15 Ships and Ships' Fittings

Lucy Blue, Julian Whitewright and Ross Thomas

Introduction

From at least the middle of the 2nd millennium BC, Egypt was sending vessels to the mouth of the Red Sea, to Punt and beyond, to bring back myrrh and frankincense, along with other exotic artefacts of trade and tribute (Casson 1989, 11, nt.2; Bard and Fattovich 2003-4). However, it was not until descriptions given by the Classical geographers and accounts in the 1st century AD *Periplus Maris Erythraei* (Casson 1989) of voyages within the Red Sea and beyond, that detailed evidence for these seafaring activities was forthcoming. From the Ptolemaic period merchants plied the route to Arabia and India in ever-increasing numbers. Strabo (Geog. 2.5.12) states that 'Now 120 ships sail from Myos Hormos to India' contrasting this with the limited evidence of such voyages of the past. Both the archaeological and documentary evidence indicate that the harbour of Myos Hormos, with its sister port Berenike to the south, played a major role in facilitating trade along the northern reaches of the Red Sea coast and the Indian Ocean (Sidebotham 1986; 2011; Casson 1989; Peacock and Blue 2006; Tomber 2008). However, activity at the port of Myos Hormos ceased sometime in the 3rd century AD, to be revived some 1000 years later when the Islamic port of Quseir al-Qadim was created. It is described by Arab geographers as the Red Sea port of Qus (Garcin 1976; Whitcomb and Johnson 1979, 3) and for a while operated alongside the chief port in this region, 'Aydhab, facilitating trade and overseeing the protection of pilgrimage to the Holy Cities. Yaqut (626/1228) describes it as 'a harbour of Yemenite ships', and Qalqashandi writing in the 14th century, recorded how ships frequented the port in order to transport merchandise the shortest distance across the mountains to Qus (Al-Qalqashandi 1913–20, iii, 465, cited by Whitcomb and Johnson 1979, 4). Archaeological evidence confirms activity at the site until the beginning of the 16th century when operations appear to have shifted south to the present town of Quseir (Peacock 2006, 4).

Excellent organic preservation has permitted the recovery of maritime finds to supplement the meagre historical accounts. Whitcomb and Johnson (1979, 203) record metal nails indicating ship building activities, fishing hooks, sail makers awls and needles, as well as toggles and pulleys. The list has now been substantially supplemented by the Southampton excavations. Direct evidence for ship construction is limited but the discovery of the Roman harbour front (see Chapter 4, this volume) and the recovery of maritime finds including wooden and horn brail rings, sheaves, sail fragments and a deadeye, fragments of lead sheathing and hull planking, contribute to an enhanced appreciation of the maritime context (c.f. Whitewright 2007). This chapter will highlight the specific artefacts that provide detail of the ships and their rigging in both the Roman and later Islamic periods.

15.1 Hull Remains

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Hull remains are extremely rare finds in the Red Sea. To date no single ancient shipwreck preserving hull features has been recovered from the region and historical accounts provide limited detailed accounts of vessel construction. The finds, particularly from the Roman contexts at Quseir al-Qadim, together with material recovered from its sister port Berenike (Vermeeren 1999a, 316), have revealed detail of Roman hull planking hitherto unavailable, adding greatly to our understanding of the vessels and their construction. The recovery of reused Islamic sewn timbers, previously utilised in ship building, remains a unique archaeological find.

Roman hull remains *(Julian Whitewright)*

Two pieces of wooden planking were excavated during the 2002 season, both reused in secondary Roman contexts, from Trench 8A (Fig. 15.1). One piece (W467) is fragmentary while the other [W383] is relatively complete, although altered from its original state. Both planks were fashioned by sawing. The larger piece (W383) appears to have been reused at least once before ending up in a 2nd century AD context as a structural element in a doorway. The dimensions and shapes of the planks have been altered due to reuse and degradation, however both display mortise and tenon joints with a number of tenons and pegs (treenails), that would have secured the tenons, still *in situ*. W383 is 862 mm in length, with an average width of 130 mm and a consistent thickness of 50 mm. The average dimensions of the mortises of the larger plank are 70-90 mm deep by 60 mm wide, the one visible tenon is 6 mm thick and the pegs are 12 mm in diameter. The mortice and tenon joints are spaced at an average of 80 mm apart. Three additional features are present on the plank, probably resulting from reuse. At either end of the plank a recess as been carved, these are equidistant from a pair of square holes which are arranged in the centre of the plank. The second, smaller plank (W467) is 275 mm in length and of consistent width (60 mm) and thickness (30 mm). The smaller plank had one mortise that was 60 mm wide, the tenon was still in place and measured 40 mm wide; the peg hole is 5 mm in diameter.

Interpretation

The most characteristic feature of the planking elements described above is the remains of mortice and tenon joinery along the plank edges. This type of edge fastening is typical of the shell-first tradition of shipbuilding which was common in the Mediterranean until the late antique period (for examples see Pomey 2004; Steffy 1994, 23-78). The use of mortice and tenon edge fastening may indicate that the planks are reused fragments of ships, built in the Mediterranean tradition which visited Myos Hormos during the Roman occupation of the site and which were subsequently repaired or broken up there. Little is known about the construction of indigenous ships of the Indian Ocean during this period, but they are generally described, by Mediterranean observers as being of the sewn construction technique (Procopius I.xix.23-26; *Periplus* 36; Hourani 1995, 92). The remains of planking from Myos Hormos and comparable reused planks from Berenike (Vermeeren 1999a, 316) may indicate that at least some of the shipping engaged in the trade between

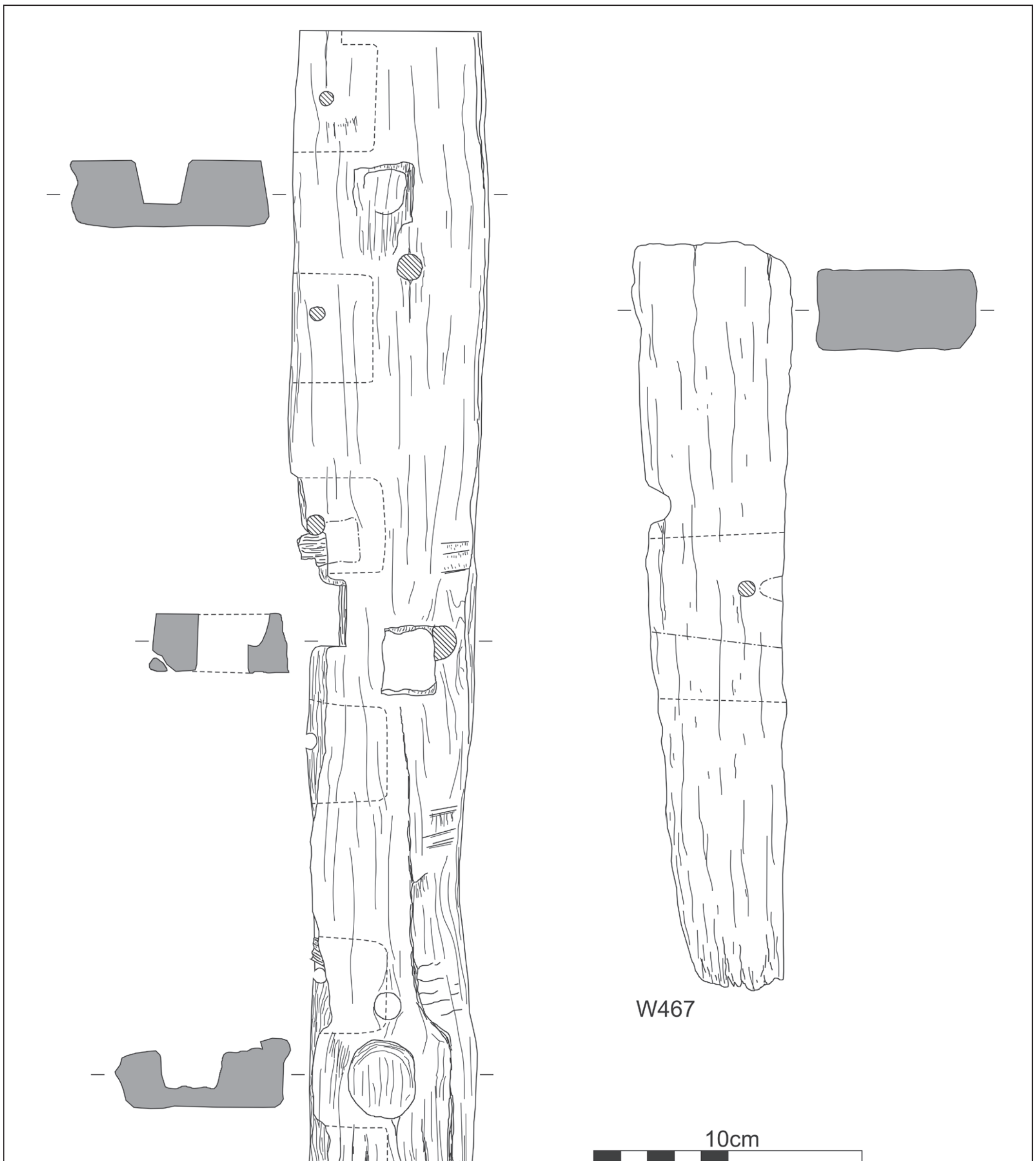

Figure 15.1. Re-used planks from Myos Hormos.

the Red Sea and the wider Indian Ocean was constructed according to the Mediterranean shipbuilding tradition of the time.

Islamic hull remains *(Lucy Blue)*
Excavation of medieval Quseir al-Qadim was more limited than the investigation of the Roman settlement, although the medieval necropolis (Trench 1A) proved to be a fruitful source for Islamic ship finds (Fig. 15.2).

The necropolis, first excavated by Whitcomb and Johnson (1979, 57-61, plate 18), besides numerous skeletal remains (see chapter 21, this volume) produced wall remains some 0.5 m in height, possibly a monument or mausoleum, both above and adjacent to the burials. A single piece of blue and white Chinese porcelain dating to the early to mid 15th century AD was recovered from the base of this structure.

Grave structures were rarely encountered but one, Tomb 1 (Burial 61) was a mudbrick lined, cist-type grave c. 1 m below the surface and sealed with timber planks (Fig. 15.3). Within the grave the body of a 35-40 year old woman was found (Macklin 2000, 49). A second burial (Tomb 2) was located just to the south of Tomb 1. It was also overlain with planks, but in this case the mudbrick grave lining was absent. Tomb 2 was covered with short, stocky and irregularly shaped reused timbers that had once been fastened by iron nails. The planks associated with Tomb 1 were more regular in shape, and had originally been fastened by fibres, sewn through holes along their edges (Fig. 15.4). In this reused context, the planks were no longer attached to each other, lying some 20-40 mm apart over the top of the grave. It is likely that both sets of timbers were reused boat timbers, as one displayed the characteristics of sewn boat timbers, and the other possibly boat timbers that had been secured by iron nails

Tomb 1 (Burial 61)
Eight planks were excavated (between 700–980 mm in length; 100-160 mm in breadth; 30-35 mm average thickness; Table 15.1). Of those timbers whose species was identified, the majority (Planks 1-6) represent an unidentified hardwood, probably non-native to Egypt, but not *Tectona* sp. or teak wood as preliminary identification indicated (Blue 2006c; also Chapter 17, this volume). Plank 7 is tentatively identified as cf. *Afzelia*, belonging to the *Leguminosae* family (Chapter 17, this volume). All planks had traces of what is believed to be bitumen, pitch or mastic on at least one side (some had traces on both sides and/or along the plank edges). The substance was not scientifically analysed and so the term 'bitumen' is used as shorthand for what might have been any of these

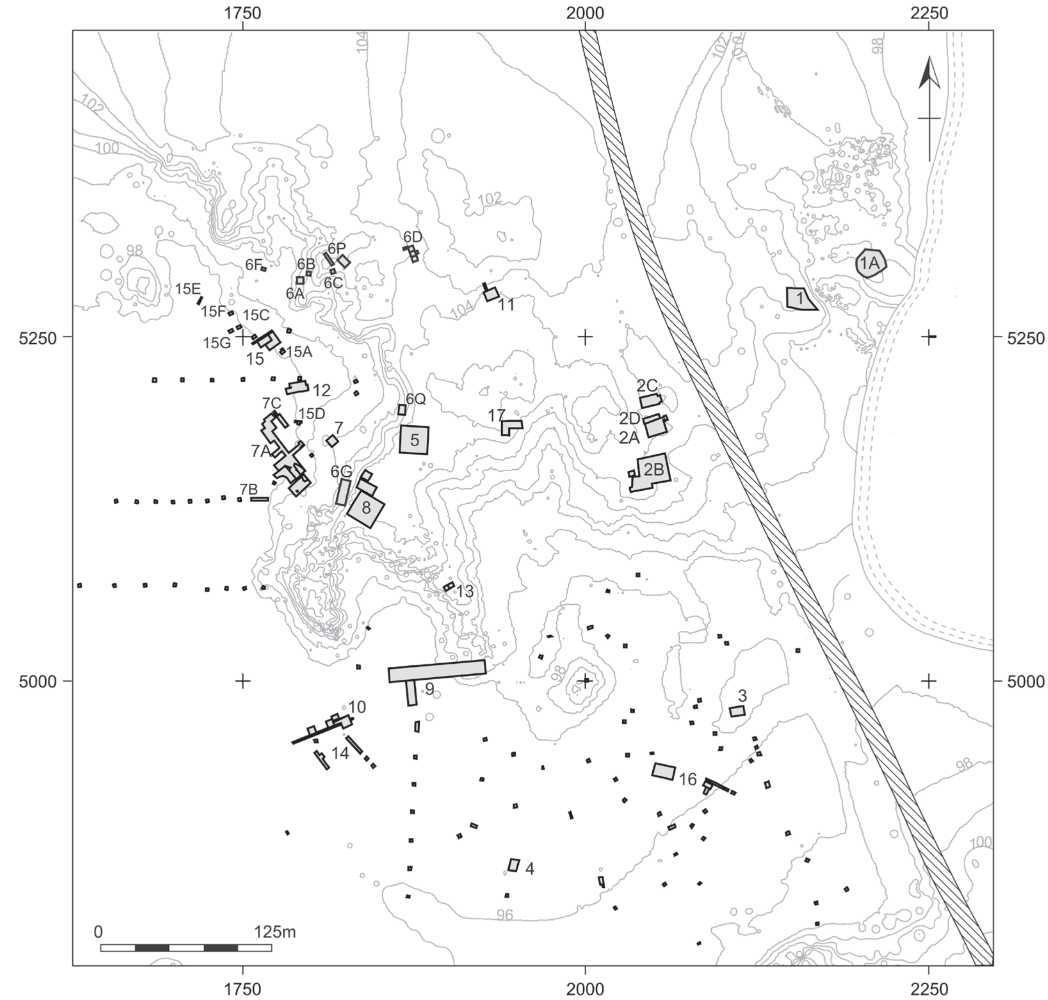

Figure 15.2.
Site plan showing the location of trenches excavated during fieldwork.

Plank Number	Length	Breadth	Width
Plank 1	98	12.5	2
Plank 2	86	10	3.5
Plank 3	97.5	13.5	2
Plank 4	c.44	c.13-16	c.3-3.5
Plank 5	76	15	3.5-4
Plank 6	90	16	3
Plank 7	77	11.5	3.5–4.5
Plank 8	70	11.5	4

Table 15. 1. Tomb 1, Burial 61, Plank dimensions (cm), preservation of Plank 4 was relatively poor.

substances. The majority had matting on the same side. Some planks also had traces of burning on one side, while all but one (Plank 8) had drilled holes, with a maximum diameter of 15 mm and average 10 mm, located along the edges, generally but not always, along both. Four planks with holes had coconut coir and wooden treenails still *in situ* extending through the thickness. The majority of holes were located along the longitudinal edges and were generally driven at a slight angle through the plank thickness. They were located at a regular distance from the edge (this varied from plank to plank from 20-35 mm, but tended to be similar on the same plank). They were positioned 20-65 mm apart (average 40-65 mm). A number, located along the plank edges were fed by a channel or groove recessed into the wood on one side of the timber. The recess extended at a right angle from the hole to the plank edge. Some of these recessed channels had coconut coir *in situ* (Fig. 15.5). Some planks had additional holes drilled into the centre of the plank often in pairs. They extended along the length and the average distance between pairs of holes was 70 mm.

One of the eight planks (Plank 6) had what could be interpreted as a 'frame palimpsest' on one side (Fig. 15.5). The impression or shadow was c. 65 mm wide and was located on the opposite side to the recessed stitching, the bitumen and the matting. Some planks had notches (Nos. 2 and 3) on their edges, while others were scarfed at the ends (Nos 1, 8 and 3) or had bevelled edges (Plank 6; Fig. 15.5).

Interpretation of the timbers from Tomb 1
The characteristics of the timbers recovered from Tomb 1 would appear to indicate that they were formally used in the construction of a sewn plank-built vessel. The timbers had been deliberately planked to an appropriate thickness and regular shape. The presence of holes along the plank edges, stitched with coir and subsequently pegged, is a common characteristic of sewn constructed vessels (McGrail and Kentley 1985), although at present there is no indication of the former sewing pattern, other than the association between the holes and recesses for stitches, described above. Future analysis of the relationship of holes within and between planks may help identify the sewing sequence and perhaps explain the presence of seemingly random holes in the planks – were they integral to the sewn vessel or associated with a later reuse or repair? The fact that both the bitumen and the recesses for the coir stitches are uniformly located on the same side of the planks, would indicate that this particular side of the planks had originally been on the outside of the hull. The practice of cutting recessed channels from the stitch hole to the edge of the plank on the outside of the hull has been identified as a feature of sewn boat construction and is seen as a means of protecting the coir stitch. As Severin (1985, 283) observed in the construction of the Omani Boom Sohar 'a groove was cut between the pairs of holes, on the outside of the hull, so that the cord was recessed and protected from chafe'.

Plank 6 (Fig. 15.5) has what is probably the palimpsest of a frame on the alternate side from the bitumen and recesses for the coir stitching, originally positioned inside the hull. A pair of holes associated with this may indicate how the frame had originally been secured to the hull. It seems that the frame was originally lashed to the plank by coir passing through the holes. A number of additional centrally placed pairs of holes have been identified but no additional frame impressions are discernible. However, a number of these central pairs of holes are associated with recesses for coir stitches on one side of the plank, again the same side as the bitumen, the side that is believed to be the exterior of the former hull of the vessel.

Tomb 2
Seven planks were found (between 370-500 mm in length; 190-250 mm in breadth; 25-55 mm thick; on a second tomb (Table 15.2). All the planks appear to have been deliberately cut to a regular length, perhaps to fit the tomb. All the planks were of similar rectangular dimensions with the exception of Plank 1 that was scarfed so that one edge was 370 mm and the other side 85 mm. The timber has been identified as common Egyptian species (Chapter 17, this volume)

Plank Number	Length	Breadth	Width
Plank 1	37-38.5	20	2.5
Plank 2	48	23	5.5
Plank 3	50	24	4
Plank 4	50	23	5
Plank 5	50	25	5
Plank 6	50	23.5	5
Plank 7	37	19	5.5

Table 15.2. Characteristics of planks from Tomb 2, all dimension given in cms.

All planks except Plank 1, had traces of bitumen on one side and iron nails or holes where iron nails had been. Those still *in situ* were nailed from the pitch side of the plank and the head of the nail was always flush with the plank, and did not always extend through its entire width.

Figure 15.3. Tomb 1, sealed with timber planks.

Figure 15.4. Tomb 1, Plank 6 in situ.

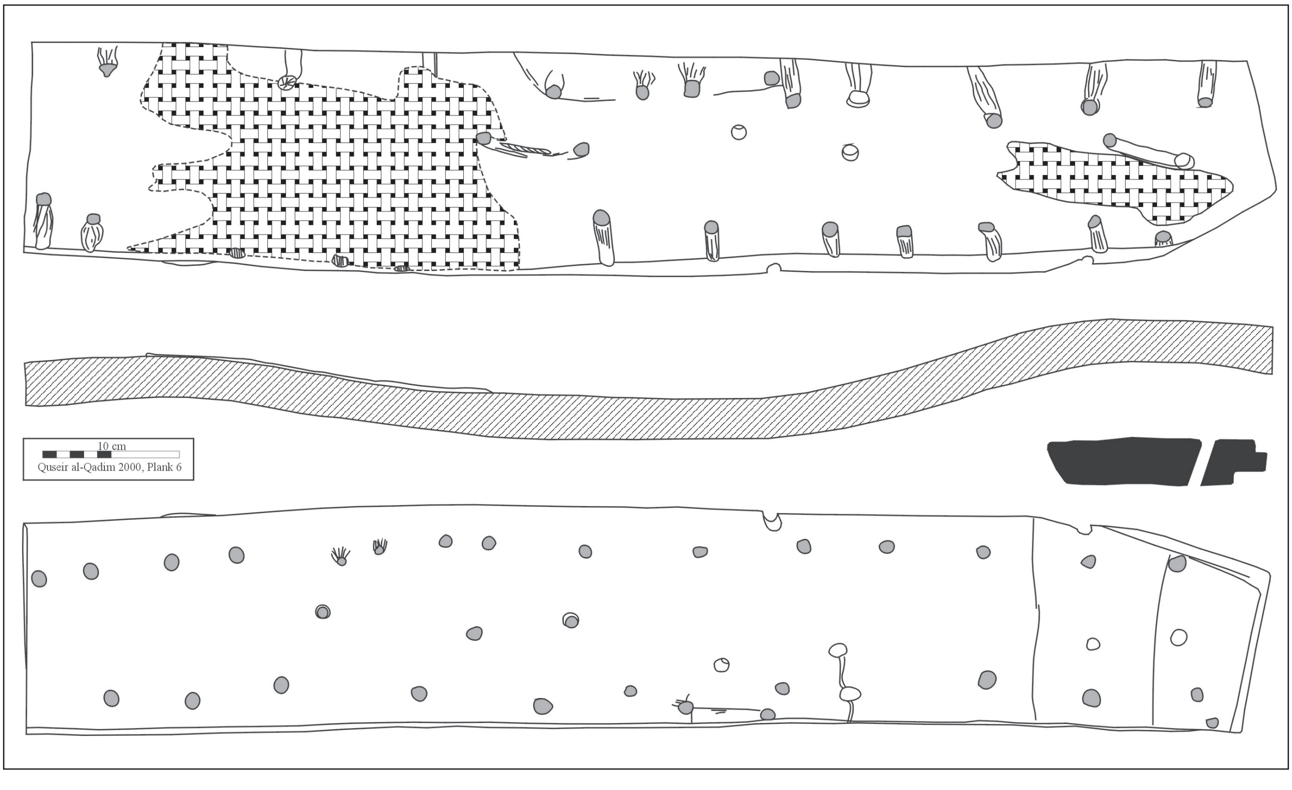

Figure 15.5. Tomb 1, Plank 6.

Some displayed tool marks and when damaged or naturally cracked, wadding was placed in the holes to act as a filling. Three of the planks had matting on one side, the same side as the bitumen.

Interpretation of timbers from Tomb 2
The timbers from Tomb 2 were much more regular in shape, being stockier and generally shorter than those from Tomb 1. It is assumed that they were cut to fit the tomb and had originally been much bigger. All timbers with iron nails still *in situ* had been nailed from the same pitched side, giving the impression of nailing from the outside of the hull to the inside.

Dating of the burials
No grave goods were found in association with the burials, other than traces of cloth wrappings. However, the construction of overlying walls suggests that the burials pre-date the buildings and were earlier, but no later than 15th century AD. The earliest occupation of the medieval Islamic site of Quseir al-Qadim is late Ayyubid, giving a potential date range between the late 12th and early 15th centuries AD. However, the planks have obviously been reused and thus their original use as planks in a vessel of sewn construction could pre-date the medieval Islamic necropolis.

Interpretation
Recent discoveries at the medieval Islamic site of Quseir al-Qadim afford direct archaeological evidence for the construction of both sewn and iron nailed plank-built vessels of the Indian Ocean, broadly between the end of the 12th and the beginning of the 15th centuries AD. The practice of sewing planks with coconut coir for the construction of boat hulls, is believed to have been widely practiced in the Indian Ocean region and is still employed in the construction of sewn vessels in southern India and nearby islands today (personal observation; Hourani 1995, 91; Villiers 1952, 40; Johnstone and Muir 1962; Johnstone 1988, 178). The distinguishing feature of Arab craft of the Indian Ocean from antiquity through to the late 20th century, is generally agreed to be 'the use of fibre, rather than nails, to sew the planks of hulls together' (Said 1991, 107), although very limited evidence exists to support this theory. The Quseir al-Qadim planks thus provide an insight into medieval boatbuilding techniques of the Indian Ocean.

The earliest sewn boats come from Ras al-Jinz in Oman where they date to the third millennium BC (Cleuziou and Tosi 2000). The first historical reference to 'small sewn boats' is in the 1st century AD *Periplus* (Casson 1989, 141, 15.5.30), but most of the evidence for traditional Arab practice is restricted to later references by travellers, historians and geographers, and to a few sketchy iconographic depictions.

In the 6th century AD Persian Gulf, it appears that 'all the boats which are found in India and on this sea… are bound together with a kind of cording' (Procopius *Bel. Pers.* I.19.23). Abu-Zaid Hassan of Siraf, writing in the 10th century AD, describes how the people of Oman travelled to the Maldives and Laccadives and having felled and prepared the timbers, stripped the bark of coconut trees to produce yarn 'wherewith they sew the planks together'. In the 12th century AD Ibn-Jubayr describes the sewn vessels built at 'Aydhab in more detail, 'For they are stitched with cords of coir, which is the husk of the coconut, this they thrash until it becomes stringy, then they twist from it cords with which they stitch the ship' (Hourani 1995, 92; McGrail 2001, 72).

Images of sewn boats may date from as early as the 2nd century BC (Mookerji 1912, 32). The painting that accompanies the 1237 AD manuscript of Al Harīrī's Maqamat from Iraq, is a most convincing example. It shows a double-ended vessel with sewn planking (Hourani 1995, 92, plate 7). Beyond the Indian Ocean, a recent archaeological discovery of a 9th century AD shipwreck of a sewn constructed vessel in Indonesian waters, but of Arab (western Indian Ocean) origin, provides detail of the stitching technique employed (Flecker 2000).

Marco Polo visited the Persian Gulf twice at the end of the 13th century AD and describes the ships as 'bad' and states how 'many get lost for they have no iron fastenings, being only stitched together with cord made from the husk of Indian nut' (Villiers 1952, 40; Johnstone and Muir 1962). In the 14th century, Friar Odoric described sailing from Bombay to Ormuz in a similar 'bark compact together only with hempe' (Johnstone 1988, 178). Vasco da Gamo noted Arab vessels along the coast of Mozambique in the 15th century AD built without nails, their planks being held together by cords, as did Lancaster a century later (Johnstone and Muir 1962; Stanley 1898, 26). There are still a number of examples of stitched vessels in use around the shores of the Red Sea and Indian Ocean, including the *sambuk* of the Dhofari coast of Oman; and the *masula* and the *vallam* of India (McGrail and Kentley 1985).

The implication therefore is that iron nails were not adopted in the construction of boats and ships in the region until the arrival of the Portuguese and that even then the practice of attaching planks by means of stitching was not abandoned (Moreland 1939; Hornell 1942; Johnstone and Muir 1962). However, if the timbers from Tomb 2 at Quseir al-Qadim are in fact reused ship timbers then the introduction of iron nails in the construction of vessels may well have occurred prior to the Portuguese arrival.

Timber from the Islamic Harbour
The probable extent of the Islamic harbour has been suggested (Blue 2006a) on the basis of sedimentological analysis. In the course of this work, a timber from a ship or boat was excavated from Pit 8600, located in sediment associated with the Islamic harbour area. The timber (Fig.

15.6) was recorded before being preserved *in situ*. It is likely to be part of the framing system of a vessel, either a half frame or futtock. The timber is square in section with a width of 90 mm and a thickness of 100 mm, it is 1.23 m from tip to tip. The timber appears to be unused; there are no marks or holes as a result of nailing/tree-nailing/sewing on any of the surfaces. A series of saw marks survive along the entirety of one side. This implies that the timber was originally manufactured as part of a pair of frames. This involves shaping the wood before sawing it down the centre to produce a pair of identical framing timbers, hence the saw marks on one side only. Why the timber was then deemed surplus to requirements will probably remain a mystery, but it does indicate that boat repair or building was being carried out at the Islamic harbour of Quseir al-Qadim. The location of this find just on the edge of what is believed to be the land/ marine embayment interface at the back of the former channel/Islamic harbour, perhaps indicates an area of boat building activity. This find compliments what are believed to be the remains of wood chippings perhaps also associated with boat repair uncovered in Trench 16A (Peacock and Blue 2006).

15.2 Shipbuilding, Maintenance and Repair in the Roman Era

Ross Thomas

Further details on ship and boat hulls come from a range of artefacts made from wood, copper, iron, pitch and lead as well as faunal evidence of antifouling (removal of shellfish from the hull). In combination these artefacts can inform us about the maintenance of hulls. Because the artefacts represent a range of different hull maintenance activities, the evidence for woodworking, wood treatment, antifouling and lead sheathing will be treated separately in the following sections.

Woodworking

Wood was probably an expensive commodity in Myos Hormos because it had to be transported across the Eastern Desert, where it was taxed (Lewis 1983, 141; Bülow-Jacobsen 2003, 420; O.Krok.41). Large straight pieces required for planking were exceptionally expensive (Lewis 1983, 141; Meyer 1992, 48; O.Krok.41, Bülow-Jacobsen 2003, 420; Bagnall *et al*. 2005; Sidebotham 2007) and have only been found to date in the archaeological record following a long history of reuse and removal from their original maritime context, such as structural elements around the Roman town in Myos Hormos (Thomas and Masser 2006). The by-product of woodworking, the chips and shavings of the shipwright's craft, are preserved in some areas of Myos Hormos, when not used as fuel. Their preservation was restricted to the anaerobic conditions of the silted lagoon and the desiccation of the sites in higher places. Despite these limiting factors, the occurrence of woodchips indicates woodworking, of which most is likely to represent ship or boat building.

In the Roman harbour, woodchips were absent in the north (Trenches 6F, 12 & 15), though found in the main area (Trenches 7, 7A & Pit 10100). Just east of the harbour,

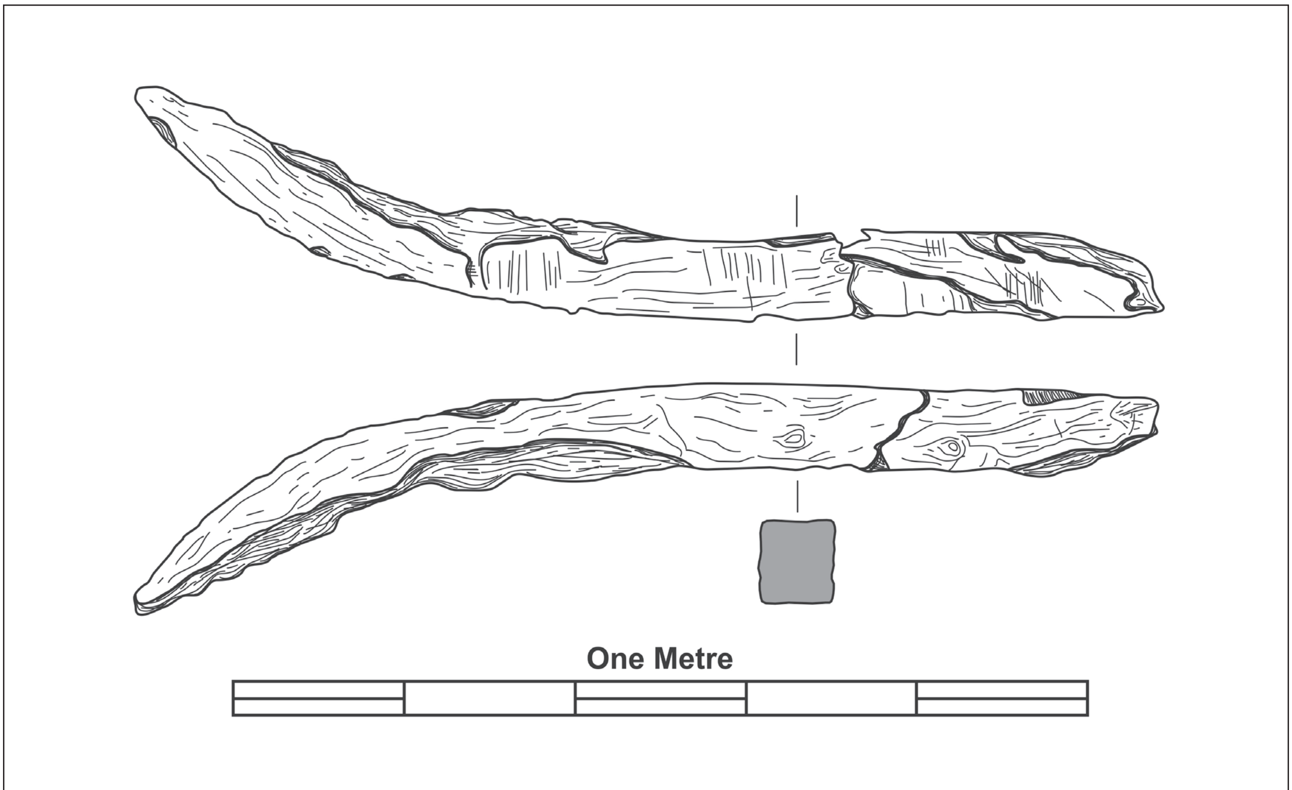

Figure 15.6. Timber framing element from the Islamic harbour.

there were large quantities in the rubbish dumps adjacent to the Roman town (Trenches 6A, 6B, 6C, 6G, 6H, 6J, 6Q, and 6P). There is a noticeable absence in the south (Trenches 9 and 10), though large quantities were found in Trench 14. Woodchips were rare (Trenches 8 and 11) or absent in the Roman town and rubbish dumps to the north (Trenches 6E and 6D), except Trenches 17 and 2B, where considerable quantities of woodchips were found alongside maritime artefacts.

Among the wood species used in the construction of hull and rig were a predominance of Indian and East African teak and blackwood (Chapter 17, this volume). The presence of woodchips confirms that the wood used was shaped (or re-shaped) in Myos Hormos, as was also the case at Berenike (Vermeeren 2000b), where the identified woodchips were mainly teak, but also included local lagoon or desert species (acacia, mangrove, palm and tamarisk), Mediterranean conifers, oak and elm and bamboo (Vermeeren 2000a, table 2). The context suggests that these woodchips most probably result from the work of shipwrights.

Wood treatment

Teak was renowned in antiquity for its resistance to decay (Vermeeren 2000a, 8, quoting Theophrastus). Despite this, all-wooden hulls require constant maintenance to protect the wood from rotting, joints from leaking and to prevent marine borers from damaging the wood. Greco-Roman ships from the Hellenistic period to the 3rd century AD were sealed with pine pitch (Meiggs 1982, 467) or bitumen and often sheathed with lead sheets, attached by broad headed copper tacks, for protection against boring molluscs such as Teredo navalis (Parker 1992; Hocker 1995; Steinmayer and MacIntosh Turfa 1996).

Waterproofing was made from a composite of resin or pitch mixed with hardening agents, fibre or material and/ or wax as well as pigments (Hocker 1995, 199; Collombini *et al*. 2003, 659). This was applied to the outside, to protect from borers, rot and fouling and inside to protect from rot caused by bilge water and can be found in boats of the classical Mediterranean (Parker 1992, 27; Hocker 1995, 199). Numerous resinous lumps have been found at Berenike and in Myos Hormos (Thomas and Masser 2006), though a direct association with ship maintenance is unproven as pine pitch was also used for sealing wine amphorae (Thomas and Tomber 2006). We know that some of this pitch was applied to ships hull, because it was found on numerous barnacles with wood impressions (Trench 10 and 14) that had been removed whilst 'antifouling' ships or boats (Whittaker 2006; Whittaker *et al*. 2006). The hearths in the harbour area may have been used to heat the bitumen to use in the sealing boats hulls as it was associated with other artefacts from ships (Trench 12, Blue 2006b; Trench 15, Thomas 2006; Trench 14, Whittaker 2006; Trench 10, Whittaker *et al*. 2006). The sealant was clearly transported across the desert, as indicated by a papyrus from Berenike, listing as a type of gum used for 'outfitting a ship' (Bagnall *et al*. 2005, 45-7). Pitch sealant was also found on ships planks reused in the construction of structures in Berenike (Trench 10, Vermeeren 2000a, 5, table 2).

Antifouling

Pitched hulls were not always sheathed with lead at Myos Hormos, and pitch alone was no proof against fouling or marine borers. Fouling is the growth of various shellfish and seaweed on the hull of the boat that both reduces efficiency when travelling through the water and can weaken the hull itself. Thus removal of this growth would have been an important occupation of boat crews. Barnacles with wood and pitch impressions were found on the southern foreshore (Fig. 15.7) (Trench 14, Whittaker 2006; and Trench 10, fig. 14. 2, Whittaker *et al*. 2006). They are a variant of acorn barnacle that can grow very rapidly, slowing a boat by up to 40% after just six months growth (S. Hamilton-Dyer pers.comm). The barnacles live from one to seven years, though are likely to have been removed at the first opportunity by boat crews, because of the detrimental effect on vessel performance. The Greeks used pitch to dissuade growth, whilst the Romans knew that copper nails poisoned them (Hocker 1995, 197; Laidlaw 1952, 211-2) possibly explaining the extensive numbers of copper alloy tacks recovered from Myos Hormos.

Lead sheathing

Lead sheathing is attested on the hulls of 5th century BC to 2nd century AD wrecks in the Mediterranean (Parker 1992, 199). It consists of large sheets 1-2 mm thick that were laid over the pitch waterproofing and held in place by copper tacks in a characteristic "quincunx' pattern (Hocker 1995, 197). Lead sheeting fitting this description was found in Myos Hormos in the harbour area (Trenches 7 and 7A, Blue and Peacock 2006, 67-94) alongside flat headed, square sectioned tacks with grips (Fig. 15.8). The tacks are almost always made from a copper alloy, although one iron example was found. They have heads c. 20 mm diameter with grips on the inside. The shafts are square in section and usually a little over 30 mm long. Many other nails and possibly roves from clenched nails (Fig. 15.8) were also found that may represent shipbuilding and ship maintenance, though only these sheathing tacks can be exclusively associated with maritime activity (see Chapter 10, this Volume). The sheeting is c. 2 mm thick and possesses clear impressions of the sheathing tacks heads with grips and square shafts (Fig. 15.8). In the harbour areas a number of hearths (in Trenches 12 and 15, Blue 2006b; Thomas 2006) and metal working installations (Trenches 10 and 14, Whittaker 2006; Whittaker, *et al*. 2006) were associated with these artefacts (Whittaker *et al.* 2006) suggesting they were made or modified there. The sheeting was also found in a 2nd to 3rd century store of fragmentary damaged artefacts in Trench 8 ([8308 and 8356], Thomas and Masser 2006) alongside tacks and elements of hull, possibly for re-use. A few examples were found in trash dumps between the town and harbour (Trenches 6G, 6H, 6J, 6B, 6C, 6D and 6L, Van

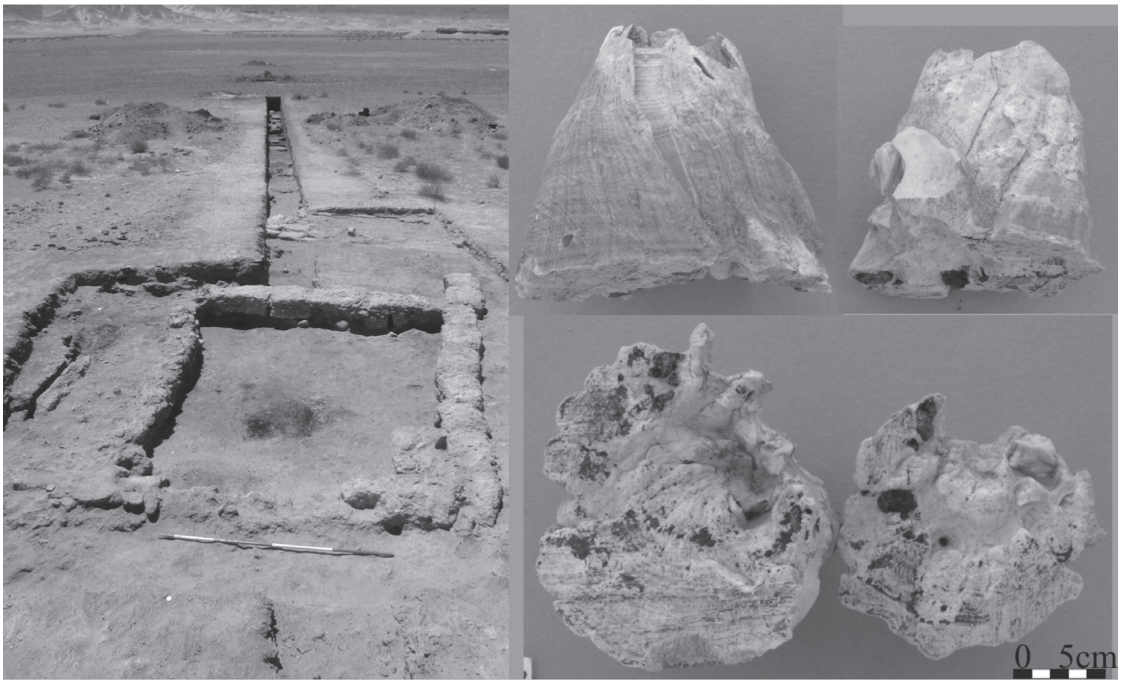

Figure 15.7. Barnacles (right) with pitch and wood, from Trench 10 & 14 (left).

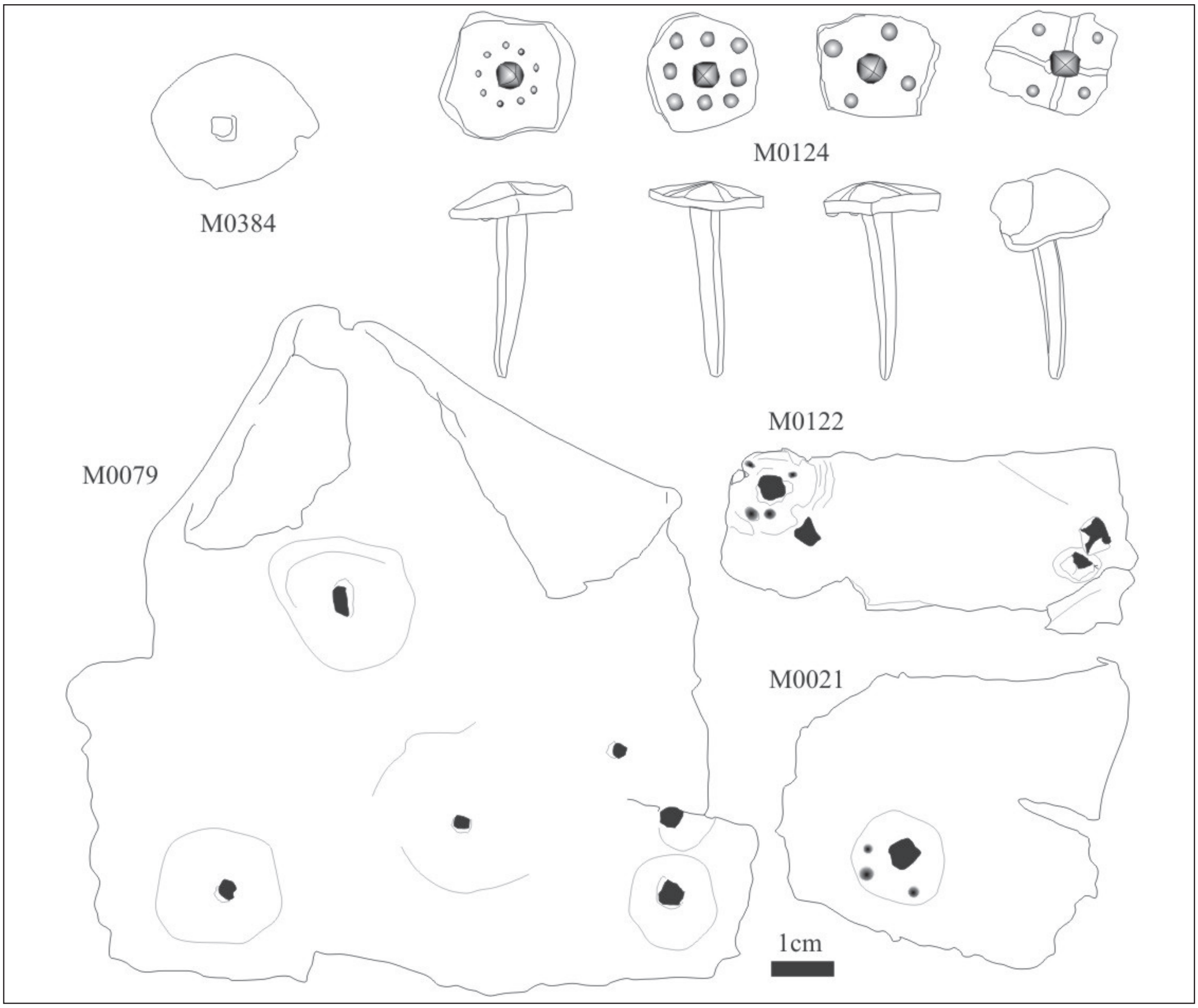

Figure 15.8. Lead sheathing, tacks and putative rove.

Rengen and Thomas 2006), though they were rare in the Roman town.

Large quantities of lead sheeting were also found at Berenike, where 95 kg of lead sheet was found in Ptolemaic deposits from Trench 36 alone (Sidebotham and Wendrich 2007, 36). The large quantity of lead found there may be explained by the construction and fitting out of large vessels called *elephantagas*, built from the Ptolemaic period onwards to transport elephants from Africa to Egypt, as discussed in a papyrus from the Fayum (Sidebotham 2007) and a number of classical sources (Agatharchides; Strabo; Diodorus). Storage of sheathing in Myos Hormos may represent preparation for repairs, as suggested by spare rolls of sheathing found on wrecks off the coast of Israel (Rosen and Galili 2007, 2).

The perceived benefits of lead sheathing are various and debated. Complete sheathing could prolong the life of a seriously deteriorated hull (Hocker 1995, 197), possibly by protecting the pitch sealant from wear or detritus, by forming a barrier against fouling and marine borers, by sealing joints and seams, by increasing rigidity, preventing sagging, by patching areas of damage or rot and perhaps by ballasting, though the latter is now widely discredited (Parker 1992, 199; Hocker 1995, 198-200; Kahanov 1999).

By the 3rd century AD lead sheathing was abandoned across the Mediterranean, possibly due to cost, particularly growing labour costs. It was replaced by driven or clamp seamed caulking, imported from northern Europe (Parker 1992, 199; Hocker 1995, 202). Though lead may have been cheap in antiquity (Hocker 1995, 199-200), we can only assume that the transportation of this heavy material would also have made it an expensive material at Myos Hormos. At Myos Hormos a putative caulking wedge was found in Trench 6B (W078), which may suggest the adoption of caulking methods similar to those seen in the Mediterranean.

Conclusions

Ship maintenance activities required to keep a ship suitable for ocean-going seafaring, involved the use of various skills, materials and installations. When combined, the artefactual evidence provides firm indications of where these activities were taking place. In the Roman period these activities appeared to be centred on two areas adjacent to the harbour, near Trenches 7A and 14, though smaller quantities of evidence was generally scattered around a wide area of the harbour facilities. These locations were also the places where ships were being loaded and unloaded as suggested by the proximity of basalt ballast dumps (discussed in more detail by Peacock *et al*. 2007). What is unusual is the presence of woodchips and ballast near Trenches 2B and 17, on the higher ground and some distance from the sea. The woodworking may represent the creation of other objects, or transportable elements (such as rigging elements), and the presence of ballast stones might result from reuse of a readily available resource.

The vocations of the people who made and maintained these vessels appear on a tariff posted at the Coptos toll-house in AD 90 (Lewis 1983, 141; Meyer 1992, 48). Amongst those listed were various maritime artisans, skilled workers, shipyard hands and caulkers (Table 15.3). Their relatively high taxation suggests that they were well paid for their skills, and that there were a number of different specializations recognized within the port communities. We know from the Coptos tariff and various letters (Bagnall *et al*. 2005; Sidebotham 2007) that the transport of people and materials from the Nile was both regular and expensive. The maintenance of wooden ships is constant, suggesting Myos Hormos was probably busy year round, sourcing and fitting the relevant materials to get the boats fit for use. The evidence for the sourcing of these materials is also preserved in the written record, where wood for shipbuilding was transported from the Nile (Bülow-Jacobsen 2003, 420; O.Krok.41). From Berenike an ostracon included an inventory of maritime equipment (O.Ber. II 131) that includes sail braces, pulleys, rope, mast belts, "gum" and "kilns" in which to melt it[1] deposited near to various customs documentation. These letters confirm the busy sourcing of materials required by those maintaining the ships. The high quality of these ships was recognised by the Tamil writers of Southern India who described them as 'the good vessels, masterpieces of the Yavana' (i.e. Greek or Roman) (from the c. AD 150 Tamil poem the Kauliliya Arthasastra; Sidebotham 1986, 23).

Description	Tariff
Skipper in the Red Sea Trade (Lewis 1983)	8 dr.
Red Sea Pilot (Meyer 1992)	8 dr.
Red Sea Bows-man	10 dr.
Guard	10 dr.
Sailor	5 dr.
Caulker/Shipyard hand	5 dr.
Artisan (Lewis 1983)	8 dr.
Skilled Worker (Meyer 1992)	8 dr.

Table 15.3. Section of the Coptos tarif (Lewis 1983; Meyer 1992).

1. Here "kilns" are preferred to "branding irons" discussed in O Ber II (Bagnall *et. al*. 2005, 47). The reason for this is that we know archaeologically that the gum (most likely made from pine pitch) was used in the sealing of hull elements and that a method of melting it was required. The alternative translations is also correct, but out of keeping with the context of the document.

15.3 Rigging Components from Myos Hormos/Quseir al-Qadim

Julian Whitewright

The high levels of maritime activity in the ancient Mediterranean are indicated by the large number of ancient shipwrecks so far found and examined (e.g. Parker 1992). Some of these have well preserved remains of the hull or cargo and have provided valuable information relating to the economy or shipbuilding traditions. In contrast to the relative wealth of information on ship construction, our knowledge of the rigging of ancient vessels is limited as remains of ropes, sails and pulley blocks of ancient vessels rarely survive in the archaeological record. Studies into the rigging of ancient ships have continued to rely on alternative lines of evidence, such as iconography and ancient texts. One of the features of Quseir al-Qadim is the preservation of organic material and a large corpus of artefacts were identified as deriving from sailing vessels, providing a substantial contribution to the study of shipping (Whitewright 2007). In contrast to the Roman period, Islamic period excavations at the site produced virtually no rigging components, despite good organic preservation of other wooden and textile artefacts. The possible reasons for this are discussed below.

The Roman Period - Myos Hormos

Given the continued maritime activity from the Augustan period to the 3rd century AD (Peacock and Blue 2006, 174-5) it is perhaps unsurprising that substantial evidence of maritime activity was recovered. Most artefacts came from the Roman *sebakhs* and were thus deposited in a non-maritime context, suggesting discard after manufacture or use, rather than during use. Rigging components included 169 brail rings, a deadeye, various sheaves from rigging blocks and several fragments of sailcloth.

Deadeye

A deadeye (Fig. 15.9) was excavated in the 2001 season and dated by association to the mid-to-late 2nd century AD (Thomas and Masser 2006, 131-2). This component forms part of the standing rigging of a vessel, providing lateral and longitudinal support to the mast. Deadeyes are usually rigged in pairs, allowing them to be tensioned, at the base of shrouds which provide lateral support for the mast. Components of a similar shape and function are still found on traditional square rigged sailing vessels. The deadeye from Myos Hormos consists of an oval shaped piece of Blackwood (*Dalbergia* sp.), pierced by three holes set alongside one another in the centre of the block. It measures 214 mm long, 144 mm wide and 55 mm thick, although the reverse side had been heavily degraded. The outside edge had been grooved in order to take a rope strop which could have been up to 28 mm in diameter. The three central holes could have carried ropes of up to 25 mm in diameter. Comparable deadeyes have been excavated from the Grado (Beltrame and Gaddi 2005, 80), Laurons 2 (Ximénès and Moerman 1990, 7 and fig. 2) and Nin (Brusic and Domjan 1985, 81 and fig. 6.9) shipwrecks in the Mediterranean area.

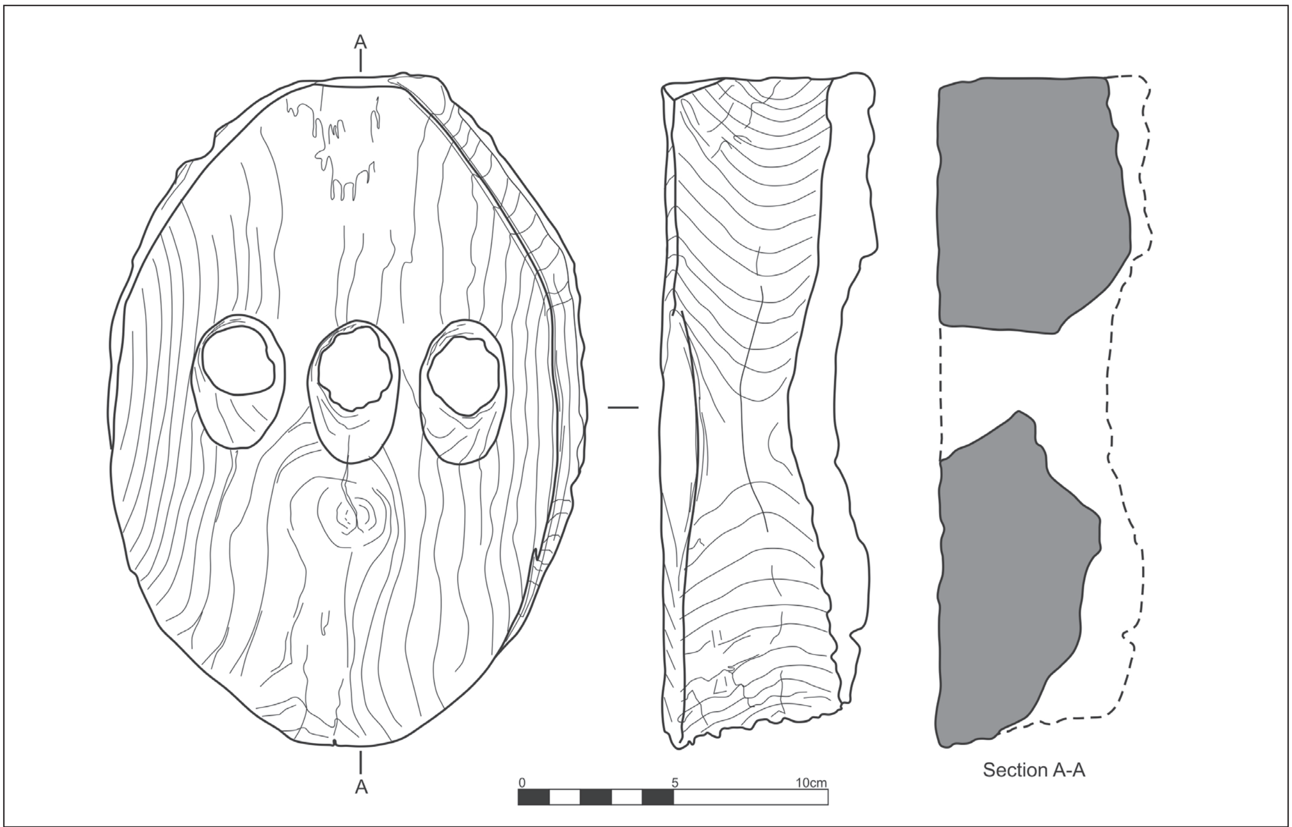

Figure 15.9. Deadeye from the Roman port of Myos Hormos.

Rigging Block Sheaves
The 2001-2 excavations also produced seven sheaves from several different rigging blocks (Fig. 15.10). A sheave is the moving part of a pulley block and they are generally round in section. By rotating as rope is pulled through the block, they serve to reduce the friction on the rope and the amount of effort required to move the rope. The sheaves all date to the latter half of the 2nd century AD with the exception of one (W0198 in Fig. 15.10) which is Early Roman in date. Unfortunately, the finds consisted of the sheaves only, no shells or axles were found. Such finds being part of a block and tackle, would probably have been used in some aspect of a vessel's running rigging. They could also have been utilised in other, non-nautical activities at the site, such as in the movement of heavy objects, so it is impossible to be sure that they were maritime. Six of the sheaves were flat, circular discs of wood ranging in size from 46 mm to 81 mm diameter. The outer edges of the disc sheaves, where not decayed, were grooved to carry the associated rope, while their thickness, and so the diameter of the rope they could carry, was very consistent at between 14-16 mm. This may indicate the use of a standard diameter rope. It might be possible to account for the difference in sheave diameter by the use of bigger sheaves in blocks designed to resist higher loads. Comparative disc sheaves, or blocks utilising disc sheaves have been excavated from the Cavalière (Charlin *et al*. 1978, 57-60), County Hall (Marsden 1974, fig. 8.2), Grand Ribaud D (Hesnard *et al*. 1988, 105-126), La Ciotat (Benoit 1962, 168-9, fig. 46), Laurons 2 (Ximénès and Moerman 1990, 5-6 and fig. 1), Madrague de Giens (Joncheray 1975, 103), Port Vendres 1 (Liou 1975, 572-3) and 2 (Colls *et al*. 1977, fig. 2) shipwrecks and from a terrestrial context at the site of Kenchreai (Shaw 1967, fig. 1). Disc sheaved blocks are also visible in the depiction of naval spoils on the triumphal arch at Orange (Amy 1962, pl. 25).

The seventh sheave excavated at Myos Hormos (W0270), although damaged was clearly cylindrical and a distinctively Mediterranean type style. Comparable examples have been excavated from the Roman harbour of Caesarea Maritima (Oleson 1983; Oleson *et al*. 1994, 104, fig. 33 and pl. 22) and also from the Agde D (Liou 1973, 578 and fig. 10), Cap del Vol (Foerster 1980, fig. 5), Chrétienne C (Joncheray 1975, 103 and fig. 50.1), Comacchio (Berti 1990), Grado (Beltrame and Gaddi 2005, fig. 2), Grand Ribaud D (Hesnard *et al*. 1988, 105-126), Kyrenia (Swiny and Katzev 1973, 351 and fig. 12) and Tradelière (Joncheray 1975, 103) wrecks. A sheave block of this type was also recovered from a looted and dredged late 4th/early 3rd century BC site in the Sea of Marmara (Pulak 1985, 3). W0270 represents the only evidence of the use of this form of sheave block at Myos Hormos. The size of the sheave suggests a block of similar size to the block found at Caesarea Maritima; 130 mm long by 90 mm wide. The sheaves from Myos Hormos

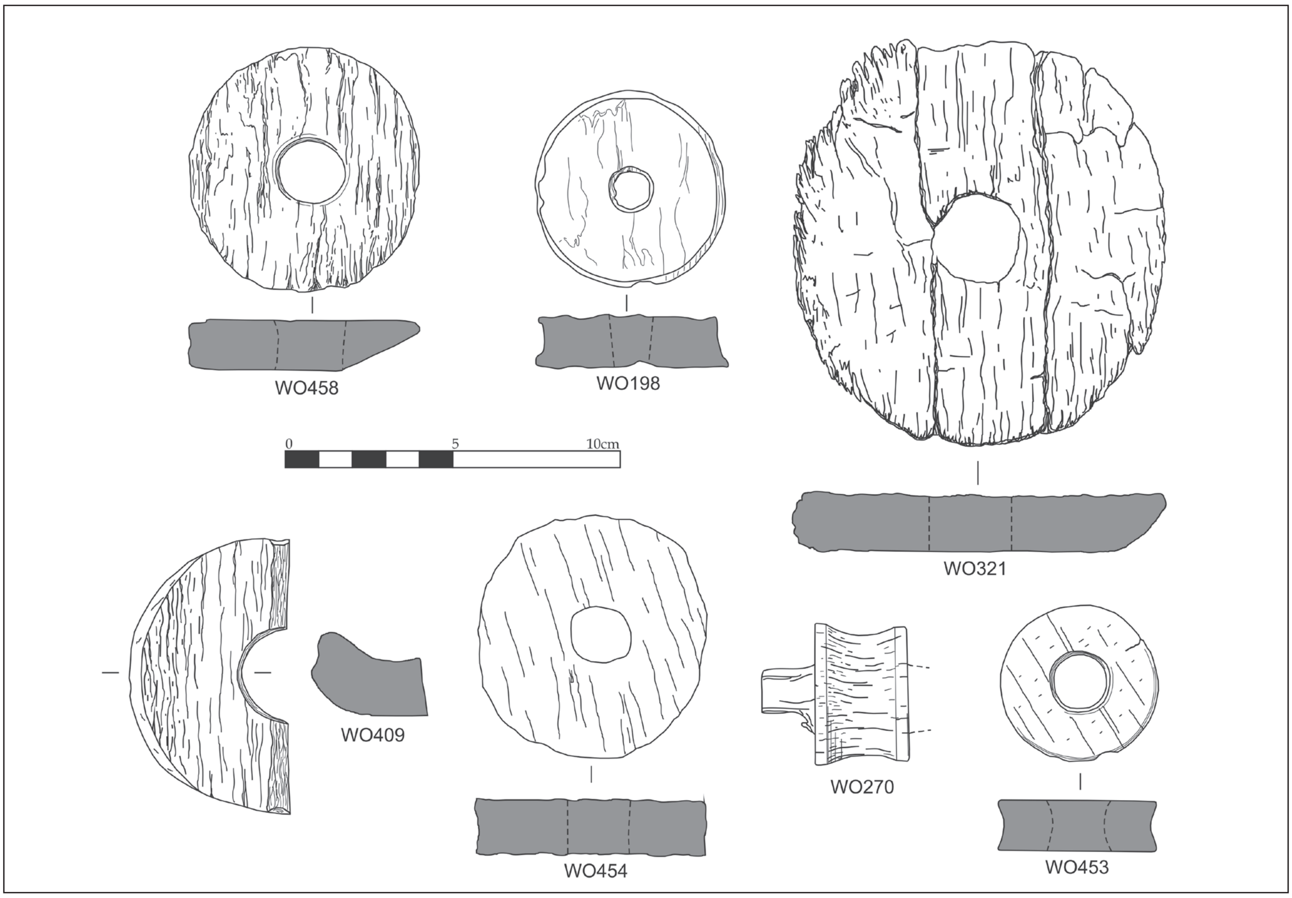

Figure 15.10. Roman rigging block sheaves from Myos Hormos.

were made from a variety of wood types including Indian Teak, Blackwood and Alder, the details are described in Chapter 17 of this volume.

Wooden Toggle

A single wooden toggle was excavated from a Roman deposit dating to the late 2nd - early 3rd century AD (Phase 2/3) from Trench 8A (Thomas and Masser 2006). The toggle (Fig. 15.12) was 73 mm in length with a circular cross-section 16 mm in diameter at the widest point tapering to 7 mm at the ends. The central notch which would have carried the rope eye was 11 mm in cross-sectional diameter with a width of 6-8 mm. Although not definitively maritime in function, toggles are a well documented part of the Mediterranean sailing rig. Their function is usually to secure the end of one rope to a soft eye in another length of rope. Their size can be variable, depending both on the size of the sailing vessel and the position of the toggle in the rig. Comparative examples of toggles have been excavated from the Grado (Beltrame and Gaddi 2005, 81-3), Kyrenia (Swiny and Katzev 1973, 351), Laurons 2 (Ximénès and Moerman 1990, 9-11 and fig. 5), Nin (Brusic and Domjan 1985) and Port Vendres 1 (Liou 1975, 573) wrecks.

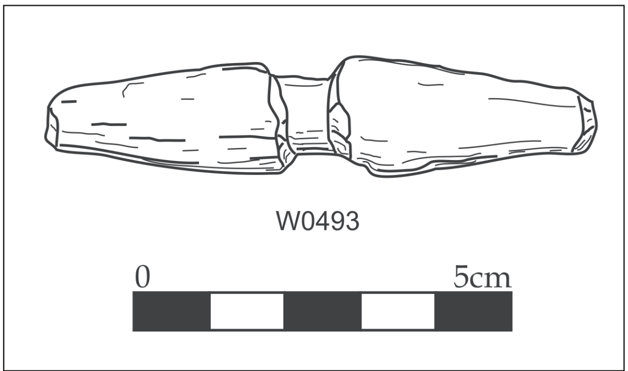

Figure 15.11. Wooden toggle from Myos Hormos.

Brail Rings

Brail rings were by far the most numerous class of maritime artefact from Myos Hormos. They were excavated during every field season, principally from the Roman *sebakhs*, and encompass the full Roman chronology of the site. The 169 brail rings excavated can be classified into two groups, based on the material from which they are made. One hundred and eighteen of them were made from cattle horn and the remaining 51 were made from wood. In most cases the wooden brail rings are manufactured with the grain running across the flat face of the ring, this technique is mirrored in the horn rings, which are cut from flattened pieces of animal horn (Hamilton-Dyer, pers. comm.). The use of these two types of materials is consistent with finds of brail rings from Berenike, which were also made from wood and horn (Wild and Wild 2001, 214). A sample of brail rings made from both wood (Fig. 15.12) and horn (Fig. 15.13) is included here in order to illustrate the characteristics of these artefacts. Details of the different wood species employed in their manufacture are described in Chapter 17, this volume. Comparative examples, made from lead as well as wood, have been excavated from the Cavalière (Charlin *et al*. 1978, 57-60), Grand Congloué (Benoit 1961, 178-9, pl. 30), Grand Ribaud D (Hesnard *et al*. 1988, 105-126), Kyrenia (H. Swiny pers. comm.) and Straton's Tower (Fitzgerald 1994, 169) shipwrecks and the anchorage of Dor (Kingsley and Raveh 1996, 55 and pl. 49) in the Mediterranean.

Although superficially similar, there are differences between individual rings from Myos Hormos which should be noted. The most obvious of these is the large variation in size ranging from 27 mm to 90 mm in diameter. In the sample illustrated (Fig. 15.12) here it is possible to see both the differences in size and cross-section. The latter range from almost circular (W0482), to oval (W0584) to square or rectangular (W0258) in shape. Horn rings (Fig. 15.13) do not usually exhibit rounded cross-sections but vary between square (FR334) and flattened rectangular (FR352). The majority of the brail rings are pierced with two holes directly through the body of the ring, although some have a single hole. These holes would have provided the point at which the brail ring was attached to its sail, as indicated by a brail ring still attached to the fragment of sail cloth (discussed below, Fig. 15.14). Although there is a large difference in the external diameter of the brail rings, there is relatively little difference in the size of the attachment holes. These range from 4-7 mm and the largest brail ring (FR352) has an attachment hole only 1 mm larger than that visible on the smallest ring (FR342).

Roman Sail Fragments

In 2003 a small fragment of Roman sail was found, dating to the late 1st or early 2nd century AD. It was possible to clearly distinguish this from other textiles because of the remains of a wooden brail ring was still attached. Sewn to the sailcloth was a reinforcement strip of heavier material and it was to this that the ring was attached. It measured 50 mm in diameter and its orientation (assumed to be with the holes uppermost) confirmed that the reinforcement strip ran horizontally across the face of the sail. Discovery of this fragment (T331) (Fig. 15.14) permitted the identification of other pieces of reinforcement webbing and fragments of sail (described in Chapter 22, this volume). One of these strips (T27) measured 1.32 m in length. The brail rings were no longer in place but there were remains of the twine used to attach them. Two sets of attachments spaced 0.81 m apart were found and these corresponded to the holes on the attached ring (T331). The webbing strip (T27) also runs along the length of a seam joining two different pieces of cotton sail together (Chapter 22, this volume). Another example (T392) is the remains of the edge of a sail and indicates that in that example the webbing strips were 0.6 m apart. Remains of sails are particularly rare in the archaeological record, but comparable ancient examples come from Edfu (Rougé 1987) on the Nile and the Red Sea port of Berenike (Wild and Wild 2001), discussed further below.

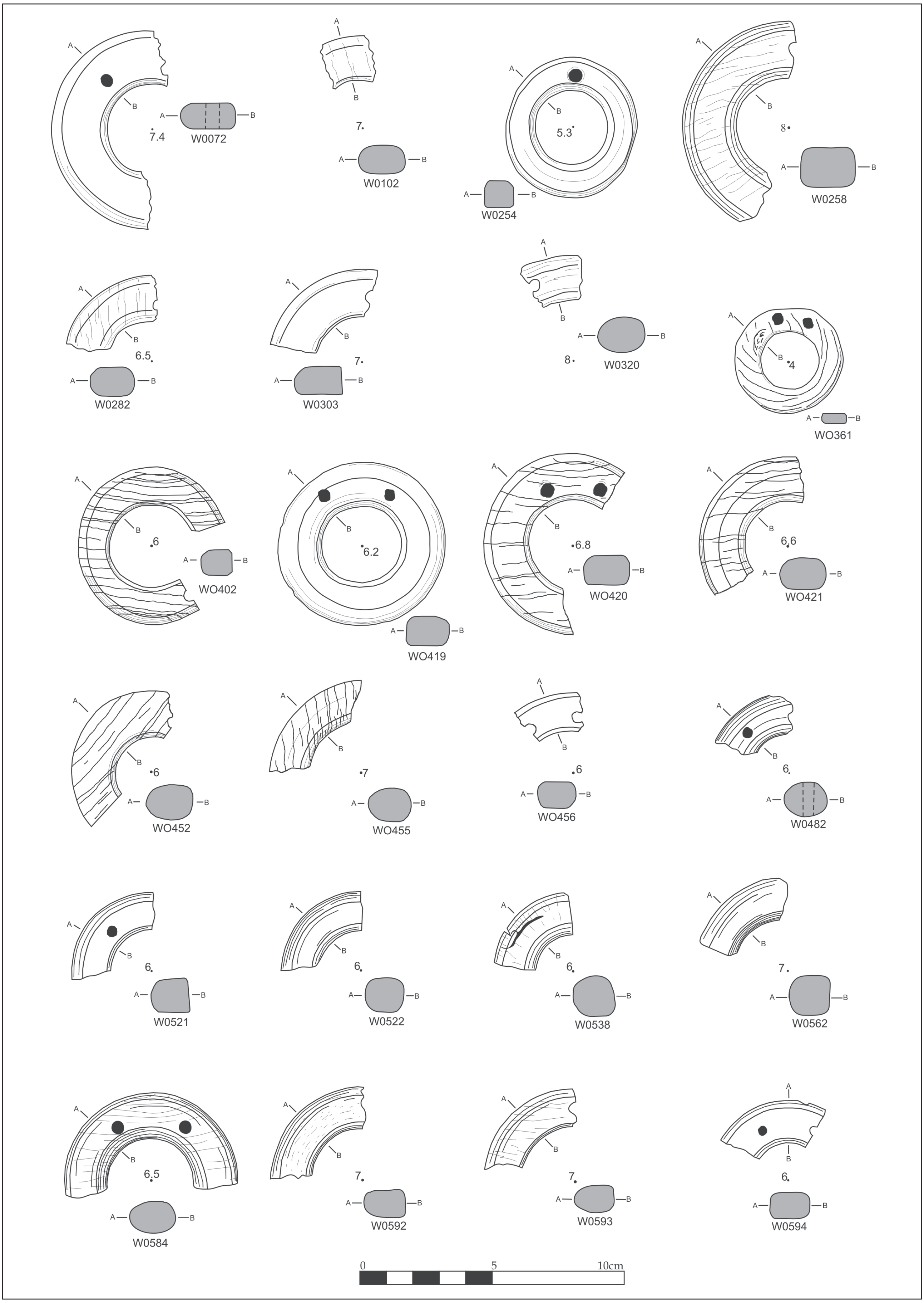

Figure 15.12. Sample of wooden brail-rings from Myos Hormos.

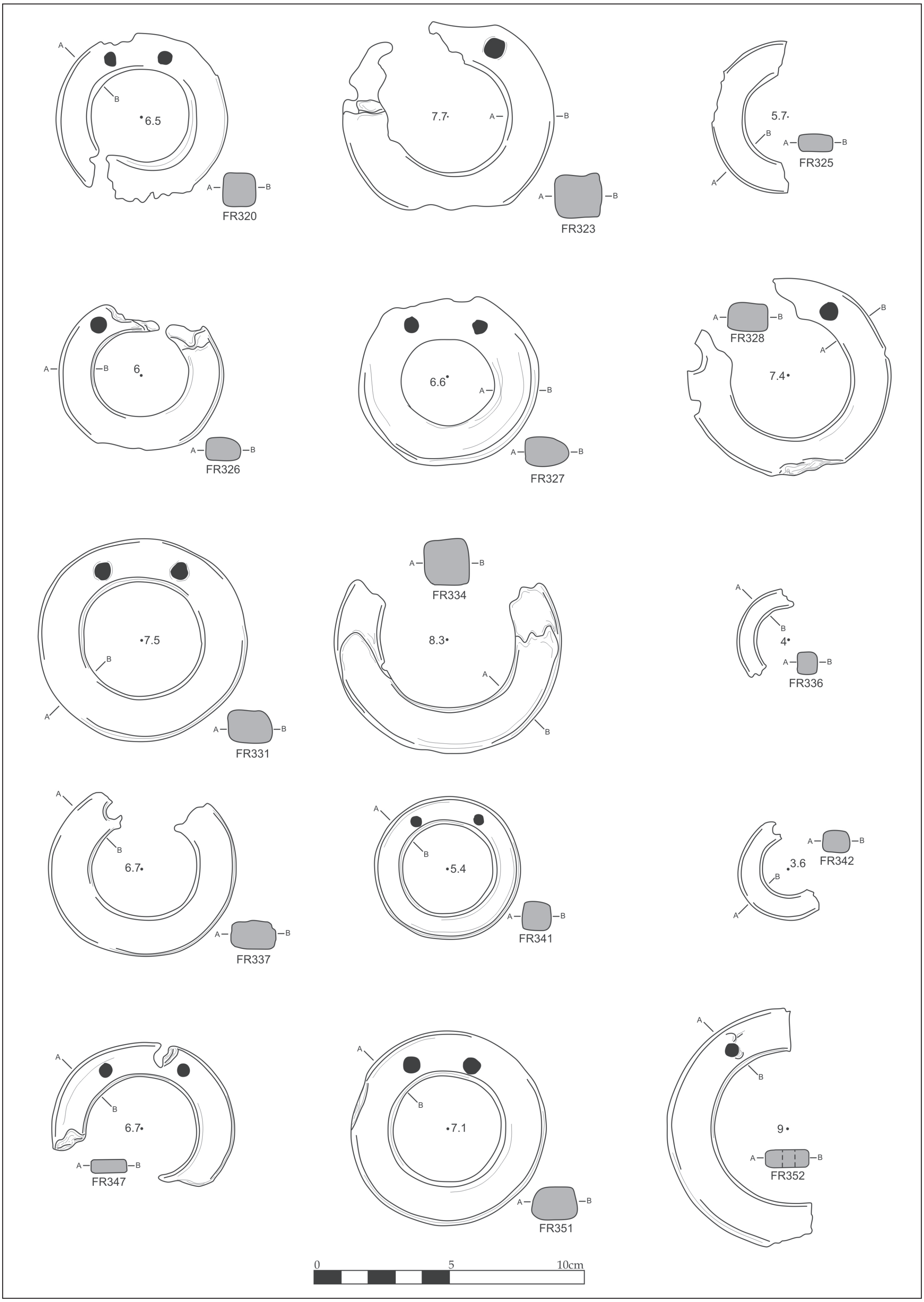

Figure 15.13. Sample of horn brail-rings from Myos Hormos.

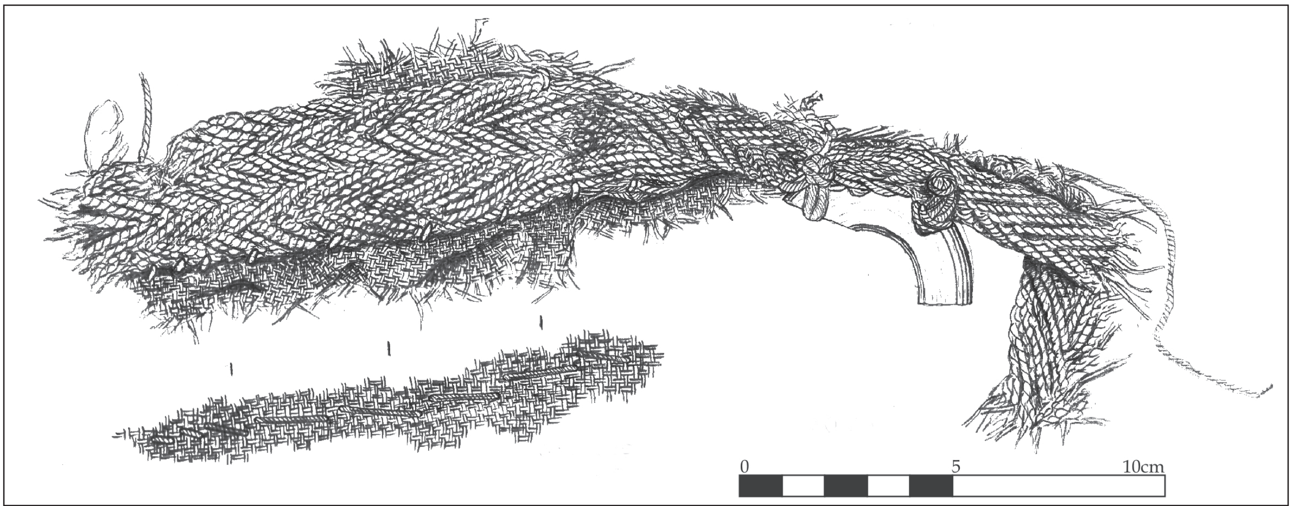

Figure 15.14. Fragement of cotton sail (T331) and wooden brail-ring from Myos Hormos.

The Roman Period - Myos Hormos: Discussion

The general form of the deadeye, sheaves, brail rings and sailcloth is consistent with finds from classical contexts within the Mediterranean basin and represents most of the components required to rig a sailing vessel (Whitewright 2009b). Brails and brail rings are characteristic of the Mediterranean square-sail rig of antiquity and they would not be needed on any of the other sailing rigs known to have been used at this time in the Mediterranean or Indian Ocean. It seems reasonable therefore, to assume that Roman sailing vessels engaged in trade in the Indian Ocean were outwardly similar in appearance, operation and capability to their Mediterranean counterparts, at least in the sailing rig. This is further reinforced by the graffito of a ship found at Berenike which is of Mediterranean appearance (Sidebotham 1996, 315-7). However, more detailed comparison with finds from the Mediterranean reveals that there are differences with the Red Sea. There is of course, the possibility that the material from Myos Hormos is also representative of sailing vessels of Indian Ocean origin, albeit rigged in a Mediterranean style. Given the nature and extent of trade between India and Egypt during this period this possibility should not be discounted.

Roman deadeyes

The deadeye excavated at Myos Hormos bears further comparison with deadeyes excavated from the Roman wrecks of Grado (Beltrame and Gaddi 2005) and Laurons 2 (Ximénès and Moerman 1990). These two wrecks date to the mid-to-late 2nd century respectively and are so contemporary with the deadeye from Myos Hormos. Five identifiable deadeyes were recovered from the Grado wreck (Beltrame and Gaddi 2005, 79) and fourteen from the Laurons 2 wreck (Ximénès and Moerman 1990, 7). Both wrecks are of interest because of the difference in the type of deadeye exhibited within the context of a single sailing rig. Of the five deadeyes recovered from Grado, two are pierced with three large holes to receive shroud rope, while the remaining three are pierced with two large holes. All five have secondary holes to receive seizing line (Beltrame and Gaddi 2005, 79-80). In the Laurons 2 wreck, six deadeyes were pierced with three holes and eight deadeyes were pierced with two holes (Ximénès and Moerman 1990, 7). All had secondary holes to receive seizing line, some of which remained in place on one example (Ximénès and Moerman 1990, 7-8, figs 2 and 3). The largest deadeye from Grado was 147 mm in length, 92 mm wide and 26 mm thick, while the smallest was 116 mm x 78 mm x 20 mm. Although the largest deadeye was a three holed type, a two holed type of comparable size was also found (Beltrame and Gaddi 2005, 79-80). The deadeyes from the Laurons 2 wreck were all of comparable size; 115 mm x 90 mm x 30 mm (Ximénès and Moerman 1990, 8).

The most obvious difference between the Mediterranean deadeyes just described and our example, is the smaller size and the arrangement of the rope holes. The Myos Hormos deadeye is 67 mm longer, 52 mm wider and twice as thick as the largest deadeye from Grado and nearly 100 mm longer, 50 mm wider and nearly twice as thick as the Laurons 2 deadeyes. The Grado vessel has been reconstructed as being some 16.5 m in length and 5.9 m wide (Beltrame and Gaddi 2005, 79) and the Laurons 2 vessel 15 m in length and 5 m wide (Gassend *et al*. 1984, 103). The general similarity in the dimensions of the two vessels is reflected in the similar sizes of the deadeyes used to support the single mast on each vessel. The much larger size of the Myos Hormos deadeye points to the simple conclusion that it was used to rig a much larger vessel than either Grado or Laurons 2. However, it may not be that simple. The Myos Hormos deadeye has three holes set alongside each other in the centre of the block, while the three-holed examples from Grado and Laurons 2 have one hole set above or below the other two (Beltrame and Gaddi 2005, fig. 1; Ximénès and Moerman 1990, fig. 2). The holes in all three examples are actually similar in size (c. 25 mm). This indicates that although the Myos Hormos deadeye was substantially larger than the examples from Grado and Laurons 2, it would have used the same size of rope between pairs of deadeyes. It may therefore be the case that personal preference or the availability of materials, not a difference in ship size, allowed the maker the Myos Hormos deadeye to arrange the three holes alongside one another rather than one above or below the others. It is also worth noting that the Myos Hormos deadeye lacked the small secondary holes, present on all the Grado and Laurons 2 examples (which were used to secure the outer rope strop). This indicates a difference in the approach to securing the deadeye to the main shroud rope. The deadeyes from Grado and Laurons 2 were secured by a rope seizing passing through the block as well as around the shroud, but that from Myos Hormos must have simply been secured by a seizing around the shroud.

The differences in the form of the deadeye from Myos Hormos and comparative examples from Grado and Laurons 2 is significant, especially as both were designed to fulfil a similar function within contemporary sailing vessels. On the basis of such evidence, the Roman sailing rig should not just be viewed in the generic terms derived from reliance on the iconographic and textual sources. A detailed understanding of the rig is required. There may have been significant differences in the rigging traditions prevalent in the Roman world which can only be viewed through the archaeological record because of the 'fine detail' which analysis of such material affords us. It is unlikely that such fine detail and therefore small technical differences can be reliably inferred from the iconographic or textual record alone. The example outlined above, highlights the importance of comparing the detail of ancient rigging with other sources.

Brail rings

The brail rings excavated at Myos Hormos provide another example of the diversity of rigging material, both within a region and across the wider Roman world. The most important characteristic of the brail rings rigged on a single sail is that the diameter of the rings is uniform enough so that a small ring cannot fit inside a large ring when the sail is furled. Such an occurrence is likely to result in a tangle or jam when the crew attempt to unfurl the sail.

The first point of note regarding the brail rings from Myos Hormos is the difference in diameter between the largest (90 mm) and the smallest (27 mm) brail ring, possibly reflecting some of the relative size differences between the largest and smallest vessels. Brail rings provide direct proportional evidence for the size of brailing lines because a larger brail ring will carry a larger rope. Larger diameter rope will logically be utilised on larger vessels, with larger sails. The picture may be complicated slightly from the 2nd century AD when it is possible that two-masted ships may have been present in the *Erythraean* Sea. Such vessels were certainly in use in the Mediterranean at this time (for examples see Casson 1995, fig. 14.2 and 169). Evidence from this period on Southern-Indian coinage shows vessels rigged with two masts (Elliot 1885, pl. 1, fig. 38, pl. 2, fig. 45) as does a contemporary graffito on a pottery sherd from the Indian port of Alagankulam in Tamil Nadu (Rajan 2002, fig. 4b; Sridhar 2005, 67-73, fig. 7, pl. 23; Tchernia 1998). Although the sail-plan of these vessels is unclear, they at least show that ships with two equally-sized masts were in use in this region as well as in the Mediterranean at this time (c.f. Deloche 1996, 243-4; McGrail 2001, 253-5). Such vessels may have used two smaller sails rather than one great mainsail, providing us with a sample of smaller brail rings than would otherwise be expected for a vessel of the same size rigged with a single square-sail. Likewise a vessel rigged with an artemon would also have produced smaller rings in association with this sail as well as larger rings from the mainsail.

The variation in the size of brail rings from Myos Hormos can be usefully contrasted with the brail rings from the Kyrenia ship where a total of 171 lead brail rings were excavated (L. Swiny pers. comm.). Of these, 131 were similar to those from Myos Hormos (with two holes punched through the body of the ring) and measured between 59 mm and 67 mm in diameter (*ibid*). The remainder, which measured between 65 mm and 72 mm in diameter, had a rectangular lug on one side where the attachment holes were located (*ibid*). Lead brail rings found on the Grand-Congloué wreck are also made in two different forms, one type with a lug and one without (Benoit 1961, 178). Like the brail rings from the Kyrenia shipwreck the largest number (around 80) have a consistent diameter of c. 80 mm and are made without a lug, this group are not pierced with any attachment holes (*ibid*), the assumption must be that they were simply attached by ties around the body of the ring. The brail rings manufactured with attachment lugs are of a greater dimension; between 90-120 mm (*ibid*). Further detailed analysis of the brail rings from the Grand-Congloué site is problematic because they are representative of at least two shipwrecks mixed together during excavation (see Parker 1992, 200-201).

There are two points of note here. Firstly, the relatively close size of the two forms of brail rings found on the Kyrenia wreck, which in part backs up the observations made regarding the diversity in size of the Myos Hormos brail rings. The brail rings from Kyrenia are similar in size because they come from a single vessel which would have required a single size of brail ring for a single sail, rather than a variety of sizes for a variety of vessels. The group of 80 brail rings from the Grand Congloué site which are similar in form and diameter may also be representative of a single vessel. The second point is the two distinct types of brail ring form (one group being made with lugs for the attachment holes and one group without) which are exhibited in the finds from the Kyrenia, given their similarity in size and deposition within the context of a single wreck site. The two different forms possibly represent two different approaches to the problem of providing a fair-lead for the brailing lines on a single ancient sailing vessel. As such they demonstrate that it is possible to encounter different contemporary forms of a single piece of technology, both designed to fulfil the same function within the sailing rig of a single vessel.

The wooden brail rings from Myos Hormos also show a lack of uniformity in the way they were made, which can be seen mainly in their cross-sectional form, different makers clearly had differing techniques which resulted in different end results. There seems no reason at present to suggest that any of the different forms would have been superior to any of the others, it may have just been a matter of personal choice. Diversity in cross-sectional form was also present in the lead brail rings from the Grand-Congloué shipwreck where three different forms of cross-section were observed (Benoit 1961, 178).

The material used in the manufacture of the brail rings found at Myos Hormos is also significant. Horn rings comprise 70% of the total number of brail rings excavated. The use of cattle horn may indicate the reuse of horn from animals slaughtered at the site for food (S. Hamilton-Dyer pers. comm.; c.f. Chapter 20, this volume). Alternatively, the horn rings could have been manufactured on the Nile, as a bi-product of cattle slaughtered there, before being transported to the coast. Written evidence records the transport of shipbuilding timber to Myos Hormos from the Nile (Bülow-Jacobsen 1998, 66) and associated rigging material could easily be carried along the same route (see Meyer 1992, 48).

The remaining brail rings were all wooden as in Mediterranean finds from the Cavalière (Charlin *et al*. 1978, 57-60) and Grand Ribaud D (Hesnard *et al*. 1988, 105-126) shipwrecks. These finds are of small numbers of brail rings, making meaningful comparative analysis of diameter difficult. Furthermore, in the case of the Myos Hormos rings the wood is generally of non-Mediterranean origin. Analysis has shown that in the examples sampled, the majority of species used were either Indian or East African Blackwood (*Dalbergia* sp.), with only a small number derived from local or Mediterranean sources (Chapter 17, this volume). This corresponds closely with the known trade routes of vessels leaving Myos Hormos (above), which sailed to both India and East Africa (Casson 1980; 1989; Schoff 1912). The evidence suggests vessels being refitted at Myos Hormos with locally produced horn brail rings prior to their outbound voyage, the replaced rings were simply deposited in the rubbish dumps of the town. Brail rings lost or broken along the route would be replaced using local materials, as required. It is this diversity of origin which probably explains the differences in the cross-section of the wooden brail rings. Different vessels visited many ports around the Indian Ocean in the course of trade and may have replaced damaged or broken rigging at each. It is impossible to tell whether the rings were made in overseas ports and bought by the visiting vessels or made on board by the sailors from wood procured whenever they made landfall.

Sails

The published archaeological evidence for sails in the Roman era is very limited, coming entirely from the Red Sea port of Berenike (Wild and Wild 2001) with an additional fragment wrapped around a mummy, found at Edfu on the Nile (Black 1996; Rougé 1987). The sail fragments excavated at Myos Hormos therefore provide important new evidence of the physical properties of ancient sailcloth.

The sailcloth from Edfu was made from Egyptian linen reinforced with locally produced flax (Wild 2002, 13; Wild and Wild 2001, 213). The use of linen is consistent with the historical evidence, which points to this as favoured for sail-making in the ancient Mediterranean (Black and Samuel 1991, 220). In contrast, the sailcloth from Berenike was made in and reinforced with, Indian cotton (Wild and Wild 2001, 211-220). Similarly, that excavated at Myos Hormos are also of Indian cotton (Handley 2003, 57). This suggests that much of the fleet engaged in the India trade may have been fitted out with imported Indian cotton or repaired upon arrival in India using Indian products (Wild and Wild 2001, 217-218). If the sails were made in Egypt (using cotton produced in India), they could represent part of a return bulk trade in relatively low value cotton. Indian cotton is mentioned in the *Periplus* (41) as being one of the products of the land around the port of Barygaza, which might be a possible source of the cotton used in the sailcloth.

Roman sails are often depicted in the iconography with a series of vertical and horizontal lines running across their face. These have been interpreted as being light ropes or strips of textile or leather used to reinforce the sailcloth, the vertical lines could also be brailing lines (Casson 1995, 68-9, 234). The sail fragments from Berenike and Edfu serve to confirm this interpretation. The fragments from Berenike were made with cotton reinforcement strips running both vertically and horizontally (Wild and Wild 2001, 214). Likewise the sail from Edfu, has a brail ring attached to the horizontal strip at the point of intersection with the vertical one (Black 1996, figs 5 and 6). One sail fragment from Myos Hormos (T392) represents the edge of a fragment of sail including the remains of the webbing strip running away from the edge of the sail. The remains of the brail ring attachment is present, its alignment indicating that the webbing strip ran vertically up the face of the sail. The two attachment holes must have been uppermost to allow the brail ring to function. The surviving edge is probably the head of the sail as there would be no reason for brail rings to be attached to the foot of the sail. In contrast to this, the sail fragment T331 shows no sign of a vertical webbing strip at the point of attachment of the brail ring to a horizontal webbing strip. A third piece of webbing and sailcloth (T27) has two brail ring attachment points which indicate that the webbing ran in a vertical direction. No evidence for horizontal webbing is present at either brail ring attachment point.

This would seem to indicate that there were at least three possible approaches to sail-making in use amongst the shipping engaged in the India trade. One involved the use of vertical and horizontal reinforcement webbing strips intersecting across the face of the sail and to which the brail rings were attached. A second technique, identified at Myos Hormos utilized only horizontal webbing strips to reinforce the sail, while a third technique seems to have utilised only vertical webbing strips. It is possible that as well as reinforcing the sailcloth, the webbing strips also served to reduce the amount of stretch to which the sailcloth would have been subject while under sail.

Conclusion

The maritime finds from Myos Hormos add to our knowledge of rigging and sails in the ancient world and especially in the Red Sea-Indian Ocean region. It is likely that Roman sailing vessels in the Red Sea and Indian Ocean were rigged with the same set of component parts as their Mediterranean counterparts, although these seem to have been made largely from materials derived from Egypt and the Indian Ocean rather than the Mediterranean.

There are some intriguing passages in the *Periplus* which describes vessels from Barygaza on the west coast of India trading with the ports on the south coast of the Gulf of Aden (14). Further on, the author of the *Periplus* says of Eudaemon Arabia (Aden) that 'because in the early days of the city when the voyage was not yet made from India to Egypt, and when they did not dare to sail from Egypt to the ports across this ocean, but all came together at this place and it received cargoes from both countries' (26 tr. Schoff 1912). The implication in this passage might be that at the time of writing Indian vessels did make the voyage from India to Egypt whereas before they did not. It is obvious from texts such as the *Periplus*, along with epigraphic (Salomon 1991, 731-6) and ceramic (Tomber 2000, 630) evidence pointing to the presence of Indian merchants in Egypt, that trade in the Indian Ocean consisted of far more than just Roman trade. A series of interconnecting networks of trade and exchange, of varying size and intensity extended over the Indian Ocean in the early first millennium AD. Roman trade with India merely represented a part of one of these networks (c.f. De Romanis and Tchernia 1997; Ray 2003). It seems very likely that both Roman and Indian Ocean sailing vessels were present at Myos Hormos. It is possible that the rigging components constructed from Indian materials may have originated on board Indian ships. Although circumstantial, the archaeological evidence may represent the first appearance of indigenous ancient Indian Ocean shipping in the region.

The evidence from Myos Hormos also seems to indicate that the manufacture of rigging material was by no means a uniform trade across the ancient world. The detailed characteristics of a vessel rigged in one location would have been different from a vessel rigged elsewhere. This point is emphasised by the comparison of deadeyes from Myos Hormos and Grado, brail rings from Myos Hormos and Kyrenia and also by the contrast in sail-making techniques in the sailcloth found at Myos Hormos and Berenike. Such differences may be representative of regional traditions or variations within the overall Mediterranean tradition.

The Islamic Period - Quseir al-Qadim

In contrast to the Roman occupation of the site, excavations of areas occupied during the Islamic period resulted in almost no corresponding rigging components. Only one single item which can be positively identified comes from an Islamic context. The reasons for the contrast in number of excavated rigging components are unclear. Although the excavation of the Islamic phases also encompassed areas of *sebakh*, they were fewer in number and may have been ones in which no rigging components were deposited. A further explanation may be offered by way of the different rigging traditions in use during the two phases of occupation of the site. The rigging of Roman ships comprised a series of components which fulfilled a specific role within the overall rig. Within this system, many wooden elements can be identified which had to be included within the rig for it to function properly. It is these elements, deadeyes, brail rings and sheaves, which can be identified from the Roman period, rather than the lengths of rope which connected them together (which were more prone to re-use or decay).

In contrast to this, the lateen/settee rig which seems to have been in use during the Islamic period of the site has fewer rigging components and these are more flexible in their function within the overall rig (Whitewright 2009b, 493). The reduction in the total number of rigging components present in the Islamic shipping, may partially account for the absence of rigging components in the archaeological record. Despite this, it is still puzzling why components common to both periods, such as disc sheaves, have not been excavated from the Islamic port of Quseir al-Qadim.

Arab rigging components

Although the rigging components represented in the archaeological record of the Islamic phase of the site is limited in number compared to the Roman, they are still significant as this type of evidence is rare. In contrast to the rich shipwreck evidence of the Mediterranean, only one wreck of western Indian Ocean origin has so far been positively identified (see Flecker 2000). This 9th century AD wreck served to confirm that the sewn method of construction often described by textual sources from the Indian Ocean was used in long distance sailing vessels. However, no evidence relating to the rigging components utilised on the vessel survived.

Most scholars have traditionally assumed that sailors in the Indian Ocean have always used the lateen sail (e.g. Boxhall 1989, 290; Hourani 1951, 100-101), although some restrict its use to the last thousand years (Villiers

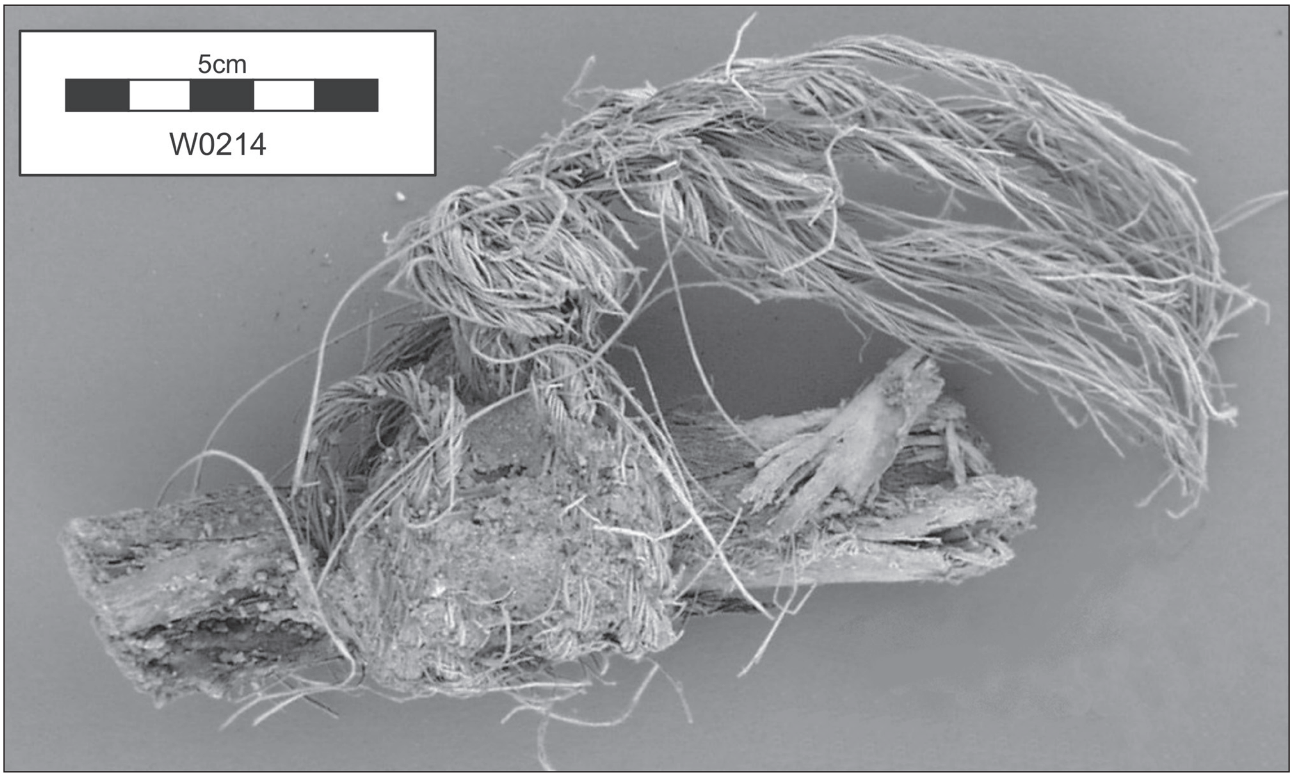

Figure 15.15. Fragment of a running stay from a lateen sailing rig.

1952, 73). This is largely based on the current use of the lateen rig on traditional craft. In reality of the situation is far more complex as there is iconographic evidence for the continued use of the square-sail in the Indian Ocean (for examples see Garlake and Garlake 1964, fig. 1; Lydekker 1919; Nicolle 1989, 183-5, fig. 49a and b; Sridhar 2005, fig. 24). However, iconographic evidence for the lateen sail in the Inidian Ocean does not appear until the 16th century (Garlake and Garlake 1964, fig. 4.3). Prior to this it's use is indicated primarily by textual sources. The geometric proportions described for sails suggests that the lateen sail was in use in the Indian Ocean from at least the 9th or 10th centuries AD (Whitewright In-Press).

The rigging component (W0214) (Fig. 15.15) excavated at Quseir al-Qadim provides rare archaeological evidence for the type of sailing rig being used in the Indian Ocean during the Mamluk period. The lower element of a running stay from a small sailing vessel, was identified following its excavation from a stratified context in a building dating to the Mamluk period (Flatman and Thomas 2006). The associated ceramic evidence suggests a date in the 13th or 14th centuries (R. Bridgman pers. comm.). The find is consistent with the foot of a running stay (*saghla*) observed by the author on a modern Arabic sailing vessel on the Red Sea coast. In each case an identical knot was used to secure the *saghla* to the rope of the stay. Similar arrangements have been documented by 20th century ethnographic observers of Arab sailing vessels (see Johnstone and Muir 1964, fig. 6). This kind of running stay is characteristic of the Indian Ocean lateen rig, rather than any other type, the find providing the earliest archaeological evidence for the use of the lateen rig in the Indian Ocean.

The absence of rigging components associated with the Mediterranean square-sail rig probably indicate that this may have fallen out of use on the Red Sea and Indian Ocean by the Mamluk period.

Roman and Islamic Cordage

In the course of the excavations a range of examples of cordage was found (discussed fully in Chapter 21, this volume). These varied from small pieces of string to larger ropes up to 25 mm in diameter. It is impossible to say with any certainty which of these finds were used in a maritime context prior to their deposition. Some must have been used in the service of the vessels using the port, while others were not. It also seems probable that rope originally used on board a sailing vessel could have been reused in a non-maritime context before deposition. Despite this some observations can be made with respect to the cordage from a maritime perspective, regarding both periods of occupation of the site.

In both phases of occupation a variety of different materials were utilised to produce the cordage found on the site. These included animal hair, flax, cane, grass, palm, and reed (see Chapter 21, this volume). It seems likely that both the mending and construction of rope took place in both the Roman and Islamic port, this is suggested by the quantity of raw, partially prepared and spun fibres demonstrating various stages in the rope-making process (Richardson 2002, 78 and 80). The largest thicknesses of rope recovered, measured 25 mm in diameter for the Roman period, and 23 mm in diameter for the Islamic period. The size of the Roman rope correlates well with the deadeye described above which could have been served with rope up to 28 mm in diameter. A variety of knots and splices were excavated including many that could have fulfilled a nautical or terrestrial function; stopper knots, clove hitches and eye splices being the most common in both periods of the site. Although difficult to quantify from a purely maritime perspective, it is clear that both the Roman and Islamic ports were provided with a full range of cordage and there was probably some form of rope making facility.

Conclusion

The site provides important information on the rigging of sailing vessels in the Indian Ocean region during both Roman and Islamic period. Finds recovered from Roman deposits suggest that the Mediterranean rigging tradition extended to Indian Ocean via Myos Hormos. These vessels would have been rigged with a brailed square-sail of Mediterranean type, but the materials used are mostly non-Mediterranean in origin, raising the possibility that Indian Ocean cultures utilised similar rigging.

It is possible to observe variant forms of rigging by comparing finds from Myos Hormos with those from the Mediterranean. Similarly, fragments of sailcloth and reinforcement strip, exceptionally rare in the archaeological record, indicate that at the least three different techniques of sail-making were in use in the Red Sea.

By contrast the Islamic deposits produced virtually no distinct rigging components and only one artefact could be identified as belonging to a sailing vessel. However, this small component of a vessel's running stay is currently the earliest direct archaeological evidence for the use of the lateen sail in the Indian Ocean in the late 13th/early 14th century.

Acknowledgements

Thanks are due to Marijke van der Veen for identifying the wood of some the rigging components and to Sheila Hamilton-Dyer for providing information relating to the manufacture of the horn brail-rings.

15.4 Maritime Rock Art from Wadi Quseir al-Qadim

Julian Whitewright

The excavation and survey of the site of Myos Hormos/ Quseir al-Qadim incorporated a regional survey of the immediate hinterland surrounding the site (Peacock 2006). In the course of this, a large number of rock engravings were recorded towards the western end of Wadi Quseir al-Qadim (Peacock 2006, fig. 2.1). These engravings included a number of short incisions, symbols, animals and birds, human body parts and Greek inscriptions (Van Rengen *et al*. 2006, 17). Six carvings of ships or boats were also discovered and recorded. The presence of ship depictions in the rock art of the Eastern Desert is fairly widespread and a survey conducted by Rohl (2000) has revealed vessels in a variety of locations.

The dating of rock art is often problematic and based on stylistic comparison. Artists from all periods often create a reflection of what they perceive to be representative of a boat or ship, rather than an accurate rendering of the subject matter, some elements being exaggerated or omitted (see Tzalas 1990). Iconographic depictions of Egyptian watercraft often retain elements or conventions which are distinctive to certain periods, for example the use of multiple steering oars on vessels from the Old Kingdom (c. 2613-2181 BC). Where characteristics are identifiable in the depictions of boats and ships it may be possible to assign those depictions to certain periods.

Catalogue of vessels

Vessel One

This image (Fig. 15.16) comprises a curved hull with a single-mast stepped amidships. A long diagonal line extends over one end of the vessel and probably represents a large steering oar. On this basis it seems reasonable to attribute that end of the vessel as the stern. A vertical line extending downward from the inboard portion of the steering oar may be a support, or a tiller to operate it. This vertical line ends at a horizontal line which continues forwards to the mast, the line becomes broken on the forward side of the mast. This line may represent an internal platform or cabin the majority of which lies toward the stern of the vessel. Two lines run downward from the masthead towards the bow and stern of the vessel and probably represent a forestay and backstay. A series of fifteen diagonal lines are shown running downwards along the side of the vessel, these begin near the bow and continue until just aft of amidships. They probably represent oars or paddles being used in the propulsion of the vessel.

Vessel Two

This image (Fig. 15.17) also exhibits the curved hull shape which is typical of Egyptian ship depictions from the Pharaonic period, although it is less pronounced than the curvature seen in Vessel One. The artist has depicted the ship with a single mast which is stepped amidships. The bow and stern of the vessel are distinguished by the presence of a steering oar. This is depicted as protruding over the stern quarter of the vessel. A central structure is shown either side of the mast, which may represent a cabin. Some details of the rigging are also discernable. A long horizontal line which runs above the central structure probably represents a yard or boom, the absence of a corresponding upper line may signify a yard which has been lowered. A series of lines run downwards from the masthead of the vessel, two towards the bow and four

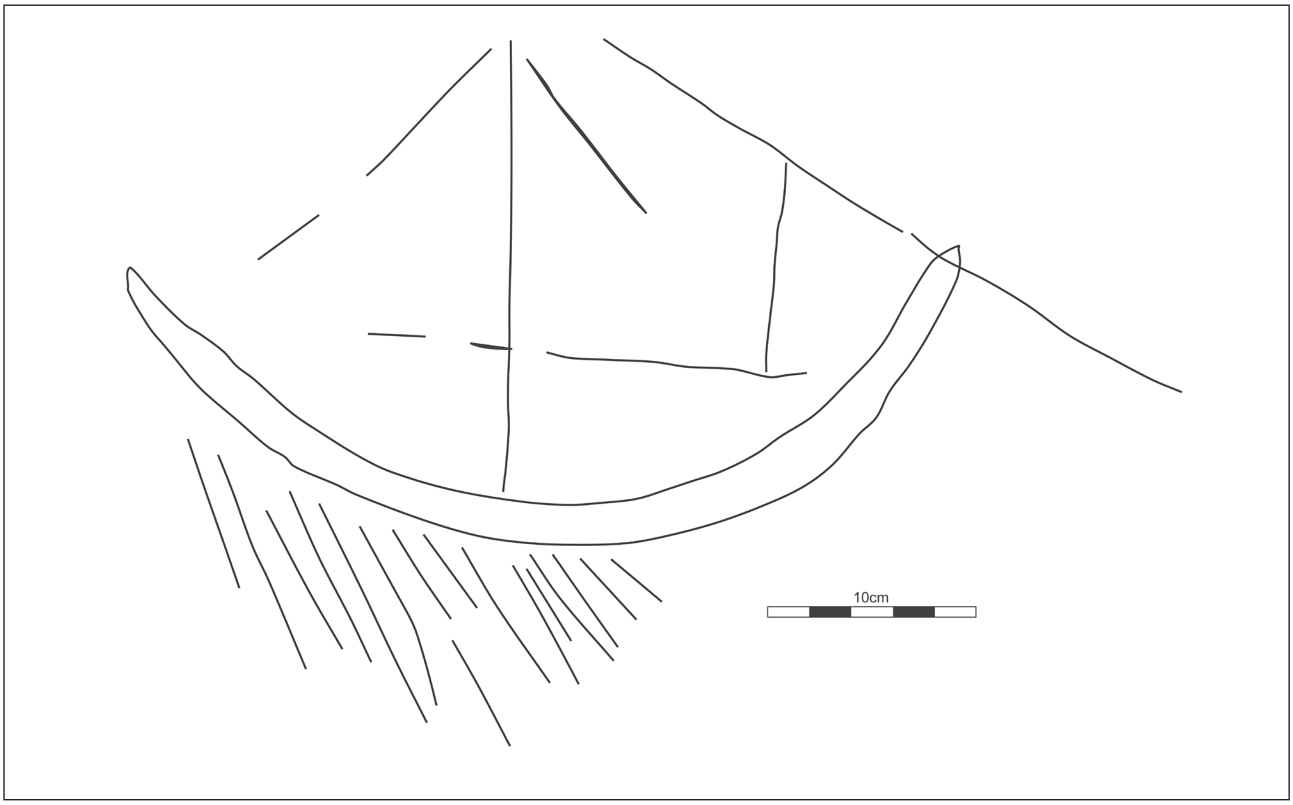

Figure 15.16. Vessel One from the rock art site in Wadi Quseir al-Qadim.

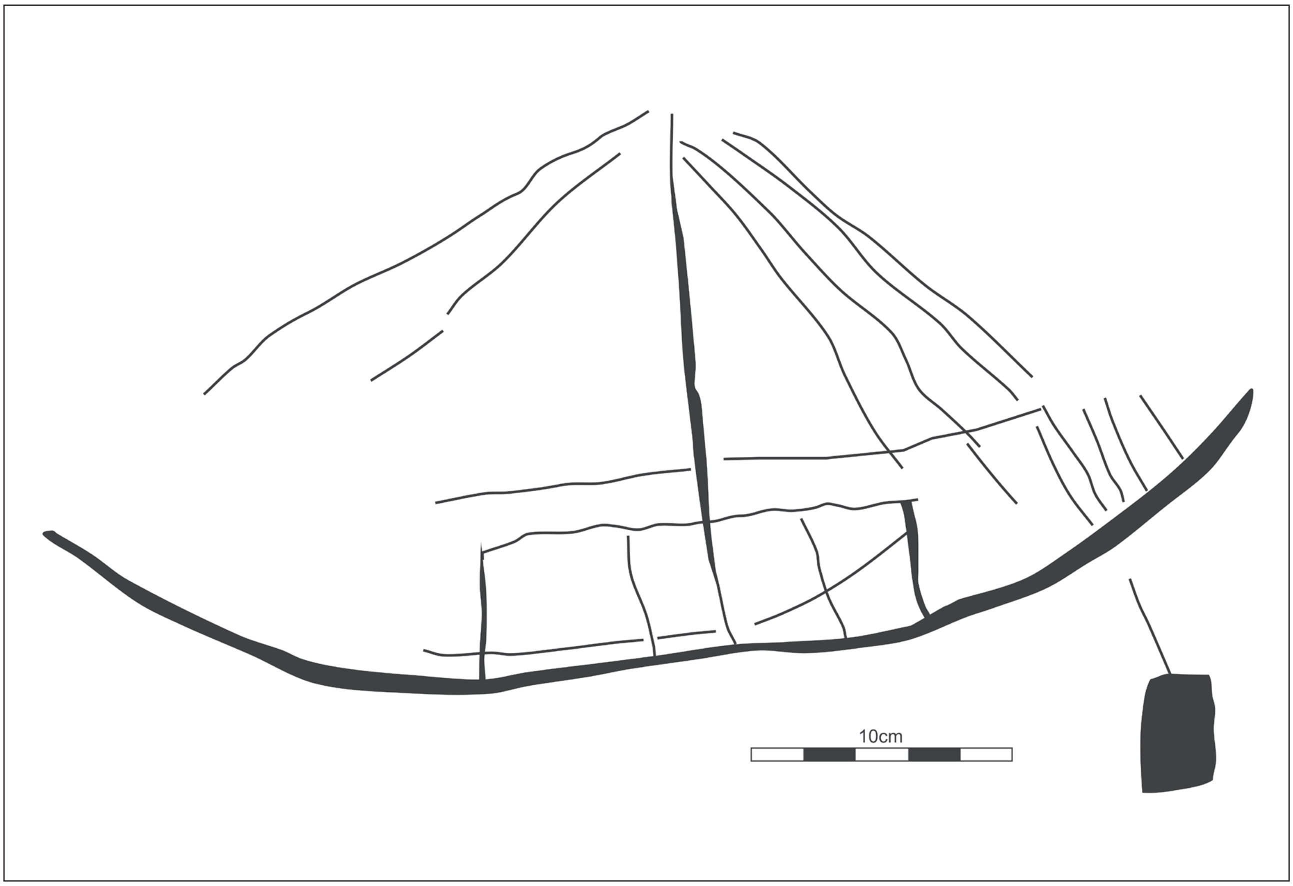

Figure 15.17. Vessel Two from the rock art site in Wadi Quseir al-Qadim.

towards the stern. The furthest forward of these is probably representative of a forestay, the remaining forward line may be a second forestay or a lift for the yard/boom. The lines aft of the mast are harder to identify, they may represent the vessel's backstay, halyard or yard/boom lifts. Finally, a series of five nearly vertical lines are carved in the stern area of the vessel. These are also open to interpretation. The forward two may be disjointed continuations of the aftermost lines from the masthead. The remaining three may represent crew at the stern of the vessel, or other rigging elements which are incomplete.

Vessel Three

This image (Fig. 15.18) represents a far more enigmatic depiction of a sailing vessel. The hull of the vessel is curved and the single-mast is stepped amidships. A single line is carved towards one end of the vessel which may represent a steering oar, however, this feature is ambiguous and so identification of bow and stern must remain doubtful. A curving horizontal line is shown above the hull of the vessel which probably represents a boom or lowered yard. Four lines run from the yard/boom to the masthead, three on one side and one on the other, these may be interpreted as representing a series of lifts rigged in support of the yard/boom. An animal has been carved over the depiction of the vessel and probably represents some form of cattle or goat. Below this and also overlaying the vessel, is a pointed motif, reminiscent of the end of a trident.

Dating of Vessels 1-3

The identification of the basic characteristics of Vessel One, allow it to be placed within the broader context of iconographic depictions of Pharaonic period shipping. The large steering oar, set over the stern of the vessel has direct parallels with images and models of riverine craft from the Middle Kingdom period (c. 2040-1782 BC) such as the sailing boat from the tomb of Intefiqer (Davies 1920, pl. 18; c.f. Jones 1995 48; Landström 1978, 16; Vinson 1994, fig. 21). Likewise the situating of the support for the steering on a structure towards the stern of the vessel, the abundance of oars and the location of the mast are all consistent with vessels from this period. Recent survey and excavation at the site of Marsā Gawāsīs, 50km north of Quseir al-Qadim, has uncovered Middle Kingdom and early New Kingdom remains, including structural elements of ships (Bard *et al*. 2007; Fattovich 2004; Ward and Zazzaro 2010). The site at Marsā Gawāsīs is one of the most likely departure points for Egyptian shipping engaged in the Red Sea trade with the land of Punt. In light of the use of Marsā Gawāsīs as an anchorage during the Middle Kingdom and early New Kingdom, the presence of depictions of contemporary vessels in the rock art of the Eastern Desert at the time is perhaps unsurprising.

The principle feature of Vessel Two is probably the steering oar. As well as distinguishing the bow and stern of the vessel it can provide some clues as to the possible period the vessel was from. The single steering oar is depicted by the artist as set over the stern quarter of the vessel which and is also depicted with a central structure spread equally on either side of the mast. These are typical conventions of artists depicting vessels during the New Kingdom (c. 1570-1070 BC) and can be seen on the sailing vessel in the tomb of Rekhmire at Thebes (Davies 1947, pl. 68; c.f.

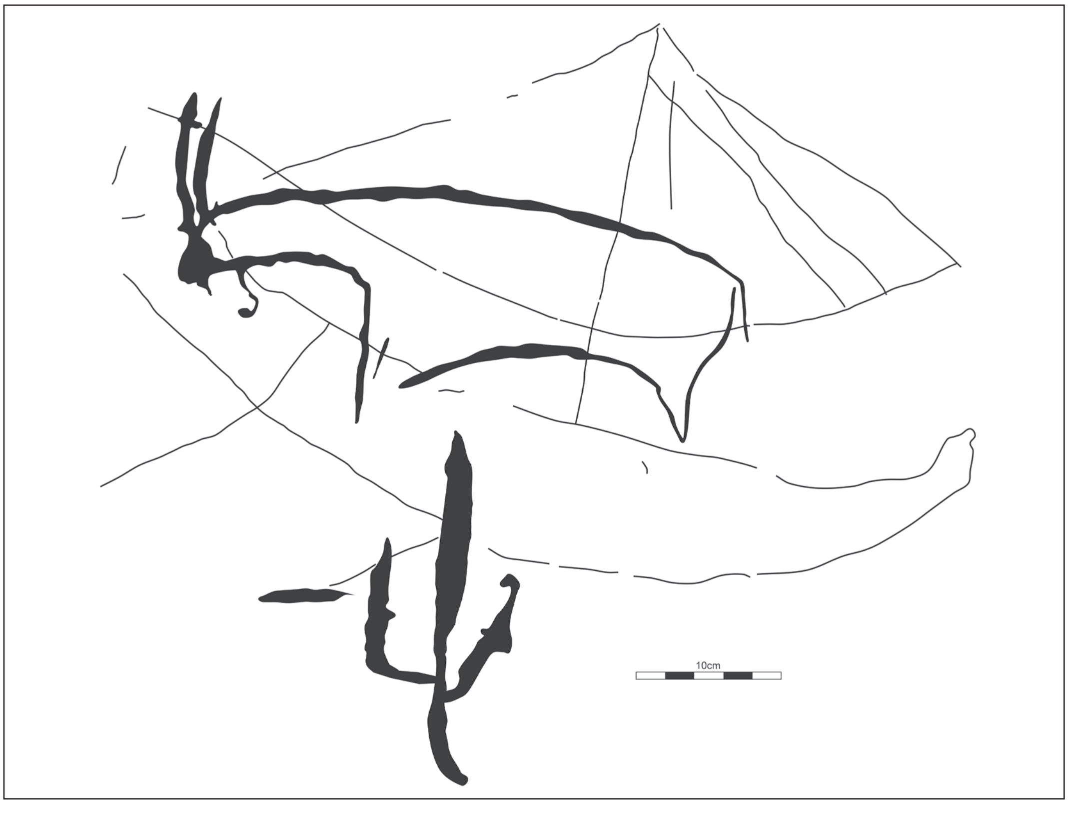

Figure 15.18. Vessel Three from the rock art site in Wadi Quseir al-Qadim.

Vinson 1994, 38-40). These features can be contrasted with those on vessels from the Middle Kingdom where any structures or cabins are set towards the stern of the vessel and steering oars are set over the very stern of the vessel. Vessel Three lacks any significant features which might allow an attempt to place it in a specific period. It simply displays the basic features which might be expected of an Egyptian watercraft from the Pharaonic period. In light of the possible dates for Vessels One and Two, it must simply suffice to say that Vessel Three could be a depiction of a sailing vessel from either of these periods. It probably does not belong to a later period.

Vessel Four

The fourth vessel (Fig. 15.19) is depicted with a hull which is far less curved than on the previous vessels. This hull form is usually referred to as Papyriform (Jones 1995, 19; Landström 1978, 6-7). A pair of steering oars are shown towards one end of the vessel which serve to distinguish the bow and the stern. The artist has also depicted the vessel with a central structure, no mast or indication of one is shown. There is a curved design in the bow of the vessel which may represent a stem post and a round object carved at the very stern of the vessel. The whole vessel is carried by at least six people, identifiable by their heads, who are arranged in pairs. The whole group, consisting of boat and bearers, are placed on a square structure. Vessel Four almost certainly represents a funerary or sacred bark comparable with models and depictions from Egyptian tombs (e.g. Davies 1948, pl. 25; Jones 1995, 18-22, figs 8, 10 and pl. VII). Such comparative evidence includes depictions where vessels are borne on the shoulders of people in the manner of Vessel Four.

Vessel Four indicates the extent to which boats and ships played an important (non-maritime) role in the belief system of ancient Egypt. Funerary barks are depicted in tombs from the Middle Kingdom onwards (Jones 1995, 18; Vinson 1994, 51) and occur in two types of scene. The first depicts a journey that the deceased was believed to make to the sacred sites of Busiris or Abydos traditionally associated with the God Osiris' birth and death (*ibid*). The second type of scene depicts the actual crossing of the Nile on the day of the burial and the overland journey to the necropolis, usually situated on the west bank (Jones 1995, 18). Having crossed the Nile, the coffin was transferred to a papyri form boat, or boat shaped bier for its final journey across the desert (Jones 1995, 19). The scene in which Vessel Four is included may represent the record or memory of such an event in the Eastern Desert, perhaps even the transportation of the deceased from the Eastern Desert to the Nile via the Wadi Quseir al-Qadim.

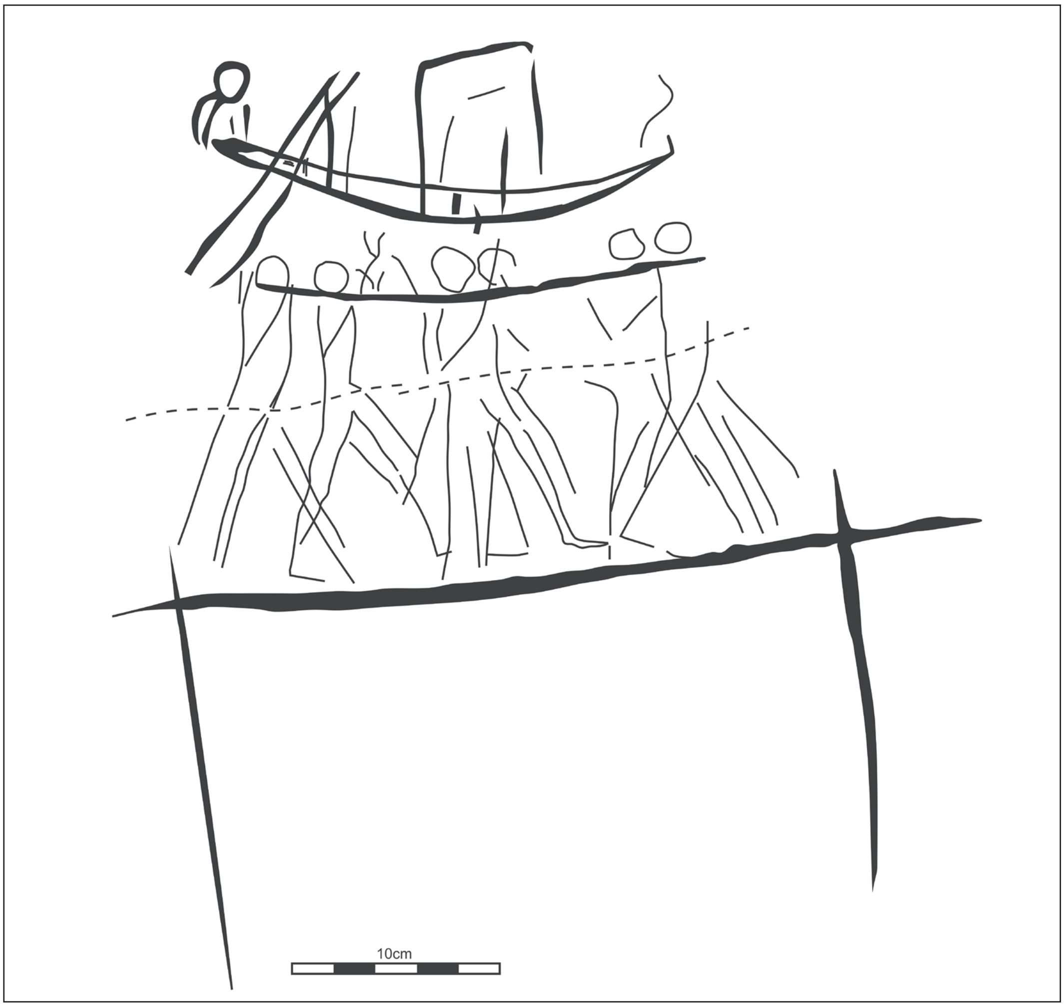

Figure 15.19. Vessel Four from the rock art site in Wadi Quseir al-Qadim.

An alternative explanation may be that Vessel Four was a type of sacred bark used in religious festivals. Their outward appearance is the same as that of a pilgrimage bark but they were carried in procession by priests during religious festivals (Jones 1995, 20; Vinson 1994, 51). The bark was the transport of the divine image of the god in imitation of the gods who were believed to cross the sky in their magical boats (Jones 1995, 20). The depiction could have been created in commemoration of such a religious event. The appearance of pilgrimage and funerary barks from the Middle Kingdom onwards corresponds to the earliest period in which Vessel One may have been depicted. Depictions and models of vessels similar to Vessel Four continue to be found during the New Kingdom.

It is therefore possible to tentatively identify the type of vessel represented by Vessel Four, in addition to its probable social context. However, the period to which Vessel Four belongs remains an extremely broad one and it can only be stated that the depiction probably dates from the Middle Kingdom or New Kingdom of the Pharaonic Period.

Vessel Five

Unlike the previous four vessels, Vessel Five (Fig. 15.20) represents a type of ship not specifically associated with Egypt. It is likely to be much later in date than the vessels discussed above. The carving shows a sailing ship with two masts, both of which appear to be carrying triangular sails. This probably represents a ship with a lateen/settee sailing rig which has a distinctive triangular shape, rather than the square-sail rig of earlier periods. The positioning of the masts, forward and aft of amidships is consistent with a sailing vessel rigged with one large mainsail (forward) and a smaller mizzen sail (aft). A series of lines leading from the top of the mainmast to the deck, aft of the mast, may represent the halyard system of the vessel. Such rigging components are often incorporated into depictions of lateen/settee rigged vessels and are characteristic of the lateen/settee rig during the early medieval period (Whitewright 2009a, 100). However, Vessel Five exhibits none of the other rigging components, such as hook-shaped mastheads, that are also associated with lateen/settee rigged ships from that period.

The lateen/settee rig was probably invented in the Mediterranean, where it began to come to prominence from the 5th century AD (Whitewright 2009a). It is unclear when it first began to be used in the Red Sea and Indian Ocean, but it must have been at some time between the 5th century AD and the 10th century AD when Arab literary sources indicate the use of a lateen/settee rig (Hourani 1951, 103; Whitewright In-Press). Given the abandonment of the site of Myos Hormos from the 3rd century AD and its reuse during the medieval Islamic period, it is this later period which provides the most likely date for the carving of Vessel Five. At this time there are likely to have been many people travelling the route between the Nile and the Red Sea who would have travelled on sailing vessels either side of their desert journey. Vessel Five may represent the memory of such vessels in the minds of a medieval traveller. Alternatively it may have been created

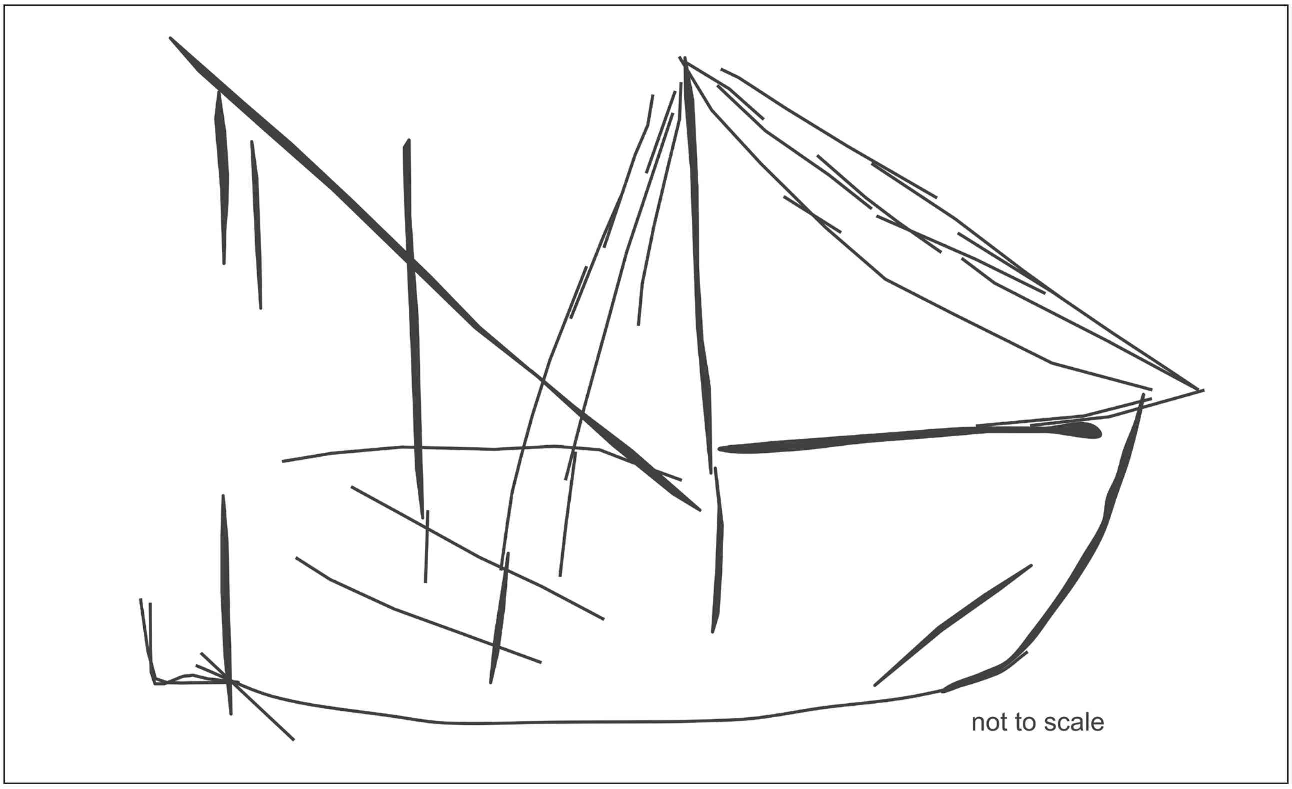

Figure 15.20. Vessel Five from the rock art site in Wadi Quseir al-Qadim.

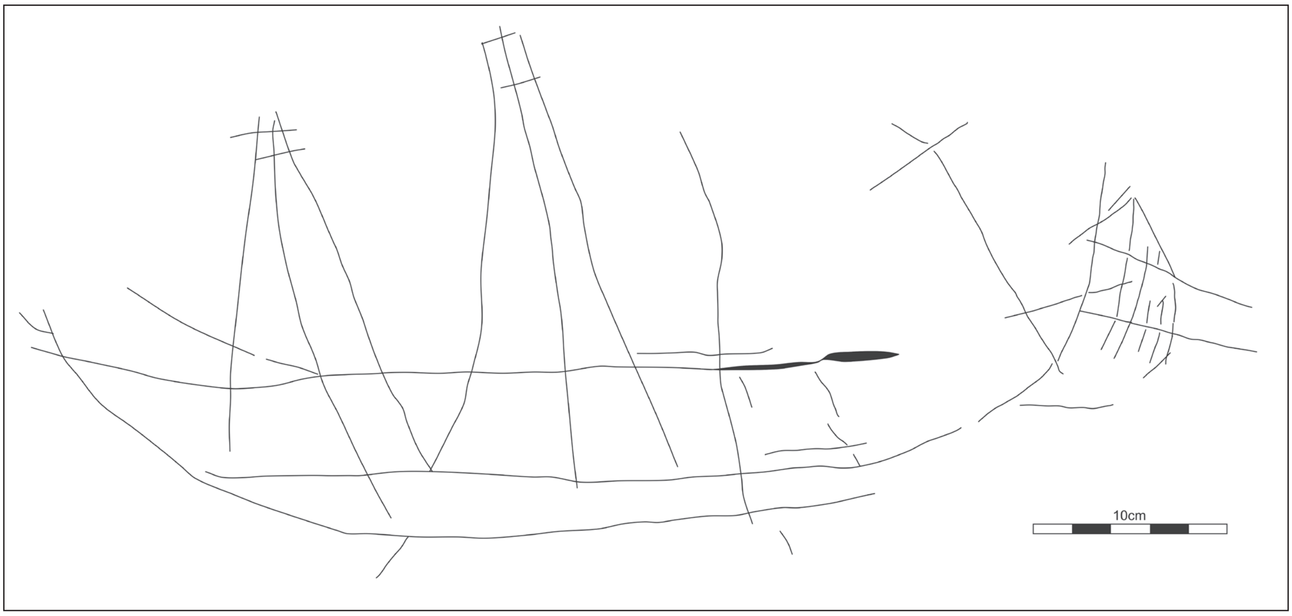

Figure 15.21. Vessel Six from the rock art site in Wadi Quseir al-Qadim.

after the abandonment of the site of Quseir al-Qadim and the establishment of the modern town of al-Quseir. The identifiable features of Vessel Five would fit those seen on indigenous Indian Ocean sailing vessels from the medieval period up to the present day (for examples of the latter see Burningham 2006).

Vessel Six

This depiction (Fig. 15.21) shows a three-masted ship towing a smaller vessel astern. The three masts are equally spaced along the length of the vessel and the artist has depicted the central (main) mast as larger than the other two (foremast and mizzen). The foremast and mainmast are both shown with lines either side of the mast running from the deck to the masthead where they terminate at a square object drawn on the top of the mast. These lines may be interpreted as showing the shrouds of the vessel, in this case the left hand line represents the portside shroud (nearest) and the right hand line the starboard shroud (furthest away) from the perspective of the viewer. The stern of the vessel is cut off in a manner which may suggest a transom stern rather than a double-ended hull. The smaller vessel towed astern has a single mast and two lines protruding from the hull probably represent oars.

Dating Vessel Six is complex because there are two main periods when it may have been created. Three-masted vessels are unknown in the Pharaonic period iconographic record and were not used in the Mediterranean until the mid-3rd century BC (Basch 1987, 473; Casson 1995, 191-199). Vessel Six must therefore be later than the 3rd century BC. Standing rigging of the type probably depicted on Vessel Six is not associated with lateen/settee rigged vessels such as Vessel Five (Whitewright 2009b). But it is associated with both Mediterranean square-sail ships from the Roman period and fully square-rigged European ships from the late-medieval period onwards. The latter type of vessel is not seen in the Indian Ocean until after Vasco de Gama's rounding of Africa in 1498. Vessel Six may therefore belong to either of two periods, the Roman period or the post-medieval period. Mediterranean square-sail vessels from the Roman period are commonly depicted towing a smaller vessel astern (e.g. Jashemski 1974, Ill. 2). But, artists usually show square-sail ships from this period with the sails or yards set, when viewed from the side (Jashemski 1974; Sidebotham 1996, Ill.2), this feature is absent from Vessel Six as no sails or yards are depicted. The area of Quseir al-Qadim was visited at least twice by square-rigged European ships possibly represented by Vessel Six. First by a Portuguese fleet in March 1541 (Facey 2004, 16) and by a British fleet in August 1799 (Harre 2004, 100; Le Quesne 2004, 152-3), on both occasions the modern town of Quseir came under attack. The final detail of the vessel to consider is the shape of the stern. Roman vessels are usually shown in the iconographic record with a double-ended, symmetrical hull (e.g. Casson 1995, fig. 14.3, 144 and 147). Occasionally a type of vessel with a rounded stern and concave stem post is shown (e.g. Casson 1995, fig. 14.5, 163 and 191). Vessel Six does not fit either of these categories, it has a rounded stem post and a squared stern which strongly suggests a transom. Such a constructional feature was not seen in the Indian Ocean until the arrival of the Portuguese in 1498, after which it became adopted into local shipbuilding traditions (Hornell 1946, 237). However, despite the adoption of the transom stern by Indian Ocean shipwrights, vessels were still rigged with the lateen/settee sail which has become characteristic of the Indian Ocean region.

Vessel Six certainly post-dates the 3rd century BC and is probably not a representation of a type of vessel indigenous to the Indian Ocean and Red Sea region. The ship had three masts supported by standing rigging, this element suggests a square-rig of some sort. The transom stern of the vessel indicates that it must have been depicted after this constructional feature became common in the Indian Ocean. Finally, the combination of a three-masted, probably square-rig and a transom stern indicates that Vessel Six probably belonged to a European tradition of shipbuilding. The depiction of such a vessel must therefore date to the post-medieval period and might be associated with the often destructive visits of European warships to the region in this period. European square-rigged naval and merchant sailing ships were gradually replaced with steam driven vessels during the latter half of the 19th century. It is therefore unlikely that any square-rigged vessels visited the area after this time and this probably represents the latest date at which Vessel Six may have been created.

Conclusion

The ships and boats carved at the rock art site in Wadi Quseir al-Qadim are all distinctively different types of watercraft. This much is obvious from even a cursory glance at them. More detailed analysis of the depictions allows an identification of the wider cultural context and possible period during which they were created. Vessels One to Four form a group of watercraft which are probably representative of the Pharaonic period in the Eastern Desert. Within this general period it is possible to conclude that Vessel One dates to the Middle Kingdom and Vessel Two to the New Kingdom. Vessel Three is more ambiguous and therefore impossible to date more specifically than being 'Pharaonic'. Vessel Four is representative of a specific type of boat used in funerary and religious ceremonies from the Middle Kingdom onwards. In contrast to this, Vessels Five and Six can be attributed to a much later period. Vessel Five was probably created between the occupation of the site during the Islamic medieval period and the modern era. Meanwhile comparative evidence suggests that Vessel Six is post-medieval in date, but probably no later than the late 19th century.

The ships and boats depicted in Wadi Quseir al-Qadim therefore cover a wide period of time. For much of this time there is no associated archaeological evidence for the use of the site of Quseir al-Qadim. Conversely, during the two main phases of occupation of the site, as Roman Myos Hormos and Islamic Quseir al Qadim, there is little or no associated maritime rock art. However, many of the Greek inscriptions also present at the rock art site have been assigned a date contemporary with the use of the port in the Roman Period (Van Rengen 2006). It is therefore possible that the location of the rock art may have been visited on a regular basis from at least the Middle Kingdom of the Pharaonic period onwards.

Depictions and inscriptions of boats in the Eastern Desert, especially where routes between the Nile and the Red Sea are known to have existed, have often been associated with the physical transportation of watercraft or their component parts (Wachsmann 1998, 238). The absence of a Pharaonic site in the vicinity of Quseir al-Qadim (Marsā Gawāsīs is some 50km distant) suggests that the physical transportation of watercraft along Wadi Quseir al-Qadim did not occur during that period. During the Roman occupation of the site, shipbuilding equipment was also known to have been transported from the Nile to Myos Hormos (Bülow-Jacobsen 1998, 66). Yet the only engravings which can be assigned to this period are religious dedications rather than records of maritime activity (Van Rengen *et al*. 2006, 23). Such dedications may be echoes of the earlier depiction of ritual ceremony symbolised by Vessel Four.

The rock art site in Wadi Quseir al-Qadim should not simply be seen as evidence for the transportion of watercraft from the Nile to the Red Sea. Although the early images of ships may be a memory of such an event, it seems more likely that they are related to activity at Marsā Gawāsīs, than to the transport of Pharaonic ships along Wadi Quseir al-Qadim. Depictions from the Pharaonic period also include the portrayal of ritual activity and remind us of the important role which watercraft played in the ceremonial life of ancient Egypt. Visitors to the site continued to record religious dedications in the Roman period, perhaps indicating an appreciation of the existing ritual imagery and suggesting the possible use of the site as a religious sanctuary (Van Rengen *et al*. 2006, 23). The site continued to be visited during the later medieval and post-medieval period when visitors added further maritime imagery to those already in existence.

The rock art site can therefore be viewed in two ways. On the one hand it represents a simple record of the variety of watercraft that people travelling through the Eastern Desert experienced, either at the Nile or the Red Sea, over a period of time stretching from the Middle Kingdom to the 19th century AD. Identification of the long use of the site, through interpretation of the ship and boat imagery, allows the ritual imagery, which comes from a variety of periods, to be put into context. The site was obviously one to which people travelling in the Eastern Desert were prepared to associate their particular rituals or beliefs by inscribing them on the wadi wall alongside those of earlier visitors. The enduring nature of the site is perhaps indicated by the presence of depictions of shipping representing the most recent history of the locality and its people.

15.5 Maritime Activities in the Roman Period

Ross Thomas

Myos Hormos was a port constructed in a desert region with limited resources and limited water, making it expensive (Lewis 1983, 141; Meyer 1992, 48) and occasionally dangerous (De Romanis 2003; Cuvigny 2003b) to reach. This is likely to have limited the people wanting to live at Myos Hormos to those with a very specific Red Sea economic interest. It is not surprising

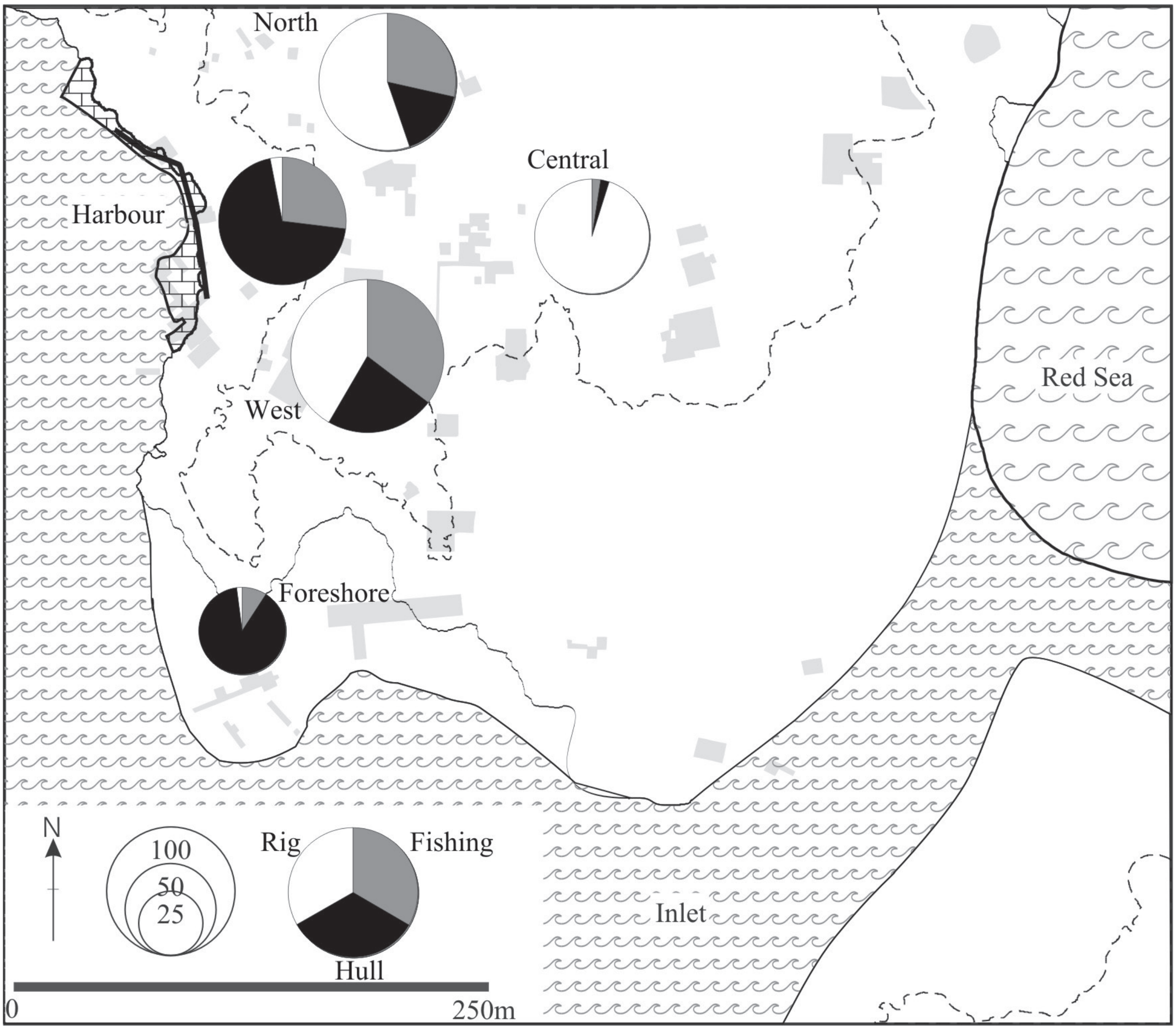

Figure 15.22. Number and proportion of maritime artefacts relating to rig, hull and fishing across the site (plan of inlet after Blue 2006a, 59 & fig 4.13).

that many excavated deposits indicate the importance of maritime activities to the Roman period inhabitants. A number of different activities were present in the assemblage representing specific vocations and relating to the layout of the harbour. The significance of maritime activities in the understanding of the demography of ports is generally ignored by archaeologists and here we attempt to fill this lacuna.

Maritime activities are represented by the artefacts discussed in this chapter (Table 15.4). They include elements of ships sail and rig (sail, webbing, brail rings, dead eyes and sheaves), of the hull and its maintenance (planks, tenons, dowels, mortices, pitch, lead sheathing and copper tacks), nets and creels (bast-fibre and flax netting, ceramic, stone and lead net weights, cork and wooden floats), fishing lines (stone, coral, ceramic and lead line weights, copper and iron hooks, wooden gorges and cork and wooden floats). These artefacts were found discarded in rubbish dumps, either in a damaged form, or following reuse within structures (e.g. plank fragments) or shoes (e.g. net fragments). Sometimes artefacts used for one maritime purpose may then be re-used in another function relating to the sea (e.g. fragments of lead sheathing reused as line or net weights).

The significance of the sea is highlighted by the prevalence of maritime artefacts across the site. They account for 10% of all artefacts excluding pottery, although their distribution is uneven. They are most prevalent in the northern and harbour areas of the site, where they account for 15-16% of the artefacts. In the western and central areas of the Roman town, they account for 7% of all artefacts. It was possible to identify what types of maritime activity were concentrated in each area (Fig. 15.22).

Ship hull maintenance was clearly undertaken around the harbour area, where concentrations of woodchips and basalt ballast were found (described in section 15.2). Elements of rigging sail were stored (and possibly created or maintained) in the dryer central area of the site. The greatest proportion of sail and rig elements (described in section 15.3) were found in the centre of town, where Handley has also recognised a concentration of sail textiles and webbing (75% from Trench 17 and 12% from Trench 2D were maritime, compared with only 2% to 6% from Trenches 6A, 6B, 6C, 6D, 6E, 6G, 6P, 6Q and 7, c.f. Chapter 22, this volume). The greatest quantity and variety of fishing equipment were found in the western and northern areas of the site. These included a full range of basket traps, nets, gorge and hooked lines, illustrating a variety of specialised fishing techniques used by the people in that immediate vicinity (see Chapter 16, this volume). The association of finds with buildings and installations of domestic and industrial function permits further detailed interpretation.

In the central area during the 1st and 2nd centuries AD, ships rigging accounts for the majority of the maritime artefacts. This area is typified by large two-storey buildings (Fig. 15. 23), putatively identified as warehouses with domestic occupation on the first floor above an open storage area on the ground floor (Masser 2006, 145). Evidence for storage amphorae and their sealing is preserved as well as domestic artefacts including Egyptian luxuries that were rare elsewhere on site. The people living in central Building A are likely to have been associated with Red Sea trade and to have been wealthier than the other inhabitants of Myos Hormos, such as those in Trench 8. The presence of so many sail and rig elements may represent the storage and maintenance of these items in this dry and secure environment of the warehouses. Sail and rig elements are the least sturdy, being most prone to problems of damp and this would seem a sensible place to store and work on them. This also illustrates the close relationship between ship maintenance and merchant activity, especially in wine. A number of wine amphora stoppers were found, including those of wine traders who were freedmen of the emperor (Claudius or Nero) called Τιβε(ριου) Κλ<α>υ(διου) Ερμιου (ST0439) and Τιβε(ριου) Κλαυδ[ιου] Σε[κου]ν(δου) (ST0373), whilst a third may represent either individual (the genitive was lost ST0409, c.f. Chapter 3, this volume).

Myos Hormos	**Maritime Artefacts**		**% of Maritime Artefacts/area**		
Location	Count	% of finds	Fishing	Hull	Rig
Trench 17	25	*59.5%*	*0.0%*	*8.0%*	*92.0%*
Trench 2B	45	*6.1%*	*0.0%*	*0.0%*	*100.0%*
Trench 2C	1	*0.5%*	*0.0%*	*0.0%*	*100.0%*
Trench 2D	5	*4.5%*	*0.0%*	*0.0%*	*100.0%*
Central	**76**	***7.0%***	***0.0%***	***2.6%***	***97.4%***
Trench 7	7	*6.7%*	*57.1%*	*14.3%*	*28.6%*
Trench 12	25	*12.4%*	*24.0%*	*76.0%*	*0.0%*
Trench 15	3	*16.7%*	*0.0%*	*100.0%*	*0.0%*
Trench 7A	55	*20.7%*	*25.5%*	*70.9%*	*3.6%*
Harbour	**90**	***15.3%***	***26.7%***	***68.9%***	***4.4%***
Trench 6A, B & C	16	*6.9%*	*0.0%*	*12.5%*	*87.5%*
Trench 6D & E	43	*15.8%*	*25.6%*	*16.3%*	*58.1%*
Trench 6K	1	*3.8%*	*0.0%*	*0.0%*	*100.0%*
Trench 6P	74	*25.9%*	*20.3%*	*13.5%*	*66.2%*
Northern	**134**	***16.4%***	***19.4%***	***14.2%***	***66.4%***
Trench 9	1	*2.7%*	*0.0%*	*100.0%*	*0.0%*
Trench 10	37	*28.0%*	*10.8%*	*89.2%*	*0.0%*
Trench 16	1	*1.7%*	*0.0%*	*100.0%*	*0.0%*
Trench 14	2	*10.5%*	*0.0%*	*100.0%*	*0.0%*
Southern	**41**	***16.6%***	***9.8%***	***90.2%***	***0.0%***
Trench 5	4	*1.1%*	*0.0%*	*0.0%*	*100.0%*
Trench 8	42	*6.7%*	*31.0%*	*33.3%*	*35.7%*
Trench 6G, H & J	83	*7.5%*	*32.5%*	*15.7%*	*51.8%*
Trench 6Q	29	*16.2%*	*20.7%*	*10.3%*	*69.0%*
Western	**158**	***7.0%***	***29.1%***	***19.0%***	***51.9%***
Total	**498**	***10.0%***	***20.0%***	***30.1%***	***49.9%***

Table 15.4. Significance of maritime artefacts across Myos Hormos. The percentage of small finds that were maritime artefacts (column 3) was calculated from the finds archive which does not include pottery and faunal remains.

The late Augustan harbour facilities and their subsequent rebuilt sea defences, installations and buildings (Blue and Peacock 2006, 175) were the source of many of the artefacts representing hull maintenance. It is easy to imagine the ships being dragged ashore onto the man-made foreshore for maintenance work, in front of structures housing metal working installations and hearths used for heating pitch and to create materials to make the hulls water tight (Blue 2006b, 84; Thomas 2006b, 94) although some of the extant buildings in this area may be later in date. To the south, evidence of antifouling was preserved in the form of barnacles still retaining pitch and impressions of the wooden planks (Whittaker 2006, 80, see chapter 3; Whittaker *et al*. 2006). The limited number and range of fishing hooks and weights were also found in the harbour area, suggests that fishing boats may have been housed there.

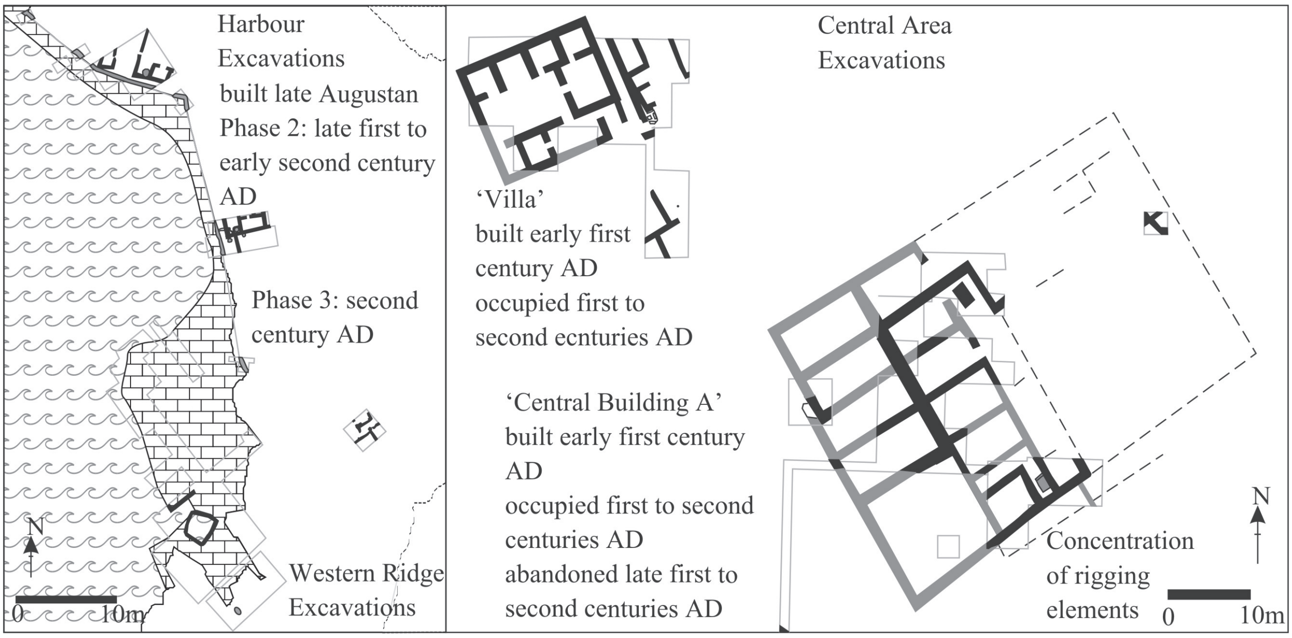

Figure 15.23. The harbour and central areas. Central Building A was re-excavated as Trench 17 in 2003 (Plan after Thomas 2006, 88; Masser 2006, 143; Whitcomb 1982, 33 & 38).

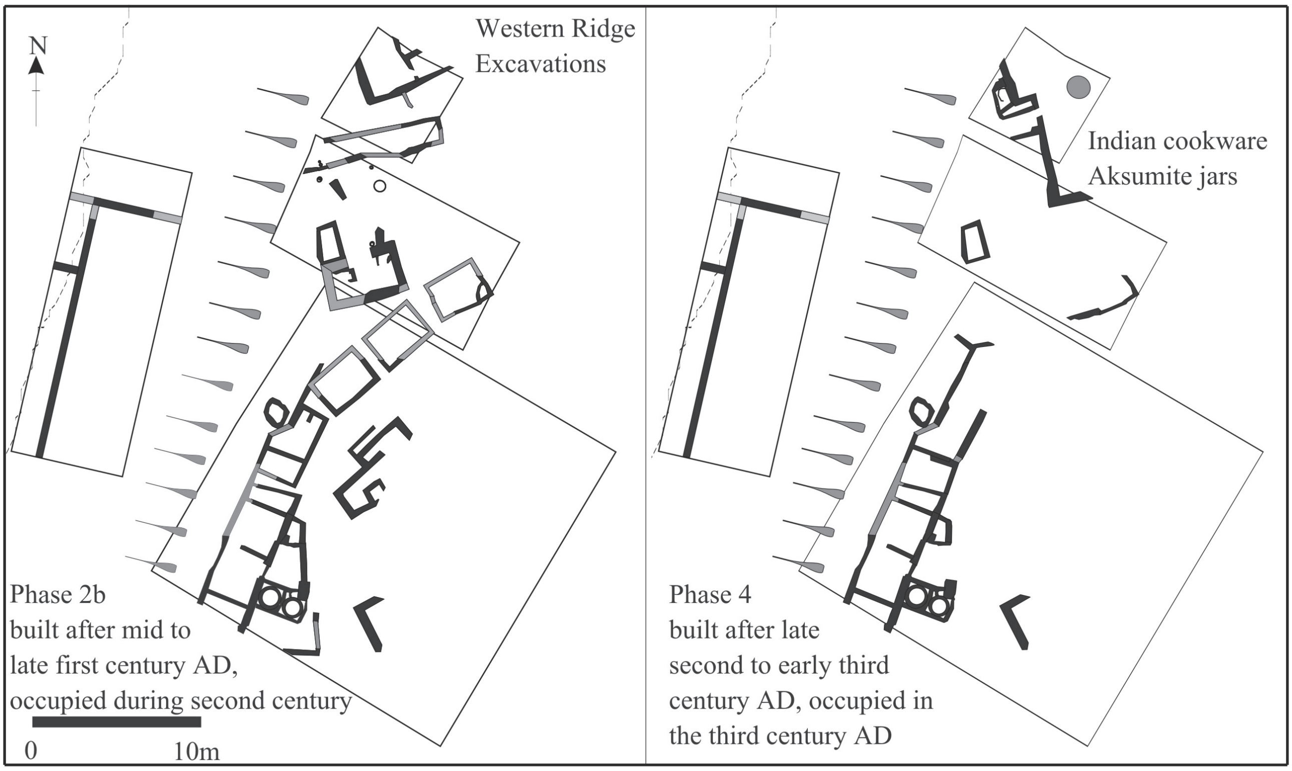

Fig. 15 24. Trenches 6G and 8 in the 2nd and 3rd centuries AD (Thomas and Masser 2006, 131).

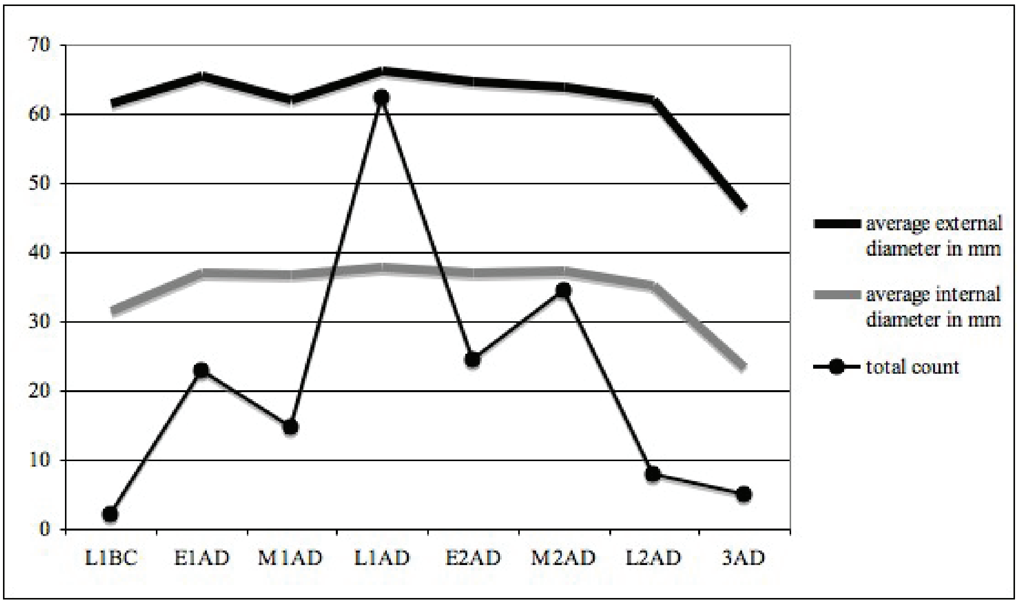

Fig. 15.25. Brail ring diameter and count distribution over time. Temporal scale divided into early (E), mid (M) and late (L) portions of each century BC or AD.

On the western ridge, a complicated series of phases shows a number of different activities taking place (Fig. 15.24), but the prevalence of fishing equipment across the site, along with a concentration of shellfish jewellery, shell bowls and scoops (see Chapter 13, this volume), suggests that these were quite different people to those inhabiting the central area. It was also in this area that the Pakubis ostracon was found. Here we found a wide variety and quantity of fishing equipment. The northern area also contained many examples of fishing equipment, concentrated in Trenches 6P and 6D (see Chapter 16, this volume). There were also many sail elements within the rubbish dumps of this area. The final phase of occupation on the western ridge (during the 3rd century AD) was located only in a small area to the north of Trench 8 (Fig. 15.24) and shows a complete change from the earlier periods and other areas. Here a significant range of imported Aksumite and Indian pottery forms, such as cooking pots, lamps and jars, suggests close cultural contact with the southern Red Sea and possibly India (Thomas and Masser 2006, 137-8). A variety of ship elements were also found in this location (above).

The decline of Myos Hormos in the 3rd century AD can be better understood through maritime activities. Hull maintenance seems to stop in the harbour area and on the southern shore during the 2nd century AD, as there is no evidence of activity in these areas during the 3rd century AD. A small pile of salvaged lead sheathing (possibly retained for use as repair patches) and ship elements found from 3rd century AD deposits in Trench 8, are all that represent any form of ship maintenance activity during this period. The distribution of quantity and diameter of the brail rings found at Myos Hormos can also suggest the changing scale and form of maritime activity over time (Fig. 15.25), although a direct correlation between brail ring and ship size cannot be assumed (Whitewright 2007, 288; c.f. discussion of brail ring size in Section 15.3 of this chapter).

If sail maintenance is related to the size and number of brail rings, then the busiest period of activity would be in the early 1st century AD and the mid-2nd century AD. The late 1st century AD is represented by the largest brail rings, suggesting that a greater number of large vessels were using the port during this period. Particularly marked is the small size of the few brail rings from the 3rd century AD, which averaged over a third smaller than those from the 1st century AD. This probably relates to the reduced traffic and limited size of vessels, perhaps part of a wider Red Sea phenomenon at this time.