c.



d.



waters, bollards, and landing stages, slipways and shipsheds, or evidence of local maritime-related industries such as *piscinae*, salt pans, or *garum*- or dye-processing installations.

Most buildings in Dana Island's lower settlement were constructed of limestone masonry with rock-cut foundations. Their masonry features suggest at least two phases of Roman or late antique construction, but architectural research on the settlement is still in an early phase (G. Varinlioğlu, pers. comm., October 2017). Remains of at least four churches dated stylistically to the second half of the 5th or early 6th century CE were identified here, contemporaneous with a number of churches in neighbouring settlements (Varinlioğlu *et al.*, 2017: 56-58; Varinlioğlu, 2017: 247, 249, 257). Two brick structures (unusual for Isauria, where stone architecture was most common) built along the shoreline appear to be baths fed by nearby cisterns; hypocaust *pilae* are visible inside one of the structures (Varinlioğlu, 2017: 248, 249, fig. 3). Quarrying evidence was discovered above and to the south of the settlement as well as along the shoreline. Pottery ranging from the Classical to the Late Byzantine and Ottoman periods was collected during the survey of the lower settlement, but the vast majority of diagnostic sherds are Late Roman in date, with a peak in the 6th century (Figs 6-7) (Varinlioğlu *et al.*, 2017: 57, fig. 11, 58; Kaye and Rauh, 2017). An inventory of 148 copper or copper-alloy coins collected from Dana Island (without other provenience information) at the Silifke Museum consist almost entirely of copper *nummi* and other Roman and Byzantine issues; no earlier coins were identified (Kaye and Rauh, 2017). No prehistoric or Bronze Age artefacts were found during two seasons of surveys, and Classical and Hellenistic as well as post-Roman sherds were recorded in the lower settlement only towards the far northwestern end of the island (Varinlioğlu *et al.*, 2017: 58). These finds suggest that in most periods the island was used primarily as an anchorage and watering place for ships' crews. The citadel was also occupied in multiple periods, probably as part of a larger regional fortification system; it likely functioned as a lightly manned watch-post or beacon tower that could be reinforced with a larger garrison or used as a refuge by larger numbers if necessary.

Survey of the coastal rock-cut features began in 2014 with a shoreline photomosaic created using an aerial drone; individual features were then numbered on the photomosaic and documented on the ground in the summer of 2016 and 2017. Approximately 66 major rock-cut features were recorded along the shore;<sup>1</sup> this total does not include areas of natural erosion, cisterns, or smaller trenches, and channels, many of which seem

1 Numbers 36-40 were not used for numbering shoreline features.

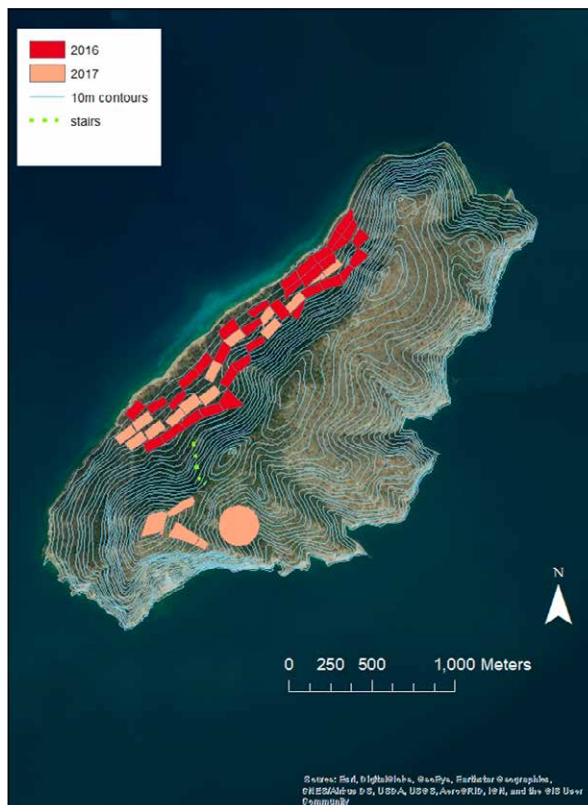


Figure 6. Survey transects traversed on Dana Island by the BOGA survey team during the 2016 and 2017 seasons (Image Noah Kaye, BOGA Survey Project).

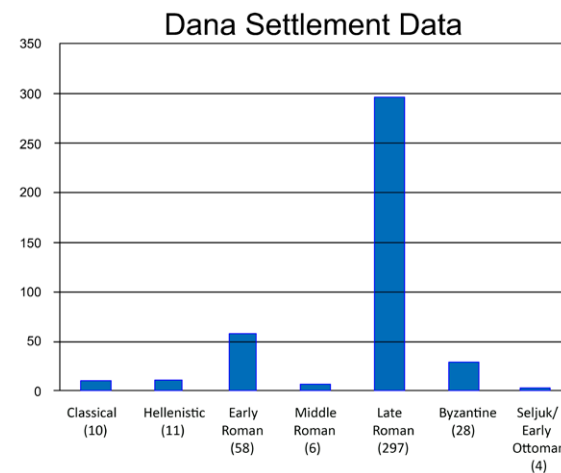


Figure 7. Diagnostic pottery finds from the 2016 and 2017 surveys of the coastal settlement, by period (Nicholas Rauh, BOGA Survey Project).



Figure 8. Eroded areas along Dana's northwestern shoreline (Photo M. Jones).

to be the result of quarrying activity. The northwestern shoreline has been significantly eroded since antiquity, with up to several metres of the original rock cuttings damaged or completely destroyed by wave action (Fig. 8): wave-cut or marine notches and undermined rock formations are evident along much of the northwestern shore. Below the current shoreline, the seafloor drops a few metres (visible from the water's edge and in drone photographs) and no traces of rock cuttings extending further under water have been observed. Any sea-level changes due to seismic activity appear to have been minor (based on the surviving rock cuttings) although this needs to be corroborated by a geomorphologist. Some rock-cut shoreline features are also partly obscured by soil and rubble, particularly towards the island's southwestern end.

Up to 33 listed rock-cut features appear to be foundations for buildings, particularly along the shore's northern half. Similar to better-preserved foundations further inland, these features were cut into the bedrock with vertical walls and level floors (Table 1). The brick buildings near the shoreline illustrate how they were used. Some foundations were cut into a softer, friable conglomerate layer below the harder stratum of limestone in which most of the rock cuttings are preserved; this lower stratum was too soft for cutting ashlar blocks, and many of these features suffered substantial erosion (Fig. 9). Courses of ashlar blocks, remnants of mortared rubble walls, and (in one case) flagstones are still *in situ* in several of the rock cuttings (Fig. 10), but most foundations along the shore have been robbed completely: they clearly provided accessible *spolia* and ballast for passing ships. Possible landing-places along the northern section



Figure 9. The surviving brick structures, which were not robbed for building material, provide a clear illustration of how many of the rock cuttings along Dana's shore were used as building foundations. The foundation here is cut into the more friable stratum below the quarried layer (Photo M. Jones).

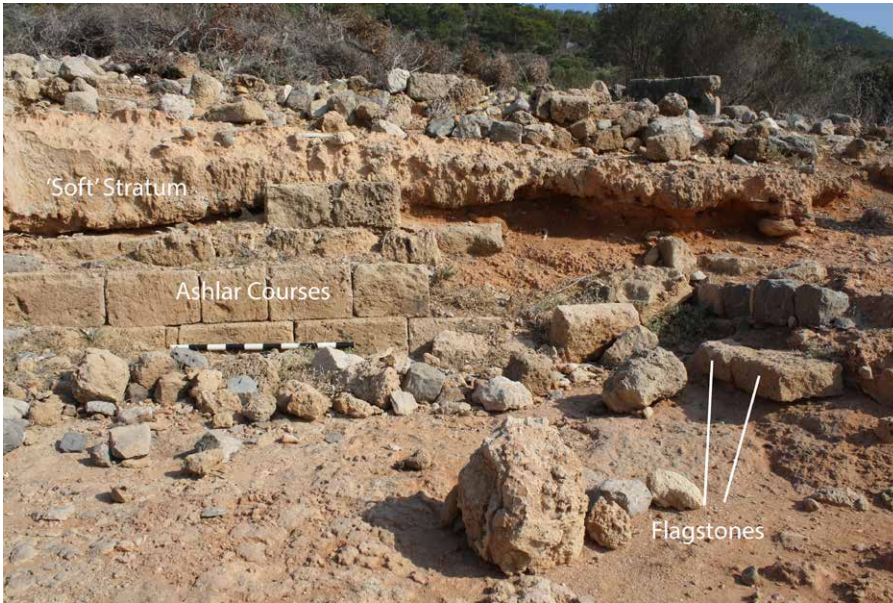


Figure 10. Feature 35, a rock-cut building foundation showing remains of walls and flagstones in situ (Photo M. Jones).

Identification of feature:	Feature numbers: certain or probable	Feature numbers: possible
Building foundation	3, 5, 8-11, 23, 28, 30-32, 35, 44, 46 (Total: 14)	4, 6, 7, 13-20, 21, 22, 24-26, 29, 46, 47 (Total: 19)
Quarry	1, 2, 21, 33, 41, 42, 43, 47A, 48, 49, 49A, 50-52, 54, 55, 58-61, 63, 64 (Total: 22)	27, 34, 56, 57, 62, 65, 66 (Total: 7)
Quarry repurposed as a building foundation		45, 53 (Total: 2)
Other (landing stage?)		12 (Total: 1)
Other (foundation for crane or hauling apparatus?)		47B (Total: 1)
Total number of labelled and identified 'major' features	36	30

Table 1. Provisional catalogue of significant shoreline features on Dana Island.

of the shore include a set of eroded rock-cut stairs near features F 8 and F 18, similar to examples on Boğsak Island (Varinlioğlu, 2017: 255, fig. 7), and F 12, an eroded ramp which may have served as a landing stage.

Like Boğsak, there are no natural springs on Dana Island, and water was stored in rainwater-fed cisterns. A partial survey in 2017 recorded 85 cisterns, but perhaps 200-300 were dug throughout the settlement. Documented examples are nearly all bell-shaped and were originally capped with separate limestone cistern heads, unlike the large, rectangular, vaulted cisterns built under dwellings on Boğsak (Varinlioğlu, 2017: 256-257). Forty-nine cisterns, including one rectangular example, were recorded along the northwestern shoreline. Several are exposed in eroded areas of bedrock, and at least four (at F 28, 30, 44 and 47) were apparently situated inside buildings, based on rock-cut foundations and setting-beds for walls (Fig. 11). Most surveyed cisterns are partially blocked by debris, so accurate capacity estimates are difficult, but many were at least 2-3 m in depth: two were measured with depths of 4.3-4.4 m. None was found near

the shoreline south of F 49, where the largest shoreline features are located. Here the slope is steeper, and while structural remains continue further inland, surface potsherd finds are nearly absent near the shore south of F 64. An unidentified round structure 3.55 m in diameter south of F 66 marks the southern limit of archaeological remains near the shoreline.

In several locations curved or meandering rock-cut channels, typically about 200 mm wide and of varying depth, were found descending to the shore (Fig. 12). These may have been used as drains for excess rainwater, possibly to prevent flooding during winter rains, as were trenches recorded on Boğsak Island (Varinlioğlu, 2007: 292). Other, shorter channels are likely quarrying or separation trenches (Ward-Perkins, 1972: 139-140, 140 fig. 1; Fant, 2008: 122, 123, fig. 5.1; Harrell and Storemyr, 2013: 24, fig. 7, 28, fig. 12). Long, straight trenches might have been used to efficiently delineate larger areas to be quarried around F 4-6, F 45-47, and F 50-51, similar to quarry features described in other regions (Ward-Perkins, 1972, 140-144; Harrell and Storemyr, 2013: 33-34).



Quarrying activity at ancient coastal sites was not unusual: quarries near navigable bodies of water were generally preferred in antiquity because of the lower costs of sea or river transport (Ward-Perkins, 1972: 141-143; Dworakowska, 1975: 96-97; Fant, 2008: 125; Russell, 2013: 138-139).

Approximately 12-14 larger, inclined rock cuttings, 7-10 m wide and 9-18 m long, seem to comprise a distinct type of feature towards the southern end of the island (F 42, 43, 45, 48, 50, 51, 52, 53, 54, 55, 58, 59, and possibly F 55A and F 56). These were initially suspected to be possible rock-cut slipways for ships (Figs 13-15) (Varinlioğlu, 2017: 249). They are separated from the shore by an eroded shelf 5-15 m wide. If they had extended to the current shoreline, their original lengths would have been 25-30 m: too short for triremes but adequate for some smaller ancient warships and rowed vessel

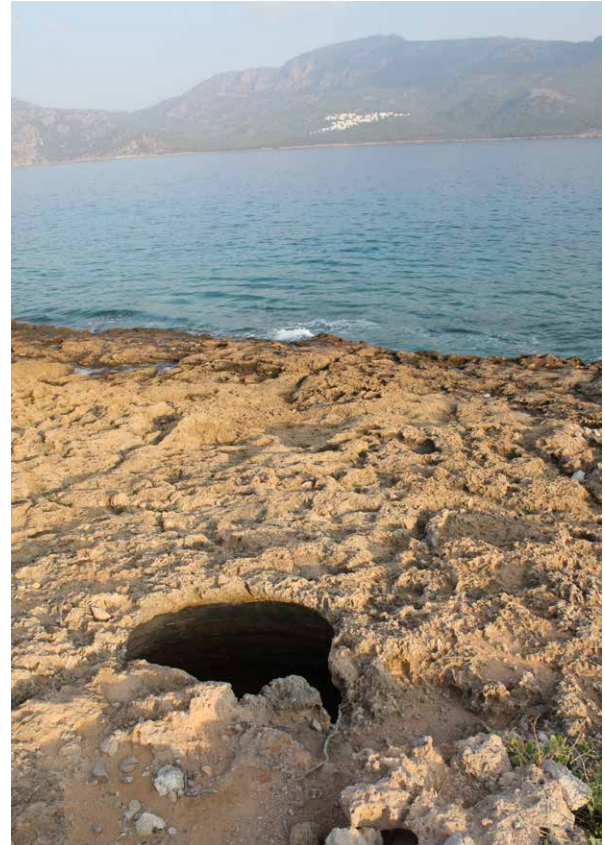


Figure 11 (right). Cistern opening in an eroded area of the shoreline near Feature 47 (Photo M. Jones).

Figures 12 a and b) Meandering rock-cut trenches leading to the shoreline, possibly drains (Photos M. Jones).

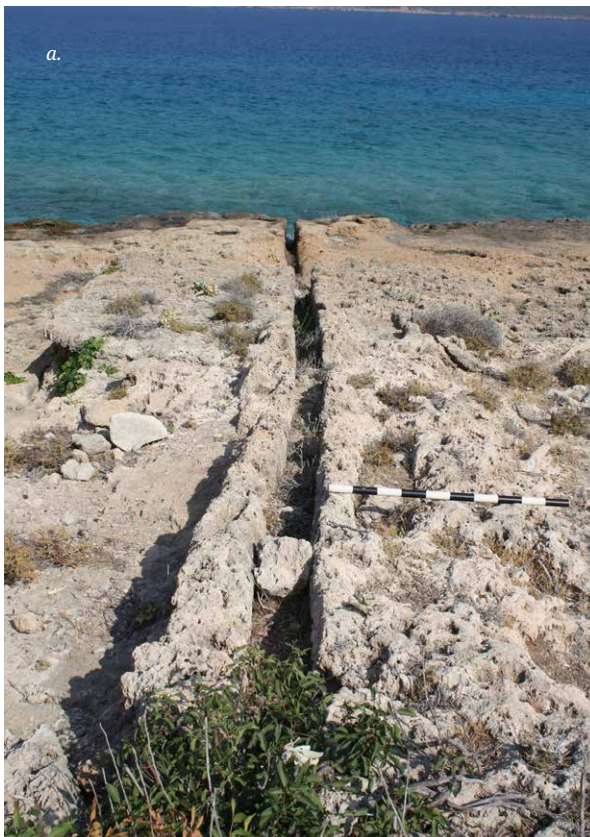




Figure 13. Feature 52, an inclined rock-cut feature (Photo M. Jones).



Figure 14. Feature 58 (Photo M. Jones).

types reconstructed as 12-25 m long (Table 2),<sup>2</sup> Remains of surviving slipways and shipsheds or their estimated lengths (in most cases original lengths have not survived) are typically 30 m or longer, with only a few documented examples under 20 m (Blackman and Lentini, 2003: 387,

2 Rankov estimates the lengths of several types of ancient warships based on *interscalmium* distances, from the 20-oared *eikosoros* (13-16 m) to the 30-oared triakonter, 50-oared bireme pentekontor, liburnian, (all 19-21 m), and the *hemiolia* (22-25 m) (Rankov, 2013a: 76, 85-92). Two smaller Roman vessels excavated in Pisa (Pisa Wreck C, a rowed vessel, and Pisa Wreck F) were approximately 11.7 m and 10 m long, respectively (Bruni, 2000: 45-47, figs 34-37).

392; Coates, 2012: 134; Blackman, 2013a: 131-132; Rankov, 2013b: 91-92). Several of the sloped features on Dana are either severely eroded or partially buried and therefore difficult to examine and measure without excavation. Most are cut to depths of approximately 300-600 mm, although several features towards the shore's southwestern end (F 58, for example) have one or more walls that are substantially deeper (1-1.3 m).

The early fortifications and pottery on the island combined with rock cuttings are reminiscent of rock-cut naval bases of the Classical and Hellenistic periods, that typically consisted of one or a few rock-cut slipways, often cut into rocky promontories and

Feature number	Width (upper or inland end/lower end)	Length (preserved)	Distance from upper/inland edge to shore (approx.)
50	6.9 m	9.2 m	25.3 m
51	10.8 m/ 9.0 m	(eroded)	-
52	8.8 m/ 9.0 m	16 m	29.6 m
53	6.5 m/ 8.8 m	14.5 m	27.0 m
55	6.7 m (near upper end)	15 m	15.5 m
57	5.6 m/ 6.0 m	12.2 m	26.2 m
58	7.0 m/ 7.8 m	18 m	27 m
59	7.8 m/ 8.8 m	13.2 m	25 m
61	7.2 m/ 8.1 m	7.3 m	24 m
63	8.5 m (middle)	10 m	24 m
64	4.3 m/ 5.1 m	11.2 m	16.8 m

Table 2. Dimensions of selected inclined rock-cut features.



Figure 15. View of Feature 58 from below (Photo M. Jones).

associated with networks of watch- and beacon-towers or other fortifications (Baika, 2013a: 231-251). The double harbour complex at Alimnia (ancient Eulimna) off the western coast of Rhodes may have been a larger rock-cut naval base: this site consists of 10 and 11 sloped rock cuttings in two harbours separated by an isthmus and overlooked by a Hellenistic fort (Baika, 2013c: 340). However, rock-cut naval installations of this scale, if indeed these are correctly identified as slipways rather than quarries, were likely rare and reserved for locations with exceptional strategic importance or other superior qualities (such as Alimnia's double harbour), and small naval dockyards associated with ports appear to have been more common (Blackman, 2003: 83-85). The BOGA team considered the possibility that a number of earlier slipways were interspersed and perhaps obscured by later Roman and Byzantine quarries and architectural remains, but

no such evidence was identified during the 2016-2017 survey seasons.

In 2016, three of the larger features (F 50, 52, and 58), as well as the gradient of a fourth (F 49), were measured with a total station; these features were chosen based on their size, slope, preservation, and a relative absence of soil and debris. Recorded gradients ranged between 4.7 and 6.5 degrees, which is within the range of slipways built for ancient warships (Rankov, 2013b: 95-96). However, additional features would have been necessary to haul out and berth such vessels. All slipway surfaces in contact with a vessel's keel must be constructed with a continuous gradient in order to facilitate a successful launch (Rankov, 2013c: 110, 119-120). This was not the case in at least one of the measured features (F 52), in which the slope actually decreased towards its upper (inland) end (although a similar change in gradient was documented in a shipshed at Sicilian Naxos: see Blackman



Figure 16. Feature 47A, a quarrying area (left), and 47B, an unidentified feature (right) (Photos M. Jones).

and Lentini, 2003: 404). No clear evidence was found for a superstructure or for roof supports at any of these features, but superstructures of perishable materials and unroofed slipways were also used in antiquity (Blackman, 2013a: 138). Square holes 70-100 mm in cross-section and typically 50 mm or so deep are found in the rock at various locations. Since they are not situated in regular patterns in the exposed features, their function is perhaps related to quarrying methods rather than architecture. Larger holes 220-250 mm in cross-section near F 17, 47, 47A, and 51, as well as a round example 350 mm in diameter near F 42, may be post holes for bollards or capstans used for moving heavy loads, particularly those around F 47A; separation trenches and the shallow, irregular shape of this feature identify it as a quarrying area.<sup>3</sup> The function of a unique rock cutting nearby (F 47B) and a group of three square or rectangular holes (250 x 250 mm and 300 x 200 mm) closer to the shore between Features 47A and 47B is unclear, but such a feature could have perhaps been used for hauling machinery or other equipment (Fig. 16). No conclusive evidence was found in the sloped rock-cut features for stone bollards or columns that could have been used for mooring or hauling vessels ashore, in contrast to Boğsak Bay. If any such features existed near the shore they were almost certainly damaged or destroyed by wave action, although natural rock formations could certainly have been used for mooring in antiquity, as they are today.

The floors of the features also lack evidence for trenches or attachment points for the longitudinal groundway timbers or transverse sleeper-beams that are necessary to decrease friction on the keel as a vessel is hauled out of the water. Evidence of such timbers is found in many documented slipways and shipsheds, and similar

installations are common even today (Fig. 17) (Blackman and Lentini, 2003: 400, 404-405; Rankov, 2013c: 102-106, 110-111; Blackman, 2013a: 125-126, 134; Baika, 2013a: 241-243, 245). It is possible that small vessels were hauled into the features on loose(?) wooden planks, and in fact, impressions of wooden timbers have been reported in some documented rock-cut slipways, but no such evidence was found in the Dana Island features (Baika, 2013a: 241). Alternatively, wooden cradles are commonly used for hauling out boats in the modern Mediterranean, but there is no conclusive textual, archaeological, or iconographic evidence for their use in antiquity (Coates, 2012: 135; Rankov, 2013c: 113-115).

Although documented shipsheds and slipways may vary in length and width on the same site (Rankov, 2013a: 92-95), the wide variation in the dimensions of the features on Dana Island, as well as their generally rough workmanship, suggests that they are evidence of quarrying activity rather than purpose-built slipways for warships or civilian vessels. Shallow trenches, likely traces of quarrying trenches around stone blocks that were later removed, are visible in the floors of several sloped features. Longitudinal trenches in the floors and back walls of some features were initially suspected to be 'keel slots', in which longitudinal groundway timbers were installed; a ship's keel would slide over the groundway timber(s) as it was launched or hauled out. Blackman (2013a: 129) now believes that keel slots in identified slipways 'should probably be best explained as holding timbers as part of a more complex system of timber groundways' (see also Baika, 2013a: 241-242). However, unlike 'keel slots' documented at a few ancient shipshed and slipway sites (such as Appolonia, Rethymno, Sicilian Naxos), the Dana Island trenches are shallower (usually 30-100 mm or, in one case, 200 mm, rather than 300-350 mm), are curved in some cases, and do not extend the entire length of the features (Blackman and Lentini, 2003: 390, 400; Baika, 2013b: 300; 2013e: 504; Blackman, 2013a: 129). These characteristics

3 Blackman (2003: 88-89) proposes that shipsheds and slipways were sometimes equipped with hauling machinery, although such equipment could also have been used for other heavy loads, including sledges loaded with quarried stone.

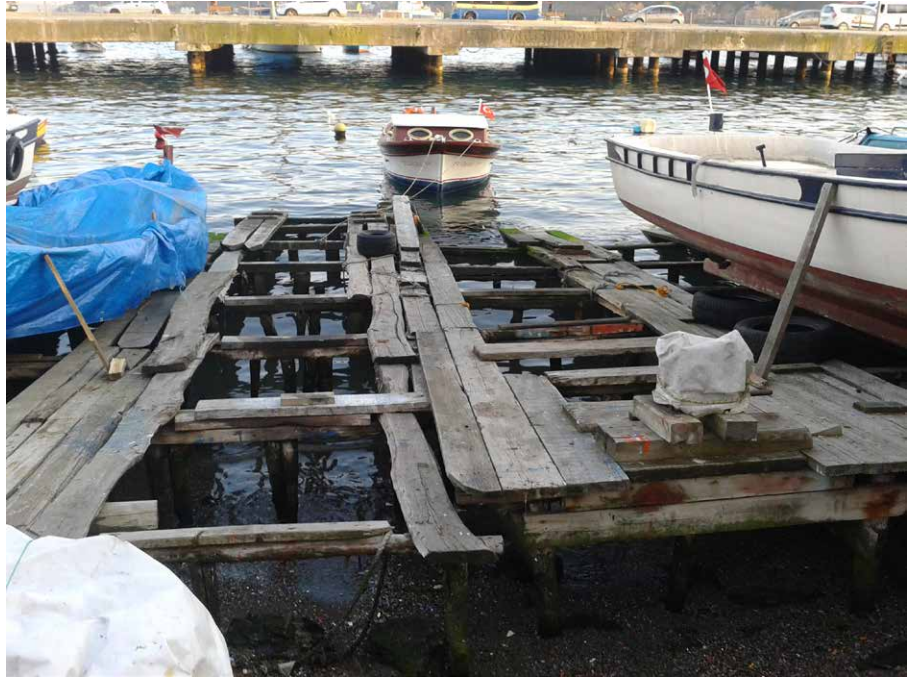


Figure 17. Modern wooden slipway in Saryer, Istanbul (Photo M. Jones).



Figure 18. Back wall of Feature 50 showing narrow and wide 'ramps', probably quarry trenches (Photo M. Jones).

suggest quarrying or separation trenches cut during the removal of stone blocks rather than features related to launching and hauling out vessels. The back or upslope walls of the features typically include short, sloped trenches or 'ramps' approximately 0.20-1 m wide, but significant variations in their shape, depth, and direction indicate that they are most likely the ends of quarrying trenches: narrower examples from the sloped features on Dana Island closely resemble a partially cut separation trench documented by Harrell and Storemyr at a Ptolemaic and Roman quarry near

Edfu in Egypt (Fig. 18) (Harrell and Storemyr, 2013: 32, fig. 21). The wider 'ramps' in the back walls of some sloped features on Dana Island resemble cuttings at a shallow quarry-face near the island's summit.

Ramps and inclined surfaces are common in large-scale quarry sites, for moving heavy loads downhill. These inclines often follow a cleavage plane or particular stratum in the bedrock. The floors of both the inclined shoreline features at Dana Island and a number of the inland quarries are cut at a similar angle. Rock cuttings possibly used for bollards, cranes, or capstans are also



Figure 19. Sloped quarry faces further inland on Dana Island (Photo M. Jones).

features of some ancient quarry sites, and wooden bollards were used in some quarries into modern times to brake the descent of sledges loaded with stone (Ward-Perkins, 1972: 143, Pl. XII b; Dworakowska, 1975: 147; Adam, 2003: 23, 25-26, 31, 32, fig. 31; Fant, 2008: 124-125; Russell, 2013: 135-138). The shallow depths of some inclined rock-cut features near the shore also seem to support their identification as quarries. Dworakowska (1975: 148-149) cites several examples of shallow ancient quarries cut to the depth of one or two stone blocks, while Adam (2003: 27, 63-64) notes that the blocks extracted from many of the quarries around Rome were 600-650 mm in height (approximately 2 Roman ft), which is in fact fairly close to the heights of blocks removed from some quarry faces on Dana (Fig. 19).

The scale of quarrying across the island indicates that it was a major industry for its inhabitants. Some of the quarried stone was doubtless used for construction on the island, but much was likely exported as well, to neighbouring settlements – Boğsak/*Asteria*'s late antique structures most certainly used imported building materials – and perhaps to more distant destinations.<sup>4</sup> How long the quarries were in operation remains unclear. An area that the BOGA team designated 'The South Complex' was cleared of vegetation and mapped during the 2017 field season (Fig. 20). Here, building foundations had been excavated into bedrock

while their upper sections were built with large ashlar blocks laid directly onto sloping walls; these are likely the original floor surfaces of an earlier quarry similar to the inclined shoreline features (Varinlioğlu *et al.*, 2017: 53, fig. 5). A small finds survey of the complex uncovered only Roman and Late Antique sherds. This construction style appears to be unique to Dana Island, but Roman and Byzantine ashlar buildings with rock-cut foundations are common throughout Rough Cilicia (Varinlioğlu, 2007: 311-312). The function and length of occupation of the complex is unclear, but it illustrates the adaptation of old quarries for new uses and is evidence of multiple occupation phases on the island.

Archaeological evidence on Dana Island is also consistent with other sources on the activities of the Isaurians of late antique Cilicia. The Isaurians are described in Byzantine sources as skilled masons: texts from the 5th and 6th centuries reference their employment in ecclesiastical construction projects in Syria, Anatolia, and Hagia Sophia in Constantinople, likely as seasonal workers, foremen, and occasionally master builders (Mango, 1966: 358, 361, 363; Gough, 1972: 199, 201). Such activity may have been particularly common during the reign of Emperor Zeno (474-491), a native of the region. Zeno funded the construction of new religious buildings at St Thecla's shrine in Seleucia *ad Calycadnum*, and his reign roughly coincides with construction projects at other Cilician sites (Mango, 1966: 358-359, 363-364; Gough, 1972: 199, 201; Elton, 2000: 295-299). While some Isaurian workers must have travelled overland to construction projects in inland Anatolia and Syria, others would have taken coastal sea routes, joining those working as sailors, merchants, and other tradesmen (Mango, 1966: 359, 361,

4 Murat Eroğlu of Gazi University in Ankara is currently completing an archaeometric analysis of building materials from Boğsak and Dana Island. This project will likely be expanded to local stone and clay sources in the Boğsak region in the future.



Figure 20. 'The South Complex': building foundations cut into old, sloped quarry faces (?) on Dana Island (Photo M. Jones).

363; 2019). Isaurians were prominent in the Byzantine army as well, another potential source of wealth and advancement for individuals from the region (Mitford, 1980: 1250-1251). Documentary and archaeological evidence demonstrating significant Isaurian involvement in the Byzantine Empire outside their native region coincides with the most intensive building activity and evidence for wealth and prosperity at settlements in the BOGA survey area.

## Conclusion

The age of the shoreline rock-cut features on Dana Island is difficult to determine conclusively. However, the BOGA survey's results suggest that most, if not all, of the features found along the island's northwestern shore likely date to the Roman and Late Antique periods, when a substantial permanent settlement existed on the island. The function of sloped rock-cut features on multi-period sites may be particularly difficult to determine. Such inclines are required for ancient slipways for ships but were also used for quarries, landing stages, streets and warehouses; in some cases, identifications of such features as slipways for warships have been debated or re-evaluated (Blackman, 2013a: 139; Baika, 2013d: 497-498, fig. B18.2a-b; Yorke and Davidson, 2017: 51, 52, fig. 5).

Although they have some similarities to the positively identified rock-cut slipways from other sites, the inclined features on Dana's southwestern shoreline most closely resemble better-preserved quarries and building foundations found further upslope on the island. Their shallow depths and slopes are probably attributable to

the selective exploitation of a specific stratum of rock or the deliberate cutting of ramps for moving loads of quarried stone to the shore. Also, these features lack many of the distinctive features found in other identified slipways and shipsheds, such as evidence for groundway and sleeper installations, somewhat regular dimensions, evidence for superstructures, or bollards or columns used when hauling and launching ships. However, this does not preclude the later use of some sloped quarries or landing stages as improvised slipways, especially for smaller boats. For the late antique settlement, locations suitable for hauling out and careening and repairing vessels or housing them for the winter were probably necessary, but such facilities can be quite minimal for small coasters (Hohlfelder and Vann, 2000: 131, fig. 7, 133, fig. 9). Ships and boats could also moor along the island's northwestern shore during much of the year.

Survey-finds suggest that Dana Island was only lightly settled before and after Late Antiquity, but at the least, it was used over a long period as a useful anchorage and watering place. Dana undoubtedly had a certain strategic value as well, and the early fortifications and pottery finds at the island's southern summit attest to its use as a fort or watch-post along a major maritime route and political frontier. The quarrying evidence on the island seems to correspond with the increased settlement and trade in southern Asia Minor during Late Antiquity, as does the evidence in Byzantine textual references to Isaurian activity as masons and builders outside Cilicia. More research is needed to understand the degree of involvement of Dana Island's Byzantine inhabitants in local, regional, and long-distance trade, but the *annona* trade with Constantinople certainly played a role in this

region's prosperity. Dana was on an important maritime route for millennia, but apparently only the social and political conditions of the early Byzantine Empire seem to have stimulated intensive exploitation and settlement. The population of Dana and nearby sites appears to have dropped significantly by the 7th century, possibly due to Arab incursions. Small amounts of Byzantine pottery on Dana and Boğsak attest to a continued Byzantine presence, perhaps military in nature, but late antique levels of activity were not matched in this area until recent times (Varinlioğlu, 2007: 314-316).

## Acknowledgements

I would like to thank the Turkish Ministry of Culture and Tourism for the opportunity to work in this region, director Günder Varinlioğlu for the invitation to join the survey, and the current and former members of the Boğsak Archaeological Survey team, particularly Rebecca Ingram, Fatih Timirli, Nicholas Rauh, Noah Kaye, Akin Yücetaş, Nur Erdemci, Yasin Öztürk, Cem Ardil, and Matthew Harpster. I would also like to thank David Blackman, Boris Rankov, Cemal Pulak, and Greg Votruba for their comments, and the Honor Frost Foundation for the opportunity to present this research.

## References

- Adam, J.-P., 2003, *Roman Building: Materials and Techniques*, A. Mathews (trans.). London.
- Akkemik, Ü., 2015, *Woods of Yenikapı Shipwrecks/Yenikapı Batıklarının Ahşapları*. Istanbul.
- Akkemik, Ü., Caner, H., Conyers, G., Karlıoğlu, N., Dillon, M.J., Rauh, N. and Theller, L., 2012, The archaeology of deforestation in south coastal Turkey. *The International Journal of Sustainable Development and World Ecology* 1.1, 1-11.
- Autret, C., Dillon, M., Lund, J., Rauh, N., and Zoroğlu, L., 2014, The Trading Networks of Ancient Rough Cilicia, in S. Ladstätter, F. Pirson and T. Schmidts (eds), *Harbors and Harbor Cities in the Eastern Mediterranean from Antiquity to the Byzantine Period: Recent Discoveries and Current Approaches*, 593-618. Istanbul.
- Baika, K., 2010, A rock-cut slipway at Poiessa (Keos, Cyclades), in D.J. Blackman and M.C. Lentini (eds), *Ricoveri per Navi Militari Nei Porti del Mediterraneo Antico e Medioevale*, 69-82. Bari.
- Baika, K., 2013a, Small-Scale and Rock-Cut Naval Bases, in D. Blackman and B. Rankov (eds), *Shipheds of the Ancient Mediterranean*, 231-53. Cambridge.
- Baika, K., 2013b, Apollonia in Cyrenaica (Sozousa), in D. Blackman and B. Rankov (eds), *Shipheds of the Ancient Mediterranean*, 294-306. Cambridge.
- Baika, K., 2013c, Eulimna (Alimnia), in D. Blackman and B. Rankov (eds), *Shipheds of the Ancient Mediterranean*, 340-348. Cambridge.
- Baika, K., 2013d, Ptolemais, in D. Blackman and B. Rankov (eds), *Shipheds of the Ancient Mediterranean*, 494-500. Oxford.
- Baika, K., 2013e, Rhithymna/Arsinoe (Rethymnon), in D. Blackman and B. Rankov (eds), *Shipheds of the Ancient Mediterranean*, 501-8. Oxford.
- Blackman, D., 1987, Triremes and Shipheds, in H. Tzalas (ed.), *TROPIS II, 2nd International Symposium on Ship Construction in Antiquity: Proceedings*, 35-48. Athens.
- Blackman, D., 1988, Of Bollards and Men. *Mediterranean Historical Review* 3, 7-20.
- Blackman, D., 2003, Progress in the Study of Ancient Shipheds: A Review, in C. Beltrame (ed.), *Boats, Ships, and Shipyards. Proceedings of the Ninth International Symposium on Boat and Ship Archaeology, Venice, 2000*, 81-90. Oxford.
- Blackman, D., 2010, The context: dockyards in antiquity, in D.J. Blackman and M.C. Lentini (eds), *Ricoveri per Navi Militari Nei Porti del Mediterraneo Antico e Medioevale*, 13-6. Bari.
- Blackman, D., 2013a, Ramps and Substructures, in D. Blackman and B. Rankov *et al.* (eds), *Shipheds of the Ancient Mediterranean*, 124-140. Cambridge.
- Blackman, D., 2013b, Miscellanea, in D. Blackman and B. Rankov (eds), *Shipheds of the Ancient Mediterranean*, 585. Cambridge.
- Blackman, D., and Lentini, M. C., 2003, The Shipheds of Sicilian Naxos, Researches 1998-2001: A Preliminary Report. *Annual of the British School at Athens* 98, 387-435.
- Bruni, S., 2000, The Urban Harbour of Pisae and the Wrecks Discovered at the Pisa-San Rossore Railway Station, in S. Bruni (ed.), *Le navi antiche di Pisa*, 21-79. Pisa.
- Budde, L., 1987, *St. Pantaleon von Aphrodisias in Kilikien*. Recklinghausen.
- Casson, L., 1995, *Ships and Seamanship in the Ancient World*. Baltimore.
- Coates, J., 2012, On Slipping and Launching Triremes from the Piraeus Shipheds and from Beaches, in B. Rankov (ed.), *Trireme Olympias: The Final Report*, 134-141. Oxford.
- Decker, M., 2001, Food for an Empire: Wine and Oil Production in North Syria, in S. A. Kingsley and M. Decker (eds), *Economy and Exchange in the East Mediterranean during Late Antiquity*, 69-86. Oxford.
- Demesticha, S., 2013, Amphora Typologies, Distribution, and Trade Patterns: The Case of the Cypriot LR1 Amphorae, in M.L. Lawall and J. Lund (eds), *The Transport Amphorae and Trade of Cyprus*, 170-178. Aarhus.



- Dworakowska, A., 1975, *Quarries in Ancient Greece*. Wrocław.
- Eger, A.A., 2017, *The Islamic-Byzantine Frontier: Interaction and Exchange Among Muslim and Christian Communities*. London.
- Elton, H., 2000, The Nature of the Sixth-Century Isaurians, in S.A. Miller and G. Greatrex (eds), *Ethnicity and Culture in Late Antiquity*, 293-307. London.
- Evrin, V., Ayaroğlu, M., Özkan, K., Toskay Evrin, Ç., Bircan, K., Bircan, M., and Zoroğlu, L., 2005, Archaeological Underwater Surveys of the Cilician Coasts in 2004. *ANMED* 2005.3, 135-140.
- Evrin, V., Ayaroğlu, M., Özkan, K., Toskay Evrin, Ç., Bircan, K., Bircan, M. and Zoroğlu, L., 2004, Underwater Archaeological Survey on Cilician Coasts: Discovering an Anchorage Site—Aydıncık—Yılanlı Island, in T. Akal, R.D. Ballard and G.F. Bass (eds), *The Application of Recent Advances in Underwater Detection and Survey Techniques to Underwater Archaeology*, 39-48. Bodrum.
- Fant, C.L., 2008, Quarrying and Stoneworking, in J.P. Oleson (ed.), *Engineering and Technology in the Classical World*, 121-135. Oxford.
- Foss, C., 1975, The Persians in Asia Minor and the End of Antiquity. *The English Historical Review* 90.357, 721-47.
- Foss, C., 1994, The Lycian Coast in the Byzantine Age. *Dumbarton Oaks Papers* 48, 1-52.
- Gerding, H., 2013, Carthage, in D. Blackman and B. Rankov (eds), *Shipheds of the Ancient Mediterranean*, 307-19. Cambridge.
- Gough, M., 1972, The Emperor Zeno and Some Cilician Churches. *Anatolian Studies* 22, 199-212.
- Harpster, M., and Varinlioğlu, G., 2015, Stemware & Slipways: A maritime survey at Boğsak, Turkey reveals evidence for the Late Antique habitation of Rough Cilicia. *Institute of Nautical Archaeology Quarterly* 42.1, 18-25.
- Harrell, J.A., and Storemyr, P., 2013, Limestone and Sandstone Quarrying in Ancient Egypt: Tools, Methods, and Analogues. *Marmora* 9, 19-43.
- Harrison, C.M., 1999, Triremes at Rest: On the Beach or in the Water? *Journal of Hellenic Studies* 119, 168-171.
- Harrison, C.M., 2003, A note on the care and handling of triremes. *International Journal of Nautical Archaeology* 32.1, 78-84.
- Heikell, R., 2006 (7th edn), *Turkish Waters and Cyprus Pilot*. St. Ives.
- Hohlfelder, R. and Vann, R.L., 2000, Cabotage at Aperlae in Ancient Lycia. *International Journal of Nautical Archaeology* 29.1, 126-135.
- Hort, A., (trans.), 1999, *Theophrastus: Enquiry Into Plants, Vols 1-2*. Cambridge, MA.
- Hurst, H., 2010, Exceptions rather than the rule: the shipshed complexes of Carthage (mainly) and Athens, in D.J. Blackman and M.C. Lentini (eds), *Ricoveri per Navi Militari Nei Porti del Mediterraneo Antico e Medievale*, 27-36. Bari.
- Iacomi, V., 2010, Some Notes on Late-Antique Oil and Wine Production in Rough Cilicia (Isauria) on the Light of Epigraphic Sources: Funerary Inscriptions from Korykos, LR 1 Amphorae Production in Elaiussa Sebaste and the Abydos Tariff, in Ü. Aydınoğlu and A. Kaan Şenol (eds), *Olive Oil and Wine Production in Anatolia During Antiquity*, 19-32. Istanbul.
- Kaye, N. and Rauh, N., 2017, Final Report, BOGA Survey, August 2017 (unpublished report).
- Lenski, N., 1999, Assimilation and Revolt in the Territory of Isauria, from the 1st Century BC to the 6th Century AD. *Journal of the Economic and Social History of the Orient* 42.4, 413-465.
- Lentini, M.C. and Blackman, D., 2014, The conservation of ancient dockyard sites, in C. Börker (ed.), *Skyllis Supplement 14: Papers Presented at the Fourth International Congress on Underwater Archaeology (IKUWA 4), Zadar, Croatia, September 29th-October 2nd, 2011*.
- Lipke, P., 2012a, Trireme Life Span and Leakage: a wood technologist's perspective, in B. Rankov (ed.), *Trireme Olympias: The Final Report*, 185-202. Oxford.
- Lipke, P., 2012b, Triremes and Shipworm, in B. Rankov (ed.), *Trireme Olympias: The Final Report*, 203-206. Oxford.
- Mango, C., 1966, Isaurian Builders, in P. Wirth (ed.), *Polychronion: Festschrift für Franz Dölger zum 75. Geburtstag*, 358-365. Heidelberg.
- McKenzie, J., 2013, Massalia, in D. Blackman, and B. Rankov (eds), *Shipheds of the Ancient Mediterranean*, 376-388. Cambridge.
- Mitford, T.B., 1980, Roman Rough Cilicia, in H. Temporini and W. Haase (eds), *Aufstieg und Niedergang der Römischen Welt* 7.2, 1231-1261.
- Ökte, E.Z. (ed.), 1988, *Kitab i-Bahriye. Piri Reis*, vol. 4, R. Bragner, V. Çabuk, and T. Duran (trans.). Istanbul.
- Pryor, J.H., 2000, *Geography, technology, and war: Studies in the maritime history of the Mediterranean, 649-1571*. Cambridge.
- Pulak, C., 2008, The Uluburun Shipwreck and Late Bronze Age Trade, in J. Aruz, K. Benzel and J.M. Evans (eds), *Beyond Babylon: Art and Trade, and Diplomacy in the Second Millennium BC*, 289-310. New York.
- Pulak, C., Ingram, R. and Jones, M., 2015, Eight Byzantine Shipwrecks from the Theodosian Harbour Excavations at Yenikapı in Istanbul, Turkey: an introduction. *International Journal of Nautical Archaeology* 44.1, 39-73.

- Rankov, B., 2013a, Roman Shiphsheds, in D. Blackman, and B. Rankov (eds), *Shiphsheds of the Ancient Mediterranean*, 30-54. Cambridge.
- Rankov, B., 2013b, Ships and Shiphsheds, in D. Blackman and B. Rankov (eds), *Shiphsheds of the Ancient Mediterranean*, 76-101. Cambridge.
- Rankov, B., 2013c, Slipping and Launching, in D. Blackman, and B. Rankov (eds), *Shiphsheds of the Ancient Mediterranean*, 102-123. Cambridge.
- Rauh, N. and Kaye N., forthcoming, Fortification Systems in Eastern Rough Cilicia – From the Iron Age to the Hellenistic Era (1200-27 BCE). *Marburger Beiträge zur Archäologie*.
- Rauh, N., Townsend, R.F., Hoff, M.C., Dillon, M., Doyle, M.W., Ward, C.A., Rothaus, R.M., Caner, H., Akkemik, Ü., Wandsnider, L., Ozaner, F.S. and Dore, C.D., 2009, Life in the Truck Lane: Urban Development in Western Rough Cilicia. *Jahreshefte des Österreichischen Archäologischen Institutes in Wien* 78, 253-312.
- Russell, B., 2013, *The Economics of the Roman Stone Trade*. Oxford.
- Toskay Evrin, Ç., and Evrin, V., 2005, The Cilician Coast Archaeological Underwater Surveys – 2005: Tisan (Aphrodisias) – Dana Adası – Mavikent – Boğsak Coastal Survey, *ANMED* 2005.4, 109-114.
- Vann, R.L., 1998, A Classification of Ancient Harbors in Cilicia, in S. Swiny, R.L. Hohlfelder, and H.W. Swiny (eds), *Res Maritimae: Cyprus and the Eastern Mediterranean from Prehistory to Late Antiquity*, 307-319. Atlanta.
- Varinlioğlu, G., 2007, Living in a Marginal Environment: Rural Habitat and Landscape in Southeastern Isauria. *Dumbarton Oaks Papers* 61, 287-317.
- Varinlioğlu, G., 2017, 'Built Like a City': Boğsak Island (Isauria) in Late Antiquity, in E. Rizos (ed.), *New Cities in Late Antiquity: Documents and Archaeology*, 247-68. Turnhout.
- Varinlioğlu, G., 2019. 'Imagine There Is No Island': Conceptualizing Byzantine Islands in Southern Asia Minor, in K. Durak and I. Jevtić (eds), *Identity and the Other in Byzantium. Papers from the Fourth International Sevgi Gönül Byzantine Studies Symposium*, 93-112. Istanbul: Koç University Press.
- Varinlioğlu, G., Kaye, N., Jones, M., Ingram, R., and Rauh, N., 2017, The 2016 Dana Island Survey: Investigation of an Island Harbor in Ancient Rough Cilicia by the Boğsak Archaeological Survey (BOGA). *Near Eastern Archaeology* 80.1, 50-59.
- Votruba, G., 2017, Did Vessels Beach in the Ancient Mediterranean? An assessment of the textual and visual evidence. *Mariner's Mirror* 103.1, 7-29.
- Ward, C., 2005, The Rough Cilicia Maritime Archaeological Project in 2004: A Preliminary Report, *Yüzey Araştırma Raporları – News of Archaeology from Anatolia's Mediterranean Areas* 2005.3, 123-127.
- Ward-Perkins, J.B., 1972, *Quarrying in Antiquity: Technology, Tradition, and Social Change*. Oxford.
- Wohmann, R., Rauh, N., and Varinlioğlu, G., forthcoming, Amphorae and Coarse Ware from Boğsak Island in South Turkey, 4th-9th Centuries CE, in *Late Roman Coarse Wares* 6. Oxford.
- Yorke, R.A. and Davidson, D.P., 2017, The Harbour at Ptolemais: Hellenistic City of the Libyan Pentapolis. *International Journal of Nautical Archaeology* 46.1, 48-71.