

# **The Chronology of Roman Trade in the Indian Ocean from Augustus to Early Third Century AD**

*Abstract:* This article examines the archaeological and numismatic evidence for Roman trade in the Indian Ocean from the Augustan annexation of Egypt up to the early third century AD. This is in order to demonstrate that the most intense period of contact and exchange was around the late-first century AD. The arguments presented here challenge two major positions which assert either a peak during the Julio-Claudian period or alternatively a continuing intensity of contact up until at least the late-second century AD.

*Keywords:* Roman, trade, India, amphora, coins.

## **Introduction**

For millennia the Red Sea, Persian Gulf and wider Indian Ocean have facilitated direct and indirect contact between Mediterranean and Middle Eastern societies with lands further east and south (see Map 1). These networks go back to the Sumerian (Mesopotamian) and Harappan (Indus Valley) civilisations (Bernstein 2008: 31; Moore and Lewis 1999: 52-8; Smith 2009: 32-36; Vogt 1996: 126-7; Warburton 2007: 9-21), and are later manifested in the interest shown by the Achaemenid kings of Persia in exploration of routes between northwest India and the Red Sea (see the voyage of Scylax of Caryanda - Herodotus *Histories* 4.44). Pharaonic Egypt was also witness to a number of state sponsored expeditions to regions of East African and probably also the southern Arabian Peninsula (Curtin 1984: 71-3; Shaw 2000: 316-7; Smith 2009: 41-5).

Exploitation of the Persian Gulf and Red Sea continued into the Hellenistic period under the Seleucid and Ptolemaic empires respectively. The Seleucids established a colony at Ikaros on the island of Failaka (near the coast of Kuwait) and developed commercial contacts with the Gerrahaeen Arabs. This is manifested in the material and coin finds both on the island and elsewhere along the eastern Arabian littoral (Salles 1987: 85-8; Salles 1996: 302-4; Sherwin-White and Khurt 1993: 65-6; Tomber 2008: 112). The Ptolemies also invested much effort into establishing stations in the Easter Desert of Egypt and ports on the Red Sea coast in order to mine gold and acquire elephants from East Africa for military purposes (Agatharchides 1.1 = Photius, Cod. 250.1, 441b; Strabo *Geography* 17.1.5; PEleph 28 – see Eide et al 1996: 572-6; Klemm and Klemm 2013). Even after the acquisition of elephants ceased to be a major concern for the Ptolemies the use of the Red Sea for commercial purposes continued in strength, as is attested by a number of offices which were established to oversee such activity in the latter second and first century BC (*OGIS* 132; *SB* V 8036; Mooren 1972: 127-33; Sidebotham 1986: 8-9, 175; Sidebotham 2011a: 17). It is also in the late second century BC that Posidonius claims that the Greeks first learnt how to use the monsoon winds to sail over open water to India.<sup>1</sup> The southwest monsoon enabled merchants travelling from the Red Sea ports to depart in July and reach the Indian coast around the latter half of September, and then with the northeast monsoon start the return journey around the

---

<sup>1</sup> There are two traditions about the “discovery” of the Monsoon winds in Graeco-Roman sources. One is related by Posidonius (recorded in Strabo *Geography*. 2.3.4-5) who reports that after the discovery of a shipwrecked Indian sailor by the Ptolemaic navy a few expeditions to India were sent under Eudoxus of Cyzicus. The other tradition is more vaguely connected to an individual known as Hippalos (*Periplus* 57; Pliny *NH* 6.26.100, 104-05). For a sceptical view on the validity of these discovery traditions see Mazzarino 1997: 72-79 (posthumously published); and Tchernia 1995b: 992-4; Tchernia 1997b: 250-60; for a more positive view see Habicht 2013.

end of December to early January (*Periplus Maris Eythraei* (henceforth *PME*) 39, 49, 56; Pliny *NH* 6.26.99-105).<sup>2</sup>

These developments directly precede the Roman period of participation in the Indian Ocean trade. The annexation of Egypt by Augustus in 30 BC meant the Roman state took over the (attempts at) regulation, monitoring and taxation of the goods coming into and out of Egypt via the Red Sea. It is this period which forms the main focus of this article. The question being asked here is at what point does Roman participation in the Indian Ocean trade appear to peak in the first three centuries of the first millennium AD.<sup>3</sup> It is argued here, on the basis of the archaeological evidence seen from sites across Egypt, East Africa, the southern Arabian Peninsula and India that this peak appears to occur during the first century.<sup>4</sup> It is further argued, on the basis the construction activity in the Eastern Desert, and also on heavily contested numismatic evidence from India, that this peak is most apparent in the latter part of the first century.

The chronological argument presented in this article is contrary to two broad positions concerning the intensity of participation during this era. One common position has been to argue that the Julio-Claudian period (30 BC-AD 68) saw the main peak of Roman

---

<sup>2</sup> This pattern of sailing was used by Graeco-Roman merchants. Some other ethnic groups employed different sailing patterns, see for example the Arabs - Hourani revised by Carswell 1995: 26-8, 74; for the patterns on the winds and currents see, Düing 1970: 12, 14, 21.

<sup>3</sup> The period from the Augustan up to the third century is treated here as a distinct division. This is not to suggest that Roman trade in the Indian Ocean ceases at this point, but that the comparative absence of Roman material by the mid-third century, is contrasted by a distinct rival in the Late Antique period. A trade which has some distinct contrasts with the earlier period, such as the increasing prominence of ports like Klysma and Aila, and the new significance of Christianity. For Late Roman Berenike see Sidebotham 2011a: 259-82; for Klysma see Mayerson 1996: 120; Young 2001: 77; for Aila and Klysma see Ward 2007; for spread of Christianity through trade see Kosmas *Indikopleustes*; also Tomber 2007a: 219-28.

<sup>4</sup> Dates for BC will always be given, only for AD where ambiguity may occur or specific dates are referred to.

commercial contact with India. This is an argument made particularly on the basis of the high numbers of Roman gold (aurei) and silver (denarii) coins minted by Julio-Claudian emperors which have been found in India (Bolin 1958; De Romanis 1997; Lebedeva 1988; P. Gupta 1991; Sewell 1904; Suresh 2004; Tchernia 1997a and 1997b). These arguments, and the difficulties inherent in using this numismatic evidence, will be discussed in greater depth in the latter part of the article. Another significant position has been to assert that Roman participation in this trade continued in strength at least into the mid-second century, and that it was not until problems such as the Antonine plague (c. AD 165-180) and the unsettled conditions in Egypt (civil unrest and banditry) during the late-second and early-third century that signs of disruption and downturn are apparent.<sup>5</sup> The evidence cited to support this position includes the Muziris Papyrus (Cappers 2006; Villeneuve 2007; Whittaker 2004), the Alexandrian Tariff (Warmington 1928; Cappers 2006), and the presence of Roman soldiers on the Farasan Islands (Villeneuve 2007; Whittaker 2004). The problems with utilising this evidence will also be examined below.

However, before engaging in this debate a few points need to be clarified. Firstly, the Roman annexation of Egypt certainly represents a new political phase in Mediterranean participation in the Indian Ocean trade. There are, however, questions about the extent of continuity and change between the Ptolemaic and Roman periods and its pace. It is not an uncommon position to regard the Roman period as ushering in, what Seland has termed, a new phrase akin to ancient globalisation or “oikoumenisation” in the Indian Ocean (2008: 70-1; 2010: 2, 18-20); while both Tomber and Sidebotham regard the trade as becoming more

---

<sup>5</sup> For support for the position of a late second and third century downturn see Whittaker 2004: 166; Mukherjee 2004: 4; McLaughlin 2010: 59-60; Gurukkal 2013: 183; see also Sidebotham 2011a., 63-4, 163 (problems with bandits and plague); Young 2001: 82-86 (increased problem in late-second to early-third century); van der Veen 2011: 13 (third century financial constraints for decline of Myos Hormos).

systematic, civilian and commercial than it had been previously (Tomber 2008: 18, 71; Sidebotham 1991: 15; Sidebotham 1996: 287-8; Sidebotham 2011a: 5). Some scholars go further and downplay the extent to which the Ptolemaic period saw many major developments relating to participation in the Indian Ocean trade;<sup>6</sup> even suggesting that Ptolemaic government monopolies stifled the flow of eastern imports, in contrast to a Roman period free market (Raschke 1975: 244; Whittaker 2004: 163, 167; McLaughlin 2010: 29, 169). This latter notion should be treated with some caution since it seems to be partially based on the account of Eudoxus of Cyzicus who is purported to have twice brought back goods from India, and then subsequently had them seized by Ptolemaic monarchs. Strabo does not make it clear to what extent the Ptolemies financed these expeditions but he leaves the strong impression that on the second voyage Eudoxus' cargo was seized not due to some monopolistic policy but because he attempted to misappropriate part of the cargo (Strabo *Geography* 2.3.4; Kidd 1988: 243-4; Habicht 2013: 199).

It is not within the scope of this work to fully engage in this debate, but it is, nevertheless, clear that the scale of Mediterranean participation in the Indian Ocean trade during the Roman period was greater than that which preceded it. This is apparent from a range of evidence, such as the archaeological remains indicating the intensity of occupation at the major Egyptian Red Sea ports during this period (Sidebotham and Wendrich 2007;

---

<sup>6</sup> See for example Warmington 1928: 82; and Fraser 1972: 174, who argue that radical developments took place in the Augustan period (similarly Raschke 1975: 244); see also Strauss 2007: 237-8, who see very little trade happening prior to Roman annexation of Egypt; Parry 1999: 213-4, thinks that traded in Ptolemaic period did not reach India given Strabo's failure to mention the port of Barygaza; P. Gupta 1991: 123, argues that Augustus would have taken time to consolidate his hold over Egypt, implying that the trade did not properly develop until the first century AD; Tchernia 1997a and 1997b, argues for increasing presence of Italian merchants in trade in Julio-Claudian period; Whittaker 2004: 21, argues that Roman annexation brought about increased liquidity that could finance the trade.

Peacock and Blue 2006a; Peacock, Blue and Whitewright 2011). The volume of Roman finds in East Africa, the southern Arabian Peninsula and India also indicate this (Suresh 2004; Tomber 2008; Sidebotham 2011a; see below), and the literary evidence, although impressionistic in nature, seems to complement this picture. For example, Pliny (*Natural History* book 6 and 12) provides a discussion of the schedules and trade routes, as well as the variety of eastern aromatics and spices that could be found at Rome. Also the anonymous author of the *PME*, a Greco-Egyptian merchant (mid-first century) who directly participated in this trade, provides reliable descriptions of the ports of trade and the goods that could be obtained (Casson 1989: 6-8; Cribb 1992: 131-45; Turner and Cribb 1996: 318; Seland 2010: 13); these included the import of spices, aromatics, cotton, silk and precious gems, and the export of wine, metal-wares, glass-wares, and gold and silver Roman coins.

A second point that needs to be addressed, is the cultural and ethnic groups engaged in trade in the Indian Ocean. This article's primary focus is to examine the intensity of Mediterranean participation in the Indian Ocean trade during the Roman period, but this is certainly not to imply that Roman merchants were the only or predominant group engaged in this trade.<sup>7</sup> Indians, Arabians, and Persians, among others, were very much engaged; while those from the Roman Empire who participated were also from diverse backgrounds.<sup>8</sup> There had been a tendency in earlier scholarship to make ethnic assertions about the supposed passivity and non-seafaring character of Indians, in contrast to the pro-active Romans who

---

<sup>7</sup> The term Roman merchant is used as one of convenience to designate subjects or citizens of the Roman Empire who engaged in this trade, and does not specifically designate Romans (from the city itself) or only those with citizenship status

<sup>8</sup> See the Nikanor Archive (*O. Petr.* 200-304) - Tait 1930; and the Berenike ostraka (*O. Ber.*) - Bagnall, Helms, and Verhoogt 2000; for graffiti in the Eastern Desert, see Meredith 1952 and 1953; Bernard 1972; for arguments in favour of the involvement of wealthy Italian financiers and merchants see Tchernia 1997a; Alston 2007; and Rathbone 1983.

were seen as the main carriers of goods (Warmington 1928: 1, 10-11; Lindsay 1874: 130; Wheeler 1954: 1). Such sweeping characterisations are generally absent from more recent scholarship, but in some scholarship there is a subtle and implicit tendency to see the Romans as the proactive partners (explicitly argued by Gurukkal 2013). For instance Miller (1969: 217; see also Warmington 1928: 274-85) argued that it was necessary for Roman coins to be exported to some regions of India in order to create a currency of precious metals with which Roman merchants could trade. More recently C. Meyer (1992: 71) argued that the Indian kingdoms lacked the resources to engage in long distance commerce, while McLaughlin (2010: 39) has speculated that Indian and Arabians who did not own their own vessels probably travelled aboard Roman ships with their own merchandise. It is, however, accepted here that various ethnic groups actively participated in this trade, many of whom already had longed established trade networks preceding the development of more direct Mediterranean participation. This is apparent from a range of archaeological and literary evidence relating to the movement of goods and from seafaring traditions.<sup>9</sup>

The third point to be raised is that while the focus of this article is on seaborne commerce via the Red Sea, which the Romans had direct access to, other routes for trade with the East existed as well. For example, incense was transported from the southern Arabian Peninsula to centres such as Petra, Bostra, Gaza, Antioch and Damascus; while various ‘Silk Roads’ stretched from Syria and northern Mesopotamia through the Euphrates Valley into

---

<sup>9</sup> For Indian seafaring tradition see Ray 1995b: 100-1; Deloche 1996: 201-6; Whittaker 2004: 153; Whitewright 2008: 308-9; Tripathi 2011: 1076-7; for Socotra as an international hub of trade see Strauch 2012; Agatharkhides 5.105a + b = (a) Photius, Cod. 250.103, 459b; (b) Diodorus Siculus 3.47.8-9; for the presence of Arabian and Indian merchants at the Red Sea ports see Fournet 2006: 429 - *I.Portes* 62, *I.Portes* 91; Bagnall et al 1979: 244-5; Mahadevan 1996: 205-8; Salomon 1991: 731-5; Sidebotham 1999a: 7; Whitcomb 1982: 67; Whitcomb 1979: 18; Tomber 2000: 624-30; Tomber 2004: 352-3; Tomber 2005: 226.

Parthian territory (Iraq/Iran), and further into central Asia (Millar 1998; McLaughlin 2010: 83-109; Wood 2002; Young 2001: 197-200).

Indeed, the levels of Mediterranean involvement in Indian Ocean trade via the Red Sea should not be conflated with the wider prosperity of Indian Ocean trade itself. The distribution and dating of Mesopotamian Torpedo jars shows the movement of these wares, almost certainly via the Persian Gulf, in both the later Parthian (c. AD 1-224) and Sasanian (AD 224-651) periods (Tomber 2007b: 974, 977-82). It is clear that eastern goods were brought to the Roman Empire via the Persian Gulf and riverine and overland routes through Mesopotamia. This sphere was under Parthian suzerainty and the limited knowledge and discussion of the Persian Gulf in the *PME* suggests that, in the main, Roman merchants were not directly involved in this region (Salles 1995: 115-46; Millar 1998: 120-1; Young 2001; Rougé 1986: 41-4; Potts 1990, II, 2-6, 10-12, 20-2). A limited amount of Roman material has been found at sites in the Persian Gulf, notably at ed-Dur, such as Eastern Sigillata A (40 BC to AD 60/70) from Syria, B1 from the Levant, and C from Asia Minor (latter half of first century AD); as well as Roman lamps from the Levant and Egypt, and green lead-glazed ware from Asia Minor (Rutten 2007: 9-12, 15-6). Nevertheless, it has been noted by Rutten that the difference between the pottery assemblage of southern Arabia and that in the Persian Gulf confirms the *PME* in showing that the Egyptian-Arabian-Indian route was separate to the Persian Gulf route; the small number of vessels brought up from southern Arabia was likely the result of “piggy-backing” trade, as personal property or as souvenirs (2007: 9-18).

That said, while “Roman merchants” generally did not utilise the Persian Gulf route merchants from the semi-independent state of Palmyra (within the sphere of Roman influence, but not directly controlled until the reign of Aurelian - AD 270-75) certainly did. Indeed, two inscriptions indicate that a 25% tax was levied by an official (“collector of the fourth”) on imported eastern goods (Healy 1996: 34; Inv. X.29; Inv. X.113); a situation



which parallels the collection of a 25% tax at Alexandria (see below) and Leuke Kome (*PME* 19).<sup>10</sup> There are also a number of dedications found in Palmyra which refer to Palmyrene officials accompanying caravans to Vologesias (near Ctesiphon) and Charax, the main mercantile centre of the Tigris and Euphrates deltas (Healy 1996: 35-6; Young 2001: 151-4). The inscriptional evidence is for Palmyrene activity via Mesopotamia and the Persian Gulf is quite notable for the reigns of Trajan and Hadrian, but there is a notable dearth around AD 161-193, and it is likely to have been effected by Roman conflicts with Parthia under Lucius Verus, as well as later emperors such as Septimius Severus and Caracalla. Subsequent conflicts between the Romans and Sassanids likely further hampered the trade, as attested by the cessation in references to Charax from this time, though an expedition to Vologesias is recorded (Inv. III.29 = CIS II.3949; Gorea 2012b: 464-65; Young 2001: 173-5).

### **Strength of the Trade in the Second and Third Centuries?**

Before laying out the case for a late first century peak in Roman participation in the Indian Ocean trade it is necessary to examine the evidence cited by those who argue it continued at similar levels of prosperity until at least the mid-late second century. The Muziris Papyrus is one document that has been used to make this case (Cappers 2006: 5-6; Villeneuve 2007: 18, 26; Whittaker 2004: 21). Broadly dating to the mid-second century, this document records a loan made at or for the purposes of acquiring goods from Muziris (Pattanam) in southern India (*P. Vindob G 40822 Verso*; Casson 1986; Rathbone 2000). The verso of this document records a consignment of ivory, cloth and nard weighing 3.5 tons and valued at (after a small tax deduction) 1,154 Egyptian talents and 2,852 drachmae (almost 7,000,000 sesterii). Rathbone has argued that such large sums were usual because he regards the Muziris Papyrus

---

<sup>10</sup> For the debate about whether this tax was directly collected by Roman officials at Leuke Kome or by was undertaken locally see, Bowersock 1983: 71; Casson 1989: 145.

to represent a copy of a standard contract, on the basis of its careless grammar, syntax and general sloppiness, implying that its form came from a boilerplate (2000: 41). The contract may well have been a standard one, but the lack of comparable documents makes it difficult to be so sure that such sums were common place. Moreover, even if the value of the cargo of the *Hermapollon* is regarded as common for the mid-second century, the *Muziris Papyrus* alone does not tell us whether the volume or value of the trade was similar, greater, or lesser than earlier periods.

Another piece of evidence which has been cited to suggest the continuing importance of trade via the Red Sea during the late-second century is an imperial rescript of Marcus Aurelius and Commodus, known as the *Alexandrian Tariff*, preserved in the *Late Antique Digest* of Justinian (39.4.16.6-7 *Marcianus I.S de delatoribus*). This rescript mentions a *uectigal* (tax/duty) to which a fairly large number of goods were liable at Alexandria. These include a number of spices and aromatics, likely acquired via the Indian Ocean, and items like Indian iron, eunuchs, and hair! However, other goods referred to include Assyrian drugs, Persian gum, Tyrian cassia, and North African wool.

Some scholars have made comparisons between the different goods cited in the *Alexandrian Tariff* and the *PME*, noting that of the 20 plant products mentioned in the former only nine of these appear in the mid-first century *PME* (Warmington 1928: 184-85; Cappers 2006: 3, 5-6).<sup>11</sup> However, it is not clear that such a comparison is informative of the overall state of the trade between the two periods. To begin with, the lack of reference to a particular good in the *PME* is not an indication that it was not traded, as finds of Roman metal-wares and glass-wares across the Indian subcontinent indicates (the *PME* only mentions raw glass and metals to Barygaza, Muziris and Bakarē - Cobb 2011: 211-5, 216-20). Furthermore the

---

<sup>11</sup> The nine corresponding goods are costus, cassia, aloe, lykion, myrrh, malabathron, long pepper, and nard.

Alexandrian Tariff does not deal exclusively with Indian Ocean goods,<sup>12</sup> and therefore cannot be assumed to represent all Indian Ocean goods liable for tax.<sup>13</sup> While these sources may give us an idea of some (but not all) of the goods being traded in the mid-first (*PME*) or the late-second century (Alexandrian Tariff), it is not possible to infer from the variety of goods mentioned anything about the volume in which they were traded.

The presence of Roman soldiers on the Farasan Islands in the southern Red Sea has also been cited by Villeneuve, along with the Muziris Papyrus, as an indication of the importance of Roman trade in the Indian Ocean by the mid-second century (2007: 18, 26; see also Whittaker 2004: 21). The presence of these soldiers is mentioned in two Latin inscriptions. The first from Farasan al-Sughra can be dated AD 144, and records the presence of a *vexillatio* of the *legio II Traiana Fortis*. The second more fragmentary inscription from Farasan al-Kubra mentions the *legio VI Ferrata* and it is thought that this detachment may have come while the legion was in Arabia around AD 110-120 (Villeneuve 2007: 24-5). These islands are around 1,000km south of the Roman Red Sea port of Berenike, and strongly indicate that a Roman naval presence existed in the Red Sea at this period. Reference to a Lucius Longinus who served on the *Hippokampos*, a dispatch galley (*tessararia*) mentioned in a papyrus from Myos Hormos (AD 93) support this view. It has been reasonably suggested that their presence was to protect the merchants from pirates and to prevent smuggling (Villeneuve 2007: 25).<sup>14</sup> However, broader strategic concerns may also

---

<sup>12</sup> McLaughlin 2010: 105, speculates from the third century Chinese text the *Weilue* that goods from Persia may have theoretically been shipped through the Persian Gulf, around the Arabian Peninsula and up the Red Sea, and thus sees the Alexandrian Tariff as dealing exclusively with Indian Ocean imports. However the Levantine and North African items detract from this notion.

<sup>13</sup> Young 2001: 209, has noted that nothing in the Alexandrian Tariff indicates that it can be equated with the *tetarte*, the 25% tax which was levied on Indian Ocean goods at Alexandria.

<sup>14</sup> For the *tessararia* see P.004 – Van Rengan 2011: 335-6.

have been an important motive for the presence of these troops, and it cannot be asserted that their presence was solely contingent on protecting merchants and combating pirates.

Finally, the presence of Palmyrenes at a number of sites connected with the trade via the Red Sea around the late second and early third century needs to be addressed. At Koptos an inscription dating to the second half of the second century has been found which records the gratitude of a group of merchants from Hadriane Palmyra, to Zabdalas, son of Salmanos, a merchant of the Red Sea. This was because he had paid for the construction of a *propylaea*, three *stoa*e and *thuromata*, from his own funds (*I. Portes* 103; Young 2001: 80-81). This inscription certainly attests to the presence of a community of Palmyrene merchants at Koptos and, more tentatively, Sidebotham has suggested a Palmyrene merchant headquarters (1986: 95; also Sidebotham 2011a: 211-12). In addition a Greek and Palmyrene inscription at Denderah (c.AD 160-212) refers to Julius Aurelius, who was part of a community of merchants and *naukleroi* (captains or ship-owners), complementing the evidence from Koptos (Sidebotham 1986: 95-6; Sidebotham 1989: 487; McLaughlin 2010: 105). The discovery of a wooden tablet with Palmyrene text at Hoq on the island of Socotra (a few hundred kilometres from the Horn of East Africa) further strengthens the evidence that Palmyrene merchants were trading via the Red Sea in the third century AD (Gorea 2012: 452-3; Dridi 2012: 461-2).<sup>15</sup>

Part of the reason for this Palmyrene presence may be a result of the hostilities between the Roman and Parthian/Sasanian empires during this period, which appears to have impacted on their trade via the Persian Gulf (see above). It is also notable that the presence of these Palmyrene merchants parallels the presence of Palmyrene soldiers (specialists in desert warfare) at various sites connected with the Eastern Desert. This can be seen from an inscription at Berenike recording a dedication to the Emperor Caracalla (September 8<sup>th</sup>, AD

---

<sup>15</sup> The date of July AD 258 has been proposed from a textual reading - AD 78-239 on the basis of radiocarbon dating; if textual date stands the text was written on wood obtained from a tree at least twenty years prior.

215) by the auxiliary soldier Marcus Aurelius Mokimos, and also two dedication to the Palmyrene god Yarhibol at Koptos and Berenike with likely late-second to early third century dates (Alston 1995: 188; Alston 2007: 4; Verhoogt 1998: 193-8; Sideobtham 2011a: 63-6). Whether the presence of Palmyrene soldiers acted as a motivating (or facilitating) factor in the apparent increase in the presence of Palmyrene merchants at this time would be difficult to prove, but it is not difficult to imagine some link. These inscriptions provide useful snapshots of the conduct of the trade or Palmyrene activity at specific points, but like the evidence examined above, do not easily lend themselves to discerning broader trends relating to the intensity of Roman trade. The comparatively more limited evidence for Palmyrene involvement in the Red Sea trade during the first century is hardly indicative of the lesser scale of trade at this time.

The caveats given for the different pieces of evidence discussed above is not intended to suggest that Roman participation in the Indian Ocean trade ceased, or became negligible, from the second century, only that the nature of this evidence means it is not amenable to determining the volume of trade at this time. Instead, it is argued that Roman participation in the Indian Ocean appears to reach a peak broadly in the latter-half of the first century, and that after this time there appears to be a decline in the volume of Roman trade. This argument is made on the basis of patterns interpreted from the archaeological and numismatic evidence found across different regions involved in the Indian Ocean trade. The nature and spread of this evidence, it is argued, can provide a broader indication of trends.

### **Archaeological Evidence: Roman Goods**

Due to the international nature of the trade archaeological excavations have been conducted at many sites, and thus standards and thoroughness in recording material is not always consistent. Suresh has noted such problems in earlier excavations in India which often

focused on recovering antiquities rather than examining settlement patterns (2004: 21). Another problem is that the extent and intensity of archaeological work undertaken in different regions. The level of fieldwork undertaken in East Africa being comparatively more limited than that in Egypt, the Arabian Peninsula, or India. Such imbalances may complicate attempts to draw quantitative conclusions about the volume of trade to particular regions.<sup>16</sup> However, examination of the archaeological material can at least provide statistical data for the number of finds and their chronology at individual sites. This allows chronological patterns seen at particular sites to be compared in order to determine broader overall trends. The surviving material from various sites across East Africa, the southern Arabian Peninsula, and the Indian subcontinent, strongly suggest that the most intense period of contact and exchange of Mediterranean goods, whether conducted by Roman merchants or other groups, date to the first century, while there is indications of decline by early-second century.

Beginning with the more limited material from East Africa the finds generally show that the most intense period of contact was during the first century BC to first century AD. In particular, the glass-ware at Heis (Munda of the *PME?*) belongs to the first-half of the first century, while the occupation at Heis, Damo and West Hafun (Opone of the *PME?*) seems to be limited to the late Ptolemaic and early Roman periods (Smith and Wright 1988: 124; Horton 1996: 447-50). It has been suggested that some beads found on Mafia Island and at Kilwa may be Graeco-Roman and date broadly around 100 BC-AD 200 (Chami 2000: 211; see also Sinclair 2007: 148). But this interpretation has not found favour elsewhere, and it has been argued that these types of glass beads were probably imported (and reworked) from the late first millennium AD (Helm et al 2012: 40, 58-9).

---

<sup>16</sup> Similar issues beset the quantification of the archaeological material in the Roman Empire – see Wilson 2009: 214; also Bowman and Wilson 2009: 7-15.

More easily identified are pottery forms which can often be narrowed down to a comparatively limited chronological period. This is notable from the recent survey at Adulis, an important port mentioned by the author of the *PME* (4-6; see also Pliny *NH* 6.34.172-74; Cosmas *Christian Topography* book 2). The Roman pottery found at several areas associated with this port appears to mainly date from first century BC to first century AD (principally Dressel 2-4 and Eastern Sigillata A) or the late Antique and early Byzantine period (notably Late Roman 1 and 2, and pottery from Aila). The only potential bridge between these two periods is a handle fragment of a possible Gauloise 4 amphora, dating anywhere between AD 50 to third century (Peacock et al 2007: 79-108; Peacock, Blue and Glazier 2007: 126-8).

A number of sites in the southern Arabian Peninsula have revealed finds of Roman goods. At Qana' (Kane of the *PME*) the pottery types found in the earliest or "lower" period (mid-first century BC to late-first century AD) are predominantly Mediterranean imports. In this section about 56% of the amphora fragments are Koan and Dressel 2-4 shapes, produced in several fabrics including Koan or east Aegean, Egyptian, and a dark red sandy clay. Some of these amphorae fragments are similar to types found in Italy. Terra Sigillata from the earliest period is mostly Eastern Sigillata, though some is possibly of western Mediterranean origin (Sedov 1996: 12-6). Occupation at Qana' continues into the "middle" (second to fifth centuries) period, the sites heyday, and the "upper" period (sixth to early-seventh centuries). The Koan and Dressel 2-4 types disappear before the middle period, but Roman amphorae, nevertheless, continues to appear, particularly in the form of North African and "North African-Gallic" wares. The overall picture seen at Qana' is characterised by Sedov as one in which trade connections with the Mediterranean had reduced by the late first century AD, but had 're-activated' during the second to fifth centuries, only 'not at the same level as before'; this 'reduction of Mediterranean objects' was in context in which the port was expanding and an increasing amount of Mesopotamian and Indian wares were imported (Sedov 1996: 16-9;

Sedov 2007: 76-89, 92, 104). A further reminder that Roman participation in the Indian Ocean trade is not necessarily marker of the wider prosperity of trade within the Indian Ocean as a whole. At ed-Dur, on the coast of the Persian Gulf, Roman finds conform to the general dates seen elsewhere in the Indian Ocean, between the last quarter of the first century BC and the end of the first century AD (Rutten 2007: 18-20). While the Mediterranean glassware at Khor Rori (Moscha Limen of the *PME*) also dates between mid-first century BC and the early-second century AD (Lombardi, Buffa, and Pavan 2008: 402).

In the Indian subcontinent (including Pakistan and Afghanistan) a range of different Roman finds have been recorded. One of the most prolific (alongside coins) is pottery, primarily amphorae. Most estimates suggest around 50 or more sites reporting Roman amphorae, with Dressel 2-4 types being most commonly recorded.<sup>17</sup> Not all of this material has been dated, but from the sites where more detail and analysis has been undertaken the pattern seems to show a predominance of amphorae of the first century BC to first century AD. This pattern is apparent from the port of Arikamedu (near Pondicherry) in southeast India where several hundred, mostly Koan and Dressel 2-4, amphorae sherds are attested. Indeed Mediterranean finds from this site dwindle by the end of the first century and beginning of the second century (Begley 1996: 12, 22; Begley 2004: 9-10; Will 2004: 328). At the site of Pattanam in Kerala, thought to be ancient Muziris, thousands of amphorae sherds have been unearthed. This material is still being processed but most appear to be Dressel 2-4 types dating from the late-first century BC to first century AD (Abraham 2009, 18, 21; Selvakumar, Shajan, and Tomber 2009: 35-6; Cherian et al 2009: 236-40; Cherian 2009-10: 154-5; Sidebotham 2011a: 191). Some of the 63 Roman amphorae sherds unearthed at Nevasa in western India (Maharashtra), after detailed examination, show that they

---

<sup>17</sup> For various estimates see Agarwala 1985: 5; Slane 1991: 212; Thapar 1997: 13; Suresh 2004: 99, 182-3, App. 3; Will 2004: 334-404; Tomber 2009: 48. Ray 2010: 10, states that c. 55 sites in India reveal Dressel 2-4.



comprise the “black-sands” fabric typical of Campania (Gupta, Williams, and Peacock 2001a: 11-4). The layers in which they were found date between 25 BC to the early-second century AD, but elsewhere Williams and Peacock (2005: 140-8) have argued that such amphorae are likely to date prior to AD 79 as a result of the damage done to the Campania wine industry by the eruption of Vesuvius.

Metal-ware and glass-ware finds in the Indian subcontinent also conform to the broad patterns seen from the Roman pottery. At Begram (Afghanistan) numerous items of Roman glassware, earthenware and bronze objects were discovered sealed together in two rooms (Hiebert 2011: 62-63; Mehendale 2011: 131-32, 140-3; Cambon 2011: 149, 152, 160-1). Whitehouse believed that stylistically many of these glassware objects may range in date from AD 50-125 (1989a: 151-7; 1989b: 94-6). However, recent interpretation has placed them firmly within the first century, and some of these finds, like the ribbed bowls, show parallels to finds at ed-Dur and Arikamedu.<sup>18</sup> Further parallels between the finds at Begram and those at Taxila/Sirkap (Pakistan), as well as parallels with both sites to Tillya Tepe (Afghanistan), suggest that the finds from Taxila/Sirkap can also be dated to the first century (Cambon 2011: 160-1; Sarianidi 2011: 214; Schiltz 2011: 225-7).

## **Archaeological Evidence: The Red Sea and Eastern Desert of Egypt**

### *Red Sea Ports*

In addition to the patterns indicated by the date and distribution of the Roman goods just discussed, the archaeological and written evidence from the Red Sea ports of Myos Hormos and Berenike are also important indicators of the intensity of Roman participation in the Indian Ocean trade. A variety of literary, papyrological and inscriptional evidence reveal that

---

<sup>18</sup> All pieces are Roman as they belong to the same chemical family and likely originated in Egypt. See, Cambon 2011: 152-3; Suresh 2004: 134; Brancaccio and Liu 2009: 222; Mehendale 2010: 131-5, 140.

these were the two main ports through which Roman trade in the Red Sea was conducted and that Koptos was the main centre on the Nile where these goods were sent out and received.<sup>19</sup> Furthermore, the importance of these two ports is indicated by a number of stations that were established on the routes leading from Koptos to Myos Hormos and Berenike (see below).<sup>20</sup>

The port of Berenike is located on the cape of Ras Banas in Foul Bay, and had been founded by Ptolemy II (Pliny *NH* 6.33.168). The archaeological evidence reveals the fluctuating prosperity of this port from the third century BC to the mid-sixth century AD. In particular the evidence suggests the first century was a peak period of prosperity which was followed by a dramatic decline in occupation after the early-second century, and a modest recovery starting in the mid-fourth century (Sidebotham, Hense, and Nouwens 2008: 161-2, 171-2; Barnard and Rose 2007: 183). These contrasts are reflected in the identifiable material and written finds, as well as the coins at Berenike; of the latter, 41% were minted in the Augustan period and first century, the majority being issued in the reigns of Claudius, Nero, and the Flavians; while only 9% date to the second and third centuries.<sup>21</sup> Cartouches dating to the reigns of Trajan and Marcus Aurelius at the temple of Khem at Berenike, as well as a the military dedication seen at Berenike around the late-second to early-third century (see above) certainly indicate that activity had by no means ceased at the port at this time (Sidebotham

---

<sup>19</sup> See literary description in Strabo *Geog.* 17.1.45; Pliny *NH* 6.26.102-3; an inscription of tolls for travellers across the Eastern Desert - Koptos Tariff - *OGIS* 674 = *IGRR* I. 1183 = *I. Portes* 67; see also the Muziris Papyrus which mentions a public customs house at Koptos - *P. Vindob.* G 40822 recto, col. 2.4-9; for delivery of goods to Myos Hormos and Berenike see the business receipts of Nikanor family (Nikanor Archive - *O. Petr.* 200-304), and the customs receipts found at Berenike (*O. Ber.*).

<sup>20</sup> For Myos Hormos, see Peacock and Blue 2006a; for Berenike, see Sidebotham and Wendrich 2007; Sidebotham 2011a.

<sup>21</sup> Sidebotham 2011a: 244 – the fourth to fifth centuries make up 34% - the coins found are almost exclusively Egyptian; see also Sidebotham 1999; Sidebotham 2000: 169-178; Sidebotham and Seeger 1996.

1986: 158-9; Sidebotham 1989: 490; Sidebotham 2011a: 63-4, 211-2). But the patterns for the intensity of occupation at this site would suggest a less significant volume of goods coming through this port compared with the first century.

The port of Myos Hormos is located at modern Quseir al-Qadim and was founded at some point in the Ptolemaic period, as shown by the comments of Agatharkhides and Strabo.<sup>22</sup> It appears that the site was abandoned by the early third century due to silting, partial submergence, and possibly, indirectly, as a result of the series of crises faced by the Roman Empire in the third century, though the site would later be reutilised in the Ayyubid and Mamluk periods (Whitcomb 1979: 37; Blue 2007: 265, 74-75). Like Berenike, the port of Myos Hormos also seems to show signs of disuse and abandonment in various parts of the site during second century. The harbour area at Myos Hormos, which includes a jetty and workshops (notably iron-smelting furnaces), shows a lot of activity for late-first century BC and first century AD. Conversely the jetty and a number of these workshops appear to have fallen into disuse during the second century (Copeland et al 2006: 116-154, Peacock et al 2006: 67-94; see Appendix 1).

In the town area at Myos Hormos some of the Roman material has been mixed up with the Islamic material as a result of the digging of pits in later phases of occupation. Nevertheless the excavators were still able to determine patterns of occupation. The town area includes civic and religious buildings, domestic and commercial storage areas, a “poor quarter” and bakery, and waste mounds (C. Meyer 1982: 201-13; Copeland et al 2006: 118, 121-6, 128-33; Peacock and Blue 2006b: 176; Tomber 2008: 61). The chronological picture

---

<sup>22</sup> Agatharkhides 83a + b + c = (a) Photius Cod. 250.80, 456a = (b) Diodorus 3.39.1-2 = (c) Strabo *Geog.* 16.4.5; see also Strabo *Geog.* 2.5.12. For the ports identification see Peacock 1993: 229-30 (satellite analysis); and ostraka from Maximianon - Bülow-Jacobsen, Cuvigny, and Fournet 1994: 27-42 - *O. Max.* 175, 253, 254, 267, 279, 467; and Myos Hormos – Papyrus P.004 – Van Rengan 2011; Tomber et al 2011.

is more mixed, but it shows some significant buildings being constructed and occupied during the first century, followed by disuse and lack of maintenance during the second century. Many areas of refuse dumping show concentrations of first century material, although one area also shows occupation material peaking in mid-second century, with even a little third century material (Copeland et al 2006: 116-154, Peacock et al 2006: 67-94). Some of the material finds also seem to conform to this pattern, with the largest numbers of amphorae stoppers, ceramic lamps, brail rings and terracotta figurines dating from the Augustan period into the first century (Thomas 2011a and b; Peacock 2011a; Blue, Whitewright and Thomas 2011: 208-09). In addition most of the written evidence (primarily papyri and ostraka) dates to first second century, while about two-thirds of the identifiable coinage was minted in the Augustan period and first century (Van Rengan 2011; Sidebotham 2011b; see Appendix 1).

#### *Fortifications and Security in the Eastern Desert*

A number of stations or fortlets, known as *praesidia*, lined the routes leading from Koptos on the Nile to the ports of Myos Hormos and Berenike. These *praesidia* may have acted as places of refuge in addition to protecting the wells (*hydreumata*) and cisterns (*lakkoi*) located within them (Cuvigny 2006b: 267-73; Cuvigny 2006c: 353-57). Military garrisons, consisting of cavalry and infantry, were housed in these *praesidia* and on the basis of duty rosters may have number 22-24 men on average (Cuvigny 2006c: 307-10). Some ostraka from the *praesidium* (fortlet) of Krokodilo (on the Myos Hormos route) refer to soldiers escorting travellers, though not always in large numbers, and often on the explicit instructions of the prefect in charge of the region (*Praefectus Montis Berenicidis*), rather than as a matter of course. It is likely that these soldiers also had the function of monitoring smugglers, who may have tried to bring valuable goods across the Eastern Desert without being assessed for tax (Cuvigny 2005; Cuvigny 2006d and e; also Young 2001: 69-74).

Many of the dozen or so praesidia lining the route to Myos Hormos have been excavated under the auspices of the Institut français d'archéologie orientale, and show evidence for occupation primarily from the Flavian period (AD 69-96) onwards (Reddé and Brun 2006: 73-185; Brun 2006a: 187-205). A number of ostraka have been unearthed from these praesidia, especially Maximianon and Krokodilo; the latter praesidium revealing a collection dating from AD 102/3 to 118 (Brun 2006b. 61-71). On the Koptos to Berenike route a number of inscriptions at various praesidia also indicate that the Flavian period was a major time of (re)construction. One inscription from Sikyat describes how in the ninth year of Vespasian (AD 76/77), the prefect of Egypt, Iulius Ursus, ordered the construction of a well there. Cuvigny notes that the language used in this inscription parallels almost word for word that seen on a more lacunas one from Aphrodito, suggesting that the building activity at this site also belongs to the Flavian period.<sup>23</sup> Another inscription at the praesidium of Didymoi reveals that this fortlet was established on the orders of the prefect of Egypt Mettius Rufus (AD 89-92) (Brun 2006a: 19).

These routes were certainly in use prior to the Flavian period, as attested by numerous graffiti left at stopping points in the Eastern Desert, and comments by Strabo showing that stations had existed since the time of Ptolemy Philadelphus (283-246 BC).<sup>24</sup> However, the Flavian period was clearly a time of major building activity. Suggestions have been made that this was due to the growing threat the nomadic populations posed to those crossing the Eastern Desert, possibly as a result of the increasing use of camels which allowed more effective raiding.<sup>25</sup> In particular, Cuvigny has cited a partially surviving inscription (two of

---

<sup>23</sup> For these inscriptions see Cuvigny 2006c: 356; Aphrodito inscription - *I.Pan* 68.

<sup>24</sup> See Bernard 1972: 15; Young 2001: 41; *I Koptos* 3, 38-39 (Augustus); 41, 42, 43, 44, 45, 46, 47, 48, 49 (Tiberius); 1 (Claudius); 50 (Nero); 51 (Titus); 52, 53 (Domitian); 4, 5, 54, 55 (Hadrian); 56 (Antoninus); 57 (Maximinus Thrax); Strabo *Geog.* 17.1.45.

<sup>25</sup> See Brun 2006a: 196; Strabo *Geog.* 17.1.53; see also Murray and Warmington 1967: 29 (use of camels).

six slabs survive) which refers to Roman military personnel who, in the course of some months, constructed cisterns at Apollonos Hydreuma, Compasi, and Berenike, while also building a camp at Myos Hormos. They also record the soldiers' names and the centuries and cohorts to which they belonged.<sup>26</sup> She argues that since the inscription refers to the creation of *lakkoi* rather than *praesidia* in the Eastern Desert it shows that unfortified cisterns were all that was required in the Julio-Claudian period (Cuvigny 2006b: 267-73; Cuvigny 2006c: 353-7). This inscription is often thought to date to the reign of Augustus or Tiberius, but its dating is not certain, and has led to debates revolving around soldiers' names and who granted many of these eastern legionaries their citizenship.<sup>27</sup> Such an approach is clearly inconclusive, but given the construction work taking place at Sikyat, Iovis, and Didymoi in the Flavian period, it would not be implausible to believe that the *lakkoi* constructed at Compasi and Apollonis Hydreuma also dated to around the same time (Sidebotham 2011a: 154; Cobb 2011: 86-90).

Whatever the actual date of the aforementioned inscription, the archaeological evidence, ostraka and other inscriptions, strongly suggested the need to (re)construct and fortify the facilities on the Koptos to Myos Hormos and Berenike routes during the latter first century. That one of the major reasons for this was due to the potential threat posed by some of the indigenous groups of the Eastern Desert is supported by a number of ostraka from the *praesidium* of Krokodilo. They reveal the sometimes tense relations between the soldiers and inhabitants of the *praesidia* with the indigenous groups referred to as *barbaroi* (Barbarians) in these texts (Cuvigny 2005). One ostrakon records the theft of several camels by 18 *barbaroi* and an injury sustained by the cavalryman Lucretius Priscus who was part of a perusing party

---

<sup>26</sup> For discussion see Kennedy 1985: 156-7; Young 2001: 44; Alston 1995: 30; Syme 1995: 249.

<sup>27</sup> Syme 1995: 249 – suggesting Augustan date due to the presence of two legionaries with the name Lollius, both from Ancyra, (M. Lollius was legate of Galatia in 25-22 BC); Alston 1995: 30 - had suggested that the presence of a soldier called P. Flavius son of P, indicates a Flavian date; however, contra Alston 2007: 3.

(AD 108), while another report warns the soldiers to be on their guard.<sup>28</sup> There are a number of other accounts besides these.<sup>29</sup> Other evidence also indicates that the Roman military took systematic action against some of these indigenous groups. Notably, one papyrus (c.AD 60-94) refers to an engagement between the Roman military and Ethiopians and Trogodytae (the latter another vague term for inhabitants of this region).<sup>30</sup> In addition, a Sulpicius Serenus (possibly Servius, tribune of *legio XXII* and prefect of *ala Voconces*) has left an inscription giving thanks for a speedy victory over the infamous *Agriophagoi* (Wild-Animal Eaters) who were massacred and whose camels and booty were seized.<sup>31</sup>

It has already been argued that the peak of Roman participation in the Indian Ocean trade and the exchange of Roman goods in this region seem broadly to date to the first to the first century. It will further argued in the numismatics section below, that this peak is most pronounced in the Flavian period. Thus one of the causes behind this apparent increase in hostilities and need for security in the Eastern Desert should be connected with the increase in traffic and hence further encroachment onto the land and resources of the indigenous population, as well as the large number of tempting targets for plunder.

### **Numismatic Evidence: Roman Coins in India**

In the Indian subcontinent large numbers of Roman aurei (gold coins) and denarii (silver coins) have been discovered, most of them contained within hoards, but also as surface finds, and some in excavations. By comparison, very few of these types of coins have been

---

<sup>28</sup> See Cuvigny 2005: 36 - K534 (raid by barbarians), 96 - K694 (be on guard).

<sup>29</sup> For hostile interaction with the “barbaroi” see Cuvigny 2005: 135-58 – especially *O.Krok. 87* (the “Amphora of the Barbarians”) which records an attack by on the station of Patkoua in Lower Nubia by 60 barbaroi.

<sup>30</sup> See, E. Turner 1950: - Papyrus 40 ‘della raccolta Milanese (Collezioni del Castello di Milano)’.

<sup>31</sup> See, Cuvigny 2006c: 348-9 – *I. Pan 87*; see also *PME 2*.

discovered in East Africa or the southern Arabian Peninsula. However, the author of the *PME* does mention demand for them in various ports across these regions. The terms employed being *dēnarion* (denarius) and *khrēma* and *khrēmata* (“money”) often with the adjectives gold and silver.<sup>32</sup> It is difficult to know how much gold and silver may have been exported from the Mediterranean in the form of ingots. However, given that the author of *PME* chose to explicitly refer to the export of these precious metals in the form of coins or money, as well as crafted gold and silver items (which were, no doubt, valued not as bullion but as high quality artistic objects), then it seems reasonable to believe that the use of coins was a common and practical method of exporting precious metals, and are likely to have been regarded, at least partially, as bullion by its recipients (Sidebotham 1986: 46; Sidebotham 2011a: 245; Young 2001: 205; Cobb 2011: 220-3, 230).

The discovery of Roman coins in India raises some problems of interpretation. Many discovered, particularly before the mid-twentieth century, have been lost, stolen or redistributed to collectors and museums without sufficient record, often compelling scholars to rely on written accounts and published photographs.<sup>33</sup> An example of such problems is seen with the discovery at Kottayam (Kerala) in 1847 of a bronze vessel on the slope of a hill by the coast. This vessel was said to have contained gold aurei, which have been subsequently lost. The nineteenth century accounts state that the find was equivalent to no-

---

<sup>32</sup> *PME* 6, 8 – East Africa - for the Barbaroi, a little Roman money (*dēnarion oligon*), at Malaô, Roman money both gold and silver (*dēnarion ou polu, khai, khrousoun de khai arguoun*) 24 - Southern Arabia – at Muza, money (*khrēma*), 39, 49, 56 – Indian Subcontinent – at Barbarikon, money (*khrēma*), at Barygaza, Roman money (*dēnarion khrousoun khai arguoun*), and Muziris and Bakarē, lots of money (*khrēmata pleista*). For a commentary on the text see Casson 1989.

<sup>33</sup> For plates with images of some of these coins see Turner 1989; Radhakrishnan 1999.



less than five cooly-loads which Turner equates to roughly 8,000 aurei.<sup>34</sup> There are also problems with corrosion (more susceptible with silver) and preservation. The Akkenapalle and Budinatham denarii survived in lumps, the outside a congealed mass of silver sulphides, while the coins on the inside were protected from the air and thus remained un-corroded (P. Turner 1989: 14-5; Howgego 2009: 291). Despite these difficulties there is certainly sufficient information to interpret patterns from these coins, especially those within hoards.

In the Indian subcontinent there are around 170 recorded finds of Roman coins dating from Augustus to early third century, and these are spread over about 130 sites. Two regions, in particular, show major concentrations of Roman coins. The first concentration is of primarily Julio-Claudian denarii around the Coimbatore district (Tamilnadu) in southern India; this is the area around which the Cera, Pandya and Cola kingdoms met. The second is in the areas around the Krishna River in Andhra Pradesh (eastern India), consisting predominantly of post-Julio-Claudian aurei (Suresh 2004: 26, 31; P. Turner 1989: 5). Some Republican denarii have been found at a few sites, mostly in western areas such as the Laccadive Islands and Kerala (Singh 1988: 101; Suresh 2004: 153-4). Large numbers of bronze coins, mostly Late Antique in date, have been discovered in Sri Lanka; while a number of gold solidi (dating from Constantine onwards) have been revealed in various parts of India (Bopearachchi 1996: 68-70; Suresh 2004: 38-40). However, these Late Antique coins do not fall within the scope of this article.

Some of these coins have features such as slash marks and punch-marks, while imitation coins, both high quality (near parity in weight and purity) and base metals coated by silver, have been found. Most of these features and imitations are generally thought to originate in India, though their purpose is open to much debate, notions ranging from

---

<sup>34</sup> P. Turner 1989: 8-9, 62, estimates that a cooly (manual labourer) could reasonably carry 25lb of gold; see also Suresh 2004: 26, 170-1.

checking for purity, invalidating coins for circulation, authorising coins for circulation, identifying markers, and supplementing genuine Roman coins in order to circulate as currency (Warmington 1928; P. Turner 1989; Suresh 2004; Shastri 2004; Satyamurthy 2004; C. Gupta 2004). However, these issues do not directly fall within the scope of this article.

It is not always possible to be precise about the number of Roman coins in particular hoards discovered in India. Nevertheless, it has often been estimated that near to 6,000 denarii have been found in the Indian subcontinent, while estimates of aurei range from roughly 1,200 to 1,550 (if the lost Kottayam and Parur hoards are included then perhaps 10,550 aurei).<sup>35</sup> A significant majority of the denarii and aurei found in India were minted under the Julio-Claudian emperors. Notably, there are approximately 1,400 coins of Augustus, 2,500 of Tiberius, 35 of Gaius (Caligula), 300 of Claudius and 200 of Nero (Sidebotham 1986: 27; Suresh 2004: 31, 160-77). This means that almost two-thirds of these coins were minted in the Julio-Claudian period.<sup>36</sup>

The exact date when these coins were exported is a matter of great controversy, since it is debated whether their state of wear is the result of circulation within the Roman Empire or India. A coin in good condition may indicate it was exported relatively soon after being minted and that it was not circulating much subsequent to its export, while a worn coin usually indicates a degree of circulation (whether in the Roman Empire or India) prior to burial or loss. It is also debated whether these coins were a regular item of export to India or

---

<sup>35</sup> For these estimates, see P. Turner 1989: 23; De Romanis 2012: 167; Tchernia 1995a: 1003; Tchernia 1995b: 154; Tchernia 1997b: 264; Whittaker 2004: 21; Tomber 2009: 42; see also a report of 2,000 Roman gold coins in good preservation from Ahmedabad which was purportedly discovered in the 1960s, but of which disappeared without detailed record – Rajgor 2004: 69; see also Appendix 3.

<sup>36</sup> De Romanis 2012: 167, asserts that 5,728 denarii (6% are Republican, rest almost all Julio-Claudian) and 1,243 aurei can be reliably identified (see also Appendix 2). Therefore 5,728 identifiable denarii + 1,243 identifiable aurei – calculates to  $4,435/6,971 \times 100 = 64\%$ .

were instead shipped in a concentrated period as the result of specific events within the Roman Empire. It is these issues which need to be address in order to use these coins as a chronological indicator of Roman trade with India.

MacDowall has argued that most of the Roman coins found in India were exported as a result of the currency reforms of Nero (AD 64) and Trajan (AD 107) (1991: 145-53; 1996: 81-92). That is to say that Roman merchants saw the benefit of exporting older and heavier (and in the case of the denarius purer) coinage, which had the same notional value as the newer and lighter coins in the Roman Empire, but that were treated as bullion in India. A process which MacDowall believes intensified as a result of Trajan's desire to remove old coins from circulation.<sup>37</sup> Burnett, in conjunction with this, has argued that Roman coins cannot be used as indices of trade, and asserts that the process of selecting certain coins means that they came as large shipments rather than as continuous supplies (1998: 185-87; see also J. Meyer 2007: 60-61; Mukherjee 2004: 2-3).

The main basis for Burnett's claim lies on the frequency of certain coins types. Specifically those featuring Gaius and Lucius Caesar of which 25% of the Augustan coins appear to have been of this type, and the Pontifex Maximus type (minted under Tiberius).<sup>38</sup> However, the problem with this theory is that the Gaius and Lucius issues were struck in immense numbers for over 15 years (2 BC-AD 14), and the Pontifex Maximus issues were minted uninterruptedly for near 23 years of Tiberius' reign (Mattingly 1923: lxxiii, cxiv; Sutherland and Carson (1984), 28; MacDowall 2004a: 10). Furthermore, the largest proportion of these have been found in the Budinathan hoard, which contains 369 Gaius and Lucius denarii of Augustus and 1029 Pontifex Maximus denarii of Tiberius (MacDowall 1996: 87); potentially skewing the picture presented by Burnett. Moreover, while the Gaius

---

<sup>37</sup> Cassius Dio 68.15 – in AD 107 Trajan recalled older, worn coinage to be melted down.

<sup>38</sup> Gaius and Lucius - RIC 2.207ff; Pontifex Maximus (PONTIF MAXIM) - RIC 2.25ff; P. Turner 1989: 21.

and Lucius issues are common, over 40 different types of Augustan coins have been found in India (Radhakrishnan 1999: 14-16).

As noted above, the author of the *PME* does not regard coins as an unusual trade item, but in fact a convenient form of gold and silver to export. It is not surprising that common recognisable, and hence trustworthy, coins would be exported, as this would reduce the need to weigh and assay coins so frequently (MacDowall 1991: 147-9; MacDowall 1996: 83, 89).<sup>39</sup> In addition, De Romanis has pointed out that a restriction of coin exports to after AD 64 contradicts Tiberius' purported complaint about the outflow of coins to foreign or hostile nations (AD 22). It also contradicts Pliny's account of Annius Plocamus who while sailing in the Red Sea was accidentally blown off course to Taprobane (Sri Lanka), and subsequently impressed its king with his denarii minted by different emperors but of the same weight and purity; an account placed within the reign of Claudius (De Romanis 2012: 171; Tacitus *Ann.* 3.53; Pliny *NH* 6.24.84).

MacDowall, to support his claim that many of these Roman coins were exported to India as a result of the aforementioned currency reforms, argues that many of these coins were in a worn condition. This is clearly the case for many of the Julio-Claudian aurei (see below); however, the picture is more mixed for the denarii. MacDowall notes that the Nasthullapur and Vellalur hoards have a lower weight range than the Akkenapalle hoard which averages is 3.3-3.8 grams. The weight ranges of the hoards at the former two sites are comparable to hoards buried during the Flavian period in the Empire (such as Bucklersbury House and Mildenhall).<sup>40</sup> He also notes that the hoard found in Budinathan, has among the many Augustan and Tiberian denarii, an Augustan denarius countermarked with IMP VESP -

---

<sup>39</sup> For parallels of exporting coins in overland trade with the East see De Romanis 2006: 59-69.

<sup>40</sup> MacDowall 1996: 86 – (Vellalur 3-3.6 g, some even less than 3 g); also P. Turner 1989: 70-1 – (Nasthullapur – Augustan denarii 3-3.8g, Tiberian denarii 2.6-3.7g).

Imperator Vespasianus (MacDowall 1996: 87; contra De Romanis 2012: 170-2). In addition the Pakli hoard, or the 23 coins that were not dispersed unrecorded among private dealers, show a mostly Republican to Tiberian range, but there is one denarius of Hadrian.<sup>41</sup>

However, many reports describe denarii surviving in relatively good and unworn conditions. The Pollachi, Karur, Kathanganni and Bangalore (HAL Airport) hoards are variously described as having high weights, and being bold and distinct. Physical examination of the Budinatham and Akhilandapuram hoards by Turner also shows denarii in relatively good and unworn conditions (P. Turner 1989: 15-6, Pl. V). The state of the coins in the Akkenapalle and Nasthullapur hoards is more diverse, with some coins in better conditions than others. In addition, slash marks, on the busts, and a number of punch marks, including Indian symbols, appear on a fair proportion of these coins. However, both these hoards are associated with monastic sites which may have acted as banking centres. Thus their varied conditions and other features may result from their being assembled from a variety of different origins within India.<sup>42</sup> Sutherland and Carson suggest, as a rule of thumb, that silver coins in circulation tended to have only a 50 year lifespan, though others have argued for longer circulation (Sutherland and Carson 1984: 10; contra MacDowall 1996: 82; MacDowall 2004a: 9; Duncan-Jones 1994: 181, 191, 205, 210). It is not unreasonable to expect the denarii which appear in hoards in good conditions were exported without a major lag from the period in which they were minted, while even the slightly more worn denarii would have most likely been exported during the course of the first century, before such coins

---

<sup>41</sup> 5 Republican consular coins, 1 Julius Caesar, 1 Mark Antony, 1 Brutus, 12 Augustus, 2 Tiberius, 1 Hadrian – See Singh 1988: 114.

<sup>42</sup> See, Kulke and Rothermund 1986: 93, 99, 102; Morrison 1997: 95; Thapar 1978: 64; P. Turner 1989: 15, 43, 120; Suresh 2004: 65, argues that in the region of Andhra Pradesh, where a number of high quality imitations of Roman circulated, these coins were used as currency given (both imitation and genuine); for other arguments in favour of some level of circulation connected see De Romanis 2006.

were beginning to be removed from circulation (AD 107). Thus the picture seems to be of denarii being exported throughout the first century, not just after AD 64.

Almost no post-AD 64 denarii have been found in India;<sup>43</sup> in all likelihood as a result of Nero's reduction in both their weight (by 11%), and more importantly, their purity from 97.35% (pre-reform) to 93.50% (post-reform); though more recent analysis suggests the possibility of a reduction to between 80-90%.<sup>44</sup> This reduction in purity seems to have undermined the willingness of Indian merchants to receive post-AD 64 denarii as an item of exchange, partially because they would not desire to weigh and assay all these new, less trustworthy, coins (Turner 1991: 26; MacDowall 1991: 149; MacDowall 1996: 89). Merchants (Roman or otherwise) may have found it advantageous to continue to export the pre-AD 64 denarii since their higher weight and purity meant a greater bullion value. Indeed, MacDowall has connected the statement in the *PME* about the exchange of Roman gold and silver coins at Barygaza for a profit, to the fact that the ratio of value for gold to silver bullion was 1:12 before the AD 64 reform. This compares to the 1:10 value seen in some regions of India (MacDowall 1996: 92; *PME* 49; see also MacDowall 2004a and 2004b).

This reform seems to have increased the importance of gold coins as an export item by the latter-first century. Some have suggested that the currency reform of AD 64 did not directly impact on the increased export of gold, by pointing to the fact that the most common types found in India were those minted under the Julio-Claudians, especially Tiberius and Claudius, and that a shift in the preference for gold already took place (Suresh 2004: 34-5; De Romanis 2012: 176). The notion that some of these aurei were exported during the Julio-

---

<sup>43</sup> Exceptions include a denarius of Vespasian at Jabalpur (Madhya Pradesh), one of Hadrian at Pakli and another from the Laccadive island hoard, and about eight post-Neronian denarii now in the British Museum (Indian Office Collection) – Suresh 2004: 35; P. Turner 1989: 21.

<sup>44</sup> Sutherland and Carson 1984: 4-5, 134; Carson 1990: 224; for more recent reinterpretation of purity of post-AD 64 denarii see Ponting 2009: 269-75.

Claudian period should not be dismissed, especially in the light of the high quality or mint condition aurei found in hoards at Madurai hills, Adam (1 of Augustus, 10 of Tiberius), and in the report of the coins from Kottayam (1847).<sup>45</sup> However, as has been pointed out most of the Julio-Claudian aurei are worn to some degree, suggesting some gap between their minting and their export. That these Julio-Claudian aurei became worn due to circulation within the Roman Empire rather than in India, is strongly suggested by the fact most of the aurei minted in the second century which reached India survives in relatively good condition; as seen at Athirala and Vinukonda where the descriptions of condition range from “in fine condition” to “beautiful” preservation (P. Turner 1989: 16). The second century aurei are less numerous than the Julio-Claudian, though a slight increase in Severan aurei is apparent. However, these Severan aurei are mostly worn and are often found alongside late Roman coins, indicating that they were probably exported in the Late Antique period (Berghaus 1991: 110-11).

Significant numbers of hoards with Julio-Claudian aurei reveal patterns where the earlier coins are more worn, but the state of preservation improves the later they were minted. Turner noted that the Kaliyampattur hoard is reported to have contained worn Augustan to Claudian aurei, less worn Neronian aurei, alongside coins of Domitian which were in good condition. Similar patterns are also seen in the Pudukottai and Nandyal hoards, suggesting that earlier Julio-Claudian aurei were in circulation for longer before being buried with the later aurei (P. Turner 1989: 15; see Appendix 2). Suresh also noted this phenomenon at the sites of Kaliyampattur and Nandyal, as well as at Eyyal, Kumbalam, Nagavarappupadu, Nedumkandam, and Valuvally (Suresh 2004: 74; P. Turner 1989: 15).

These hoards (referred here collectively as batch-pattern hoards) in fact represent almost three quarters of the aurei finds in the Indian Subcontinent (excluding the Kottayam

---

<sup>45</sup> Suresh 2004: 74, 173 – However, on Adam hoard MacDowall 1996: 91, suggest a burial date c. AD 70 given the weight parallels of the coins with comparable hoards in the Roman Empire.

hoard, and the unidentified aurei of the Parur hoard – see Appendix 3). The latest aurei which appear in these hoards range from issues of Nero to Marcus Aurelius. However, there is a particular peak during the second-half of the first century. Four of the hoards were buried in all likelihood around the mid-late first century (first group), while the other four were buried around the first half of the second century (second group); but in terms of coin numbers within these hoards there is a 3:2 ratio between the first and second group. In addition 66% of the identifiable coins from all the aforementioned hoards are Julio-Claudian aurei, with only 2% from Flavian emperors, and 32% from the Nervan-Antonines.<sup>46</sup> The limited number of Flavian issues clearly indicating that merchants during the latter first century, when they could still get hold of the heavier Julio-Claudian aurei, chose to export them, while the subsequent increase in Nervan-Antonine issues reflecting the diminishing availability of the Julio-Claudian issues. That these were in all likelihood buried not too long after arriving in India seems to be supported by examination of the Valuvally hoard undertaken by Berghaus, in which 42 coins of Hadrian and Antoninus Pius have die-links, suggesting limited circulation prior to burial (2004: 53-54).

It should not be assumed that these hoards represent original untouched trade batches, especially since some of them reveal only a small number of coins, while many coins from the Pudukottai hoard revealed slash marks, and the Tondamanathan, Nagavarappupadu and Eyyal hoards also contained local coins (Singh 1988: 104). The distribution of the coin hoards, mostly at inland sites, is indicative of local trade networks, and it would difficult to maintain that batches of coins were not broken down and then redistributed after they left the hands of the merchants who originally brought them to India. Indeed, many of the hoards are found in local earthenware pots called *lota*, and thus have clearly been taken out of their

---

<sup>46</sup> The statistics behind these arguments are displayed in Appendix 2; the later first century coins that do appear tend to be the heavier aurei of Domitian and Nerva – MacDowall 2004a: 12.



original consignments (Suresh 2004: 26). Nevertheless the pattern displayed in these hoards is much easier to explain as a result of circulation within the Roman Empire rather than India, otherwise one might expect to find the coins in a more haphazard condition. As is the case in the Akkenapalle and Nasthullapur hoards, where coins minted in the same reign survive in different conditions, most likely due to these hoards beginning connected to monastic banking (see above). Thus the coins in the batch pattern hoards most likely represent a portion removed from an original consignment.

The presence of some aurei of late-second and early-third century emperors (specifically those of Commodus, Septimius Severus and Caracalla) in hoards alongside first century issues does raise questions about the arrival of the earlier coins in India. From the 67 aurei finds identified six of these (4% of the finds) fall into this category. These are the Daremavaripalem, Kadmat Island, Kottayam 1847, Sorayapattu, Veeravasaramu and Vinukonda hoards (see Appendix 2). There are a number of issues with these hoards, however, that may counter the assumption that these earlier first century coins were regularly being exported with issues produced c.100-180 years later. The argument that possible 8,000 mint-condition aurei of the Julio-Claudian period reported from the lost Kottayam 1847 hoard were likely exported in mid-first century rather than in the reign of Caracalla (based on an individual identification of a coin of Caracalla by Dury, who was not present at the initial discovery) has been made in more detail in Appendix 3.

Concerning the four other reported finds, some of the finds from Vinukonda show pierced holes that had been later refilled, indicating they were used as jewellery at some point (Berghaus 1991: 110; Suresh 2004: 79). The use of some of these coins as jewellery in India raises the possibility that these coins were assembled from different sources (as former personal adornments) in India rather than as part of a single original trade consignment. The 15 aurei from Kadmat Island contain five issues of Vespasian alongside nine of Antoninus

Pius and one of Commodus. However, these coins arrived into the Madras Museum as a result of the purchase of the ‘Collector of Canara’, raising questions whether this is a ‘genuine hoard or specimens from a private collection’ (P. Turner 1989: 57). The Daremavaripalem hoard contains one genuine coin each of Tiberius, Nero and Domitian, the remaining are all cast (rather than die struck) Indian imitations (Nero – 1, Hadrian – 2, Antoninus Pius 17, and Commodus – 1, two unidentified), included alongside Indian gold jewellery (Suresh 2004: 59, 61, 64, 79-80, 166). Similarly only a single coin of Tiberius from the Veeravasaramu hoard is genuine, the rest are all Indian imitations of second century coins, bar one imitation of Caracalla or Geta (Turner 1989: 80-1). These imitations coins cannot be used as an indicator of when the first century coins arrived in India, only when they were finally buried. This leaves the 193 (or more) aurei from the Sorayapattu hoard ranging from Tiberius to Caracalla, with an unknown number of imitations. The coins are reported as being in fairly good condition, but there is an indication that some of these coins were pierced and used as jewellery, again raising the question, as with those from Vinukonda, about whether they were acquired from different sources within India (Suresh 2004: 59, 75, 77).

#### *Roman Coins as Indicators of Trade Fluctuations*

Some scholars have argued, largely on the basis of the number of Julio-Claudian denarii, that the Julio-Claudian period saw a peak in Roman trade with India.<sup>47</sup> In support of this view De Romanis cites Tacitus’ statement that many of the ‘Old rich families, noble and illustrious, were often ruined by a passion for magnificence’, but Vespasian ushered in a new age of

---

<sup>47</sup> See, Bolin 1958: 72-74; P. Gupta 1991: 129; Tchernia 1997a: 238-49; Tchernia 1997b: 250-83 (Italians exporting denarii); Sewell 1904: 593, 599-601, 605-7; De Romanis 1997: 119-28 (Julio-Claudian peak in trade); De Romanis 2012.

moderation, with many of *homines novi* emulating him.<sup>48</sup> It should be borne in mind that Tacitus' comments were part of a common literary topos condemning profligacy and lavish spending, and may be seen as part of an embellished desire to contrast Vespasian with Nero. The notion of the elite squandering its wealth certainly continued to find expression in contemporary comments from the later first century and beyond.<sup>49</sup>

The idea that the number of denarii represent a Julio-Claudian peak in trade is not sustainable, for although the known finds are more numerous (outnumbering the aurei by roughly 4:1, excluding the lost the Kottayam and Parur hoards), the value and weight of the aureus was much greater than the denarius.<sup>50</sup> In the Roman Empire one aureus was equal to 25 denarii. This value ratio of gold to silver was not necessarily equivalent in different regions of India (see above), but undoubtedly gold was of significantly higher value. Lebedeva makes a similar point, but she believed the aurei were exported soon after being minted and therefore argued that reign of Claudius saw the major peak of Roman trade in the Indian Ocean (1988: 51-2).<sup>51</sup> However, as shown above, the evidence indicates that the majority of the Julio-Claudian aurei are from hoards dating to around the mid-late first century, with smaller number appearing alongside second century AD aurei during the first-

---

<sup>48</sup> Tacitus *Annals* 3.55 - translation from De Romanis 1997: 119-28; See also Suetonius *Vespasian* 9.2; and Sewell 1904: 594, 617. Wallace-Hadrill 2008: 332, notes that the emperors may have felt it beneficial to allow the elite to self-destruct through competitive spending.

<sup>49</sup> See particularly Juvenal *Satires* 1 lines 135-40 (fortunes on banquets), *Satires* 3 lines 180-83 (money borrowed for lavishness) – also Martial and Statius; see further, Athenaeus *Deipnosophistae* 6.275b (third century AD) for the moralising *topos* about former novelties and extravagance becoming common-place.

<sup>50</sup> Pre-AD 64 denarius notionally minted at 3.9g (minor reduction throughout Julio-Claudian period), the aureus at just under 8g - see Carson 1990: 14, 31-2.

<sup>51</sup> See also De Romanis 2012: 175, for the face-value ratio of pre-AD 64 denarii and aurei, which he puts at 22% to 78% (note the more restricted sample size).

half of the second century. The batch pattern hoards show that the value (if not also volume) of coinage exported was greatest in the second half of the first century.

These coins, of course, only represent one segment of the trade, and were received in India alongside a variety of other goods. In fact, due to their weight, density, and high value, they would have taken up a negligible amount of cargo space in a ship's hold (Cobb 2011: 225-8, 263-9). Nevertheless, the chronological patterns interpreted from these coins broadly correlates with the patterns seen from the archaeological evidence for Roman goods in India, and the occupation of the Roman ports on the Red Sea coast.

## **Conclusion**

The archaeological evidence for Roman goods found across the India subcontinent, the southern Arabian Peninsula and East Africa suggests that most of them were exported during the first century, and that the second century material is comparatively more limited. In addition, the most intense period of occupation at the ports of Berenike and Myos Hormos also seems to have been in the first century. It has been further argued here that this consistent picture from the archaeological evidence can be supplemented by the patterns interpreted from the numismatics evidence in India. The case has been made on the basis of the batch-pattern hoards for a Flavian peak in the value of Roman coins exported to India, with a downturn during the course of the second century (perhaps not as dramatic as seen from the archaeological evidence). These patterns also seem to parallel the high level of building activity in the Flavian period for the praesidia which lined the routes across the Eastern Desert leading to the Roman Red Sea ports. Even if there are reservations concerning the more controversial numismatic evidence, this does not affect the solid picture seen from the archaeological evidence of a first century peak and second century downturn.

This evidence can, of course, only indicate broad trends and the literary sources offer little statistical data that would allow more detailed discussion of the volume of trade to different regions. Furthermore, these broad trends should not mask the annual fluctuations in the flow of goods between the Mediterranean and the Indian Ocean that would inevitably have been the result of variable weather, losses at sea, market conditions, bureaucratic delay, corruption, and the depredations of bandits and pirates. It is also worth stressing again, that while a broad downturn in the involvement of Roman merchants and the exchange of Mediterranean goods in the Indian Ocean is apparent by the early-second century this does not mean that levels of trade or participation were insignificant by the mid-late second century, only that there was reduction in scale (the sharpness varying from the archaeological and numismatic evidence).

Why did a downturn manifest itself by the first half of the second century, prior to the Antonine plague or the crises of the third century? It is difficult to identify any factors with certainty. It is possible there was a reduction in demand, but the literary sources offer only anecdotal evidence for the uses and esteem of some of Eastern goods in Roman society, not quantifiable information about demand. Written evidence about the demand for Roman goods in Indian and other eastern societies is even more limited. Another potential factor was the depredations of the “barbaroi” in the Eastern Desert, as seen the in early-second century ostraka from Krokodilo, which would have made transporting goods through this region increasingly difficult.

Alternatively it may be that the evidence does not wholly reflect a downturn, but shifting patterns of trade. Archaeologically visible items like wine amphorae and crafted metals and glass may have become less popular, while organic items like textiles, drugs and dyes may have still been significant, though this does not explain the decreasing value of Roman coin exports. Another possibility is that other routes, especially via the Persian Gulf,

became more important for the conveying of goods between the West and East;<sup>52</sup> perhaps indicating a decreasing the level of direct Roman participation, but not necessarily demand for eastern goods within Roman society. There is not space here to deal with all of these suppositions in detail, but they are certainly worthy of further study.

---

<sup>52</sup> For a comparison of the Red Sea and Persian Gulf routes see Seland 2011.

## Bibliography

- Abraham, Shinu. A. 2009: Strategies for Surface Documentation at the Early Historic Site of Pattanam, Kerala; the Malabar Region Archaeological Survey. In *Migration, Trade and People: Part I*, ed. Tomber, R., Blue, L., and Abraham, S. London: 14-28.
- Agarwala, Prakash N. 1985. *The History of Indian Business*. New Delhi: Vikas Publishing House PUT Ltd.
- Alston, Richard. 1995. *Soldiers and Society in Roman Egypt*. London: Routledge.
- 2007. Fraying Round the Edges Models of Change on the Margins. In *Aspects of the Roman East*, ed. Richard Alston and Samuel N. C. Lieu. Brepols: Ancient History Documentary Research Centre Macquarie University NSW Australia: 1-32.
- Bagnall, Roger. S., Janet. H. Johnson, Gene. B. Gragg., Philip. C. Hammond., Michael Dols., Galal el-Nahal., Carolyn G. Killean., Michael Bates and Donald. S. Whitcomb 1979. Epigraphy. In *Quseir al-Qadim 1978 Preliminary Report*, ed. Donald, S. Whitcomb and Janet H. Johnson Cairo: American Research Center in Egypt, Inc: 243-249.
- Bagnall, Roger S., Christina Helms and Arthur M. F. W Verhoogt. 2000. *Documents from Berenike Volume I*. Bruxelles: Fondation Égyptologique Reine Élisabeth.
- Barnard, Hans and Pamela J. Rose. 2007. Eastern Desert Ware from Berenike and Kab Marfu'a. In *Berenike 1999/2000 Report*, ed. Steven E. Sidebotham and Willamina Z. Wendrich. Los Angeles: Cotsen Institute of Archaeology: 183-199.
- Begley, Vimala. 2004. Chronology. In *The Ancient Port of Arikamedu: New Excavations and Researches 1989-1992. Volume Two*, ed. Vimala Begley. Paris: École Française d'Extrême-Orient: 1-16.
- Berghaus, Peter. 1991. Roman Coins from India and their Imitations. In *Coinage, Trade and Economy*, ed. Amal K. Jha. Nashik: IIRNS: 108-121.

- 2004. Evidence of Die-Links of Roman Coins and their Indian Imitation found in India. In *Foreign Coins Found in the Indian Sub-Continent*, ed. David. W. MacDowall and Amiteshwar Jha: Nasik: IIRNS: 53-54.
- Bernard, André. 1972. *De Koptos á Kosseir*. Leiden: E. J. Brill.
- Bernstein, William J. 2008. *A Splendid Exchange*. New York: Atlantic Monthly Press.
- Blue, Lucy. 2007. Locating the Harbour: Myos Hormos/Quseir al-Qadim: A Roman and Islamic Port on the Red Sea Coast of Egypt. *IJNA* 36 (2): 265-281.
- 2011. The Amphora Wharf. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 2*, ed. David Peacock, Lucy Blue, and assisted by Julian Whitewright. Oxford: Archaeopress, BAR International Series 2286: 35-42.
- Blue, Lucy, Julian Whitewright and Ross Thomas 2011. Ships and Ships' Fittings. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 2*, ed. David Peacock, Lucy Blue, and assisted by Julian Whitewright. Oxford: Archaeopress, BAR International Series 2286: 179-209.
- Bolin, Sture. 1958. *State and Currency in the Roman Empire to 300 A.D.* Stockholm: Almqvist and Wiksell.
- Bopearachchi, Osmund. 1996. Seafaring in the Indian Ocean: Archaeological Evidence from Sri Lanka. In *Tradition and Archaeology*, ed. Himanshu P. Ray and Jean-François Salles. New Delhi: Manohar: 59-77.
- Bowersock, Glen. W. 1983. *Roman Arabia*. Boston: Harvard University Press.
- Bowman, Alan and Andrew Wilson. 2009. Quantifying the Roman Economy: integration, Growth, Decline? In *Quantifying the Roman Economy*, eds. Alan Bowman and Andrew Wilson: Oxford: Oxford University Press. 3-84.
- Brancaccio, Pia and Xinru Liu. 2009. Dionysus and Drama in the Buddhist Art of Gandhara. *Journal of Global History* 4 (2): 219-244.



- Brun, Jean-Pierre. 2006a. Chronologie de l'équipement de la route à l'époque gréco-romaine. In *Le route de Myos Hormos*. Volume I, ed. Hélène Cuvigny. Cairo: Institut Français d'archéologie orientale: 187-205.
- 2006b. Méthodes et conditions de fouille des fortins et des dépotoirs ou les affres d'un Gallo-Romain en Égypte. In *Le route de Myos Hormos*. Volume I, ed. Hélène Cuvigny. Cairo: Institut Français d'archéologie orientale: 61-71.
- Bülow-Jacobsen, Adam, Hélène Cuvigny and Jean-Luc Fournet. 1994. The Identification of Myos Hormos New Papyrological Evidence. *BIFAO* 94: 27-42.
- Burnett, Andrew. 1998. Roman Coins from India and Sri Lanka. In *Origin, Evolution and Circulation of Foreign Coins in the Indian Ocean*, ed. Osmund Bopearachchi and Don P. M. Weerakkody. Sri Lanka: Manohar: 179-189.
- Cambon, Pierre. 2011. Begram: Alexandria of the Caucasus, Capital of the Kushan Empire. In *Afghanistan: Crossroads of the Ancient World*, ed. Fredrik Hierbert and Pierre Cambon. London: The British Museum Press: 145-209.
- Cappers, René. T. J. 2006. *Roman Foodprints at Berenike*. Los Angeles: Cotsen Institute of Archaeology.
- Carson, Robert A. G. 1990. *Coins of the Roman Empire*. London: Routledge.
- Casson, Lionel. 1986. P. Vindob G 40822 and the Shipping of Goods from India. *BASP* 23 (3-4): 73-79.
- 1989. [Introduction, Translation, and Commentary of] *Periplus Maris Erythraei*. Princeton: Princeton University Press.
- Chami, Felix A. 2000. Further Archaeological Research on Mafia Island. *Azania* 35 (1): 214.
- Cherian, P. J. 2009-10: Pattanam to Challenge Euro-Centric Notions and help rewrite the History of Indian Ocean Trade. *Journal of Indian Ocean Archaeology* 6: 153-158

- Cherian, P. J., G. V. Ravi Prasad, Koushik Dutta, Dinesh Kr Ray, Veerasamy Selvakumar, and K. P. Shajan. 2009: Chronology of Pattanam: A Multi-Cultural Port Site on the Malabar Coast. *Current Science* 97 (2): 236-240.
- Cobb, Matthew A. 2011. *Roman Trade in the Indian Ocean during the Principate*. Swansea. PhD Thesis.
- Copeland, Penny. 2011: Metal and Metal Working. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 2*, ed. David Peacock, Lucy Blue, and assisted by Julian Whitewright. Oxford: Archaeopress, BAR International Series 2286: 89-120.
- Copeland, Penny, Ross Thomas, Paul Masser, James Philips and Wilfried van Rengen. 2006. The Roman Town. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 1*, ed. David Peacock and Lucy Blue. Oxford: Oxbow Books: 116-154.
- Curtin, Philip D. 1984. *Cross-Cultural Trade in World History*. Cambridge: Cambridge University Press.
- Cuvigny, H el ene. 2005. *Ostraca de Krokodil . La correspondance militaire et sa circulation*. Cairo: Institut Franais d'arch ologie orientale.
- 2006a. Introduction. In *Le route de Myos Hormos*. Volume I, ed. H el ene Cuvigny. Cairo: Institut Franais d'arch ologie orientale: 1-35.
- 2006b. Les documents  crits de la route de Myos Hormos   l'  poque gr co-romaine (inscriptions, graffiti, papyrus, ostraca). In *Le route de Myos Hormos*. Volume II, ed. H el ene Cuvigny. Cairo: Institut Franais d'arch ologie orientale: 265-294.
- 2006c. Le fonctionnement du r seau. In *Le route de Myos Hormos*. Volume 2, ed. H el ene Cuvigny. Cairo: Institut Franais d'arch ologie orientale: 295-359.

- ed. 2006d. *Le route de Myos Hormos*. Volume I. Cairo: Institut Français d'archéologie orientale.
- ed. 2006e. *Le route de Myos Hormos*. Volume II. Cairo: Institut Français d'archéologie orientale.
- Cribb, Joe. 1992. Numismatic Evidence for the Date of the 'Periplus'. In *Indian Numismatics, History, Art, and Culture*, ed. David W. MacDowall, Savita Sharma, and Sanjay Garg: Delhi: 131-145.
- Deloche, Jean. 1996. Iconographic Evidence on the Development of Boat and Ship Structures in India (2<sup>nd</sup> C. B.C - 15<sup>th</sup> C. A.D.): A new Approach. In *Tradition and Archaeology*, ed. Himanshu P. Ray and Jean-François Salles. New Delhi: Manohar: 199-224.
- De Romanis, Federico. 1997. Rome and the *Notia* of India: Relations Between Rome and Southern India from 30 BC to the Flavian Period. In *Crossings*, ed. Federico De Romanis and André Tchernia. New Delhi: Manohar: 80-160.
- 2006. *Aurei* after the Trade: Western Taxes and Eastern Gifts. In *Dal Denarius al Dinar: L'Oriente e la Moneta Romana*, ed. Federico De Romanis and Sara Sorda: Rome: Istituto Italiano di Numismatica: 55-87.
- 2012. Julio-Claudian *Denarii* and *Aurei* in Campania and India. *Annali dell'Istituto Italiano di Numismatica* 58: 161-192.
- Dridi, Hédi. 2012. Appendix II: Radiocarbon Analysis of Splinters from the Wooden Tablet. In *Foreign Sailors on Socotra*, ed. Ingo Strauch. Bremen: Hempen Verlag: 461-62.
- Düing, Walter. 1970. *The Monsoon Regime of the Currents in the Indian Ocean*. Honolulu: East-West Centre Press.
- Duncan-Jones, Richard. 1994. *Money and Government in the Roman Empire*. Cambridge: Cambridge University Press.

- Eide, Tormud, Tomas Hägg, Richard Holton Pierce, Laszlo Török, ed. 1996. *Fontes Historiae Nubiorum: Volume II*. Bergen: University of Bergen.
- Fraser, Peter. M. 1972. *Ptolemaic Alexandria: Volume I and II*. Oxford: At the Clarendon Press.
- Fournet, Jean-Luc. 2006. Langues, écritures et culture dans les *praesidia*. In *Le route de Myos Hormos*. Volume II, ed. Hélène Cuvigny. Cairo: Institut Français d'archéologie orientale: 427-500.
- Gorea, Maria. 2012a. Palmyra and Socotra. In *Foreign Sailors on Socotra*, ed. Ingo Strauch. Bremen: Hemen Verlag: 447-57.
- 2012b. The Sea and Inland Trade of Palmyra. In *Foreign Sailors on Socotra*, ed. Ingo Strauch. Bremen: Hemen Verlag: 463-85.
- Gupta, Chandrashekhar. 2004. Foreign Coins and Imitations Used for Ornamentation. In *Foreign Coins Found in the Indian Sub-Continent*, ed. David. W. MacDowall and Amiteshwar Jha: Nasik: IIRNS Publications: 115-120.
- Gupta, Parmeshwari. L. 1991. Coins in Rome's Indian Trade. In *Coinage, Trade and Economy*, ed. Amal K. Jha. Nashik: Indian Institute of Research in Numismatic Studies: 122-137.
- Gupta, Sunil, David Williams and David Peacock. 2001. Dressel 2-4 Amphorae and Roman Trade with India: The Evidence from Nevasa. *South Asian Studies* 17: 7-18.
- Gurukkal, Rajan. 2013. Classical Indo-Roman Trade: A Historiographical Reconsideration. *Indian Historical Review* 40: 181-206.
- Habicht, Christian. 2013. Eudoxus of Cyzicus and Ptolemaic Exploration. In *The Ptolemies, the Sea and the Nile*, ed. Kostas Buraseis, Mary Stefanou and Dorothy J. Thompson. Cambridge: Cambridge University Press: 197-206.
- Healy, John F. 1996. Palmyra and the Arabian Gulf Trade. *ARAM* 8 (1): 33-37.

- Helm, Richard, Alison Crowther, Ceri Shipton, Amini Tengeza, Dorian Fuller and Nicole Boivin. 2012. Exploring Agriculture, Interaction and Trade on the Eastern African Littoral: Preliminary Results from Kenya. *Azania* 47 (1): 39-63.
- Herbert, Sharon C. and Andrea Berlin. 2003. The Excavation: Occupation History and Ceramic Assemblages. In *Excavations at Coptos (Qift) In Upper Egypt, 1987-1992*, ed. Sharon C. Herbert and Andrea Berlin. Rhode Island: Journal of Roman Archaeology Supplementary Series Number 53: 13-156.
- Hierbert, Fredrik. 2011. The Lost Worlds of Afghanistan. In *Afghanistan: Crossroads of the Ancient World*, ed. Fredrik Hierbert and Pierre Cambon. London: The British Museum Press: 55-64.
- Horton, Mark C. 1996. Early Maritime Trade and Settlement along the Coast of Eastern Africa. In *The Indian Ocean in Antiquity*, ed. Julian Reade. London: Kegan Paul International: 439-59.
- Hourani, George. F. revised and expanded by John Carswell. 1995. *Arab Seafaring in the Indian Ocean in Ancient and Early Medieval Times (Expanded Edition)*. Princeton: Princeton University Press.
- Howgego, Christopher. 2009: Some Numismatic Approaches to Quantifying the Roman Economy. In *Quantifying the Roman Economy*, ed. Alan Bowman and Andrew Wilson. Oxford: Oxford University Press: 287-295.
- Kennedy, David. 1985. The Composition of a Military Work Party in Roman Egypt (ILS 2483: Coptos). *JEA* 71: 156-160.
- Klemm, Rosemarie and Dietrich Klemm. 2013. *Gold and Gold Mining in Ancient Egypt and Nubia*. Heidelberg: Springer.
- Kulke, Hermann and Dietmar Rothermund. 1986. *A History of India*. London: Routledge.

- Lebedeva, Elena. 1988. India in Roman External Trade: The Evidence of Numismatics. *UNESCO International Association for the Study of the Cultures of Central Asia Information Bulletin* 14: 45-58.
- Lindsay, William. S. 1874. *History of Merchant Shipping and Ancient Commerce. Volume I.* New York: Ams Press Inc.
- Lombardi, Alessandra, Vittoria Buffa and Alexia Pavan. 2008. Small Finds. In *A Port in Arabia: Between Rome and the Indian Ocean (3<sup>rd</sup> C. BC – 5<sup>th</sup> C. AD): Khor Rori Report 2*, ed. Alessandra Avanzini. Rome: <<L'ERMA>> di Bretschneider: 317-475.
- MacDowall, David. W. 1991. Indian Imports of Roman Silver Coinage. In *Coinage, Trade and Economy*, ed. Amal K. Jha. Nashik: Indian Institute of Research in Numismatic Studies: 145-163.
- 1996. The Evidence of the Gazetteer of Roman Artefacts in India. In *Tradition and Archaeology*, ed. Himanshu P. Ray and Jean-François Salles. New Delhi: Manohar: 79-95.
- 2004a. Foreign Coins Found in India: In View of the Monetary Systems Operating in the Countries of their Origin. In *Foreign Coins Found in the Indian Sub-Continent*, ed. David. W. MacDowall and Amiteshwar Jha: Nasik: IIRNS Publications: 9-14.
- 2004b. The Indo-Roman Metal Trade. In *Foreign Coins Found in the Indian Sub-Continent*, ed. David. W. MacDowall and Amiteshwar Jha: Nasik: IIRNS Publications: 39-44.
- Mahadevan, Iravatham. 1996. Tamil-Brāhmi Graffito. In *Berenike 1995 Preliminary Report*, ed. Steven E. Sidebotham and Willamina Z. Wendrich. Lieden: Centre for Non-Western Study: 205-208.
- Mattingly, Harold. 1923. *Coins of the Roman Empire in the British Museum: Volume I.* London: Published by the Trustees of the British Museum.

- Mayerson, Philip. 1996. The Port of Clysma (Suez) in Transition from Roman to Arab Rule. *JNES* 55 (2): 119-126.
- Mazzarino, Santo. 1997 (posthumously published). On the Name of the Hipalus (Hippalus) Wind in Pliny. In *Crossings*, ed. Federico De Romanis and André Tchernia. New Delhi: Manohar: 72-79.
- McGrail, Seán. 2004. *Boats of the World from the Stone Age to Medieval Times*. Oxford: Oxford University Press.
- McLaughlin, Raoul. 2010. *Rome and the Distant East*. London: Continuum.
- Mehendale, Sanjyot. 2011. Begram: At the Heart of the Silk Roads. In *Afghanistan: Crossroads of the Ancient World*, ed. Fredrik Hierbert and Pierre Cambon. London: The British Museum Press: 131-143.
- Meredith, David. 1952. The Roman Remains in the Eastern Desert of Egypt. *The JEA* 38: 94-111.
- 1953. The Roman Remains in the Eastern Desert of Egypt (Continued). *The JEA* 39: 95-106.
- Meyer, Carol. 1982. Large and Small Storerooms of the Roman Villa. In *Quseir al-Qadim 1980 Preliminary Report*, ed. Donald, S. Whitcomb and Janet H. Johnson. Malibu: American Research Center in Egypt, Inc: 201-213.
- 1992. *Glass from Quseir al-Qadim and the Indian Ocean Trade*. Studies in Ancient Oriental Civilization no.53.
- Meyer, Jørgen C. 2007. Roman Coins as a Source for Roman Trading Activities in the Indian Ocean. In *The Indian Ocean in the Ancient Period*, ed. Eivind H. Seland. Oxford: Archaeopress: 59-68.
- Millar, Fergus. 1998. Caravan Cities: The Roman Near East and Long-distance trade by Land. In *Modus Operandi: Essays in Honour of Geoffrey Rickman*, ed. Michel Austin,

- Jill Harries and Christopher Smith. London: University of London, Institute of Classical Studies: 122–37.
- Miller, James. I. 1969. *The Spice Trade of the Roman Empire 29 B.C. to A.D. 641*. London: Oxford University Press.
- Moore, Karl and David Lewis. 1999. *Birth of the Multinational: 2000 Years of Ancient Business*. Copenhagen: Copenhagen Business School Press.
- Mooren, Leon. 1972. The Date of SB V 8036 and the Development of the Ptolemaic Maritime Trade with India. *Ancient Society* 3: 127-33.
- Mukherjee, Bratindra N. 2004: Some Aspects of Foreign Coins in the Indian Subcontinent. In *Foreign Coins found in the Indian Sub-Continent*, ed. David. W. MacDowall and Amiteshwar Jha: Nasik: IIRNS Publications: 1-8.
- Murray, George W. and Eric H. Warmington. 1967. Trogydytica: The Red Sea Littoral in Ptolemaic Times. *The Geographical Journal* 133 (1): 24-33.
- Parry, John. J. 1999. *The Seaports of Graeco-Roman Egypt: A Study of their Positioning, Trade and Development*. University of Liverpool: PhD Thesis.
- Peacock, David. 1993. The Site of Myos Hormos: A View from Space. *JRA* 6: 226-32.
- 2011a. Ceramic Lamps. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 2*, ed. David Peacock, Lucy Blue and assisted by Julian Whitewright. Oxford: Archaeopress, BAR International Series 2286: 47-56.
- 2011b. Ptolemaic and Roman Coins. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 2*, ed. David Peacock, Lucy Blue and assisted by Julian Whitewright. Oxford: Archaeopress, BAR International Series 2286: 85-97.
- Peacock, David and Lucy Blue, ed. 2006a. *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 1*. Oxford: Oxbow Books.



- 2006b. The Excavations: Overview. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 1*, ed. David Peacock and Lucy Blue. Oxford: Oxbow Books: 174-177.
- Peacock, David and Lucy Blue, assisted by Julian Whitewright, ed. 2011. *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 2*. Oxford: Archaeopress, BAR International Series 2286.
- Peacock, David, Lucy Blue and Darren Glazier. 2007. Review, Discussion and Conclusion. In *The Ancient Red Sea Port of Adulis, Eritrea*, ed. David Peacock and Lucy Blue. Oxford: Oxbow Books: 125-134.
- Peacock, David, Lucy Blue, Paula Whittaker, Michael Walsh and Ross Thomas. 2006. The Roman Harbour. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 1*, ed. David Peacock and Lucy Blue. Oxford: Oxbow Books: 67-94.
- Peacock, David, with contributions from Ismini Nina, Philip Kenrick, Jeroen Poblome, Roberta Tomber and Kerlijne Romanus. 2007. Pottery from the Survey. In *The Ancient Red Sea Port of Adulis, Eritrea*, ed. David Peacock and Lucy Blue. Oxford: Oxbow Books: 79-108.
- Ponting, Matthew. 2009. Roman Silver Coinage: Mints, Metallurgy, and Production. In *Quantifying the Roman Economy*, ed. Alan Bowman and Andrew Wilson. Oxford: Oxford University Press: 269-80.
- Potts, Daniel. T. 1990. *The Arabian Gulf in Antiquity*, 2 volumes. Oxford: Clarendon Press.
- Radhakrishnan, P. V. 1999. *Roman Gold & Silver Coins from India: A Collectors Guide*. Nasik: IIRNS Publications.
- Rajgor, Dilip. 2004. Roman Currency in Gujarat. In *Foreign Coins Found in the Indian Sub-Continent*, ed. David. W. MacDowall and Amiteshwar Jha: Nasik: IIRNS Publications: 69-72.

- Raschke, Manfred. G. 1975. Papyrological Evidence for Ptolemaic and Roman Trade with India. In *Proceedings of the XIV International Congress of Papyrologists*, ed. Peter J. Parsons. (The British Academy) Oxford: Egypt Exploration Society: 241-46.
- Rathbone, Dominic. 1983. Italian Wines in Roman Egypt. *OPVS International Journal for Social and Economic History of Antiquity* 2: 81-98.
- 2000. The ‘Muziris’ Papyrus (SB XVIII 13167): Financing Roman Trade with India. In *Alexandrian Studies II in Honour of Mostafa el Abbadi*, ed. Mohammed Abd-El-Ghani. Alexandria: Société Archéologique d’Alexandrie: 39-50.
- Ray, Himanshu. P. 2010. Sailing to India: Diverse Narratives of Travel in the Western Indian Ocean. In *The Athens Dialogues: Stories and Histories, Athens 25<sup>th</sup>-27<sup>th</sup> November 2010 (25<sup>th</sup> June 2010)*. Available at <http://athensdialogues.chs.harvard.edu/cgi-bin/WebObjects/athensdialogues.woa/wa/dist?dis=35> (accessed 25/8/13).
- Reddé, Michel and Jean-Pierre Brun. 2006. ‘L’architecture des *praesidia* et la genèse des dépotoirs. In *Le route de Myos Hormos*. Volume I, ed. Hélène Cuvigny. Cairo: Institut Français d’archéologie orientale: 73-185.
- Rougé, Jean. 1986. La navigation intérieure dans le Proche Orient antique. In *L’Homme et l’eau en Méditerranée et au Proche Orient*, ed. Pierre Louis. Lyons: Maison de l’Orient: 39–49.
- Rutten, Katrien. 2007. The Roman Fine Wares of ed-Dur (Umm al-Qaiwain, U.A.E.) and their Distribution in the Persian Gulf and the Indian Ocean. *Arabian Archaeology and Epigraphy* 18: 8-24.
- Salles, Jean-François. 1987. The Arab Persian Gulf Under the Seleucids. In *Hellenism in the East*, ed. Amelie Kurt and Susan Sherwin-White. London: Duckworth: 75-109.

- 1995. The *Periplus* of the Erythraean Sea and the Arab-Persian Gulf. In *Athens, Aden, Arikamedu*, ed. Marie-François Boussac and Jean-François Salles. New Delhi: Manohar: 115–46.
- 1996. Hellenistic Seafaring in the Indian Ocean. A Perspective from Arabia. In *Tradition and Archaeology*, ed. Himanshu P. Ray and Jean-François Salles. New Delhi: Manohar: 293-309.
- Salmon, Richard. 1991. Epigraphic Remains of Indian Traders in Egypt. *JAOS* 111 (4): 731-736.
- Sarianidi, Viktor I. 2011. Ancient Bactria's Golden Hoard. In *Afghanistan: Crossroads of the Ancient World*, ed. Fredrik Hierbert and Pierre Cambon. London: The British Museum Press: 211-217.
- Satyamurthy, T. 2004. The Circulation of Foreign Coins in Southern India. In *Foreign Coins Found in the Indian Sub-Continent*, ed. David. W. MacDowall and Amiteshwar Jha: Nasik: IIRNS Publications: 55-57.
- Schiltz, Véronique. 2011. Tillya Tepe, the Hill of Gold: A Nomad Necropolis. In *Afghanistan: Crossroads of the Ancient World*, ed. Fredrik Hierbert and Pierre Cambon. London: The British Museum Press: 219-293.
- Sedov, Alexander V. 1996. Qana' (Yemen) and the Indian Ocean. The Archaeological Evidence. In *Tradition and Archaeology*, ed. Himanshu P. Ray and Jean-François Salles. New Delhi: Manohar: 11-35.
- 2007. The Port of Qana' and the Incense Trade. In *Food for the Gods*, ed. David Peacock and David Williams. Oxford: Oxbow Books: 71-111.
- Seland, Eivind H. 2008. The Indian Ocean and the Globalisation of the Ancient World. *Ancient West and East* 7: 67-79.
- 2010. *Ports and Political Power in the Periplus*. Oxford: Archaeopress.

- 2011. The Persian Gulf or the Red Sea? Two Axes in Ancient Indian Ocean Trade, Where to Go and Why. *World Archaeology* 43 (3): 398-409.
- Selvakumar, Veerasamy, K. P. Shajan and Roberta Tomber. 2009. Archaeological Investigations at Pattanam, Kerala: New Evidence for the Location of Ancient Muziris. In *Migration, Trade and People: Part 1*, ed. Roberta Tomber, Lucy Blue and Shinu Abraham. London: The British Academy: 29-41.
- Sewell, Robert. 1904. Roman Coins Found in India. *Journal of the Royal Asiatic Society of Great Britain and Ireland* 36: 591-637.
- Shastri, Ajay M. 2004. Some Aspects of Roman Coins in India. In *Foreign Coins Found in the Indian Sub-Continent*, ed. David. W. MacDowall and Amiteshwar Jha: Nasik: IIRNS Publications: 45-52.
- Shaw, Ian. 2000. Egypt and the Outside World. In *The Oxford History of Ancient Egypt*, ed. Ian Shaw. Oxford: Oxford University Press: 308-323.
- Sherwin-White, Susan and Amelie Kuhrt. 1993. *From Samarkhand to Sardis*. London: Duckworth.
- Sidebotham, Steven E. 1986. *Roman Economic Policy in the Erythra Thalassa 30 B.C. - A.D. 217*. Leiden: E. J. Brill.
- 1989. Port of the Red Sea and the Arabia-India Trade. In *The Eastern Frontier of the Roman Empire*, ed. David H. French and Chris S. Lightfoot. Oxford: Bar International Series 553 (ii): 485-514.
- 1991. Ports of the Red Sea and the Arabia-India Trade. In *Rome and India: The Ancient Sea Trade*, ed. Vimala Begley and Richard D. De Puma. Wisconsin: The University of Wisconsin Press: 12-38.
- 1996. Roman Interests in the Red Sea and Indian Ocean. In *The Indian Ocean in Antiquity*, ed. Julian Reade. London: Kegan Paul International. 287-308.

- 1999. The Coins. In *Report of the 1997 Excavations at Berenike*, ed. Steven E. Sidebotham and Willamina Z. Wendrich. Lieden: Centre for Non-Western Study: 183-199.
- 2000. Coins. In *Report of the 1998 Excavations at Berenike*, ed. Steven E. Sidebotham and Willamina Z. Wendrich. Lieden: Centre for Non-Western Study: 169-178.
- 2011a. *Berenike and the Ancient Maritime Spice Route*. London: University of California Press.
- 2011b. Appendix 1 Ancient Coins from Quseir al-Qadim: The Oriental Institute, University of Chicago Excavations 1978, 1980 and 1982. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 2*, ed. David Peacock, Lucy Blue and assisted by Julian Whitewright. Oxford: Archaeopress, BAR International Series 2286: 353-360.
- Sidebotham, Steven. E., Martin Hense and Hendrikle M. Nouwens. 2008. *The Red Land*. Cairo: The American University in Cairo Press.
- Sidebotham, Steven. E. and John. A. Seeger. 1996. The Coins Catalogue. In *Berenike 1995 Preliminary Report*, ed. Steven E. Sidebotham and Willamina Z. Wendrich. Lieden: Centre for Non-Western Study: 179-196.
- Sidebotham, Steven E. and Willamina Z. Wendrich, ed. 2007. *Berenike 1999/2000 Report on the Excavations*. Los Angeles: Cotsen Institute of Archaeology.
- Sinclair, Paul. J. J. 2007. What is the Archaeological Evidence for External Trading Contacts on the East African Coast in the First Millennium BC?. In *Natural Resources and Cultural Connections of the Red Sea*, ed. Janet Starkey, Paul Starkey and Tony Wilkinson. Oxford: Archaeopress: 187-194.
- Singh, Ajay. K. 1988. *Indo-Roman Trade*. New Delhi: Commonwealth Publishers.

- Slane, Kathleen W. 1991. Observations on Mediterranean Amphoras and Tablewares Found in India. In *Rome and India. The Ancient Sea Trade*, ed. Vimala Begley and Richard D. De Puma. Wisconsin: The University of Wisconsin Press: 204-215.
- Smith, Matthew C. and Henry T. Wright. 1988. The Ceramics from Ras Hafun in Somalia: Notes on a Classical Maritime Site. *Azania* 23: 115-141.
- Smith, Richard L. 2009. *Trade in World History*. London: Routledge.
- Strauch, Ingo, ed. 2012. *Foreign Sailors on Socotra*. Bremen: Hempen Verlag.
- Strauss, Elisabeth. J. 2007. *Roman Cargoes: Underwater Evidence from the Eastern Mediterranean*. UCL. PhD Thesis.
- Suresh, Sethuraman. 2004. *Symbols of Trade Roman and Pseudo-Roman Objects Found in India*. Delhi: Manohar.
- Sutherland, Carol. H. V. and Robert. A. G. Carson, ed. 1984. *The Roman Imperial Coinage Volume I Revised Edition from 31 BC to AD 69*. London: Spink & Son LTD.
- Syme, Ronald. 1995. *Anatolica: Studies in Strabo*. Oxford: Clarendon Press.
- Tait, John G. 1930. *Greek Ostraka in the Bodleian Library at Oxford and Various Other Collections: Volume I*. London: Egypt Exploration Society.
- Tchernia, André. 1995a. Moussons et Monnaies: Les Voies du Commerce Entre le Monde Gréco-Romain et L'Inde. *Annales Histoire, Sciences Sociales* 50 (5): 991-1009.
- 1995b: Rome and India Archaeology Alone? In *Athens, Aden, Arikamedu*, ed. Marie-François Boussac and Jean-François Salles. New Delhi: Manohar: 147-156.
- 1997a: The Dromedary of the Peticii and Trade with the East. In *Crossings*, ed. Federico De Romanis and André Tchernia. New Delhi: Manohar: 238-249.
- 1997b: Winds and Coins: From the Supposed Discovery of the Monsoon to the *Denarii* of Tiberius. In *Crossings*, ed. Federico De Romanis and André Tchernia. New Delhi: Manohar: 250-276.

- Thapar, Romila. 1978. *Ancient India Social History. Some Interpretations*. London: Sangam Books.
- 1997. Early Mediterranean Contact with India: An Overview. In *Crossings*, ed. Federico De Romanis and André Tchernia. New Delhi: Manohar: 11-40.
- Thomas, Ross. 2011a. Roman Vessels Stoppers. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 2*, ed. David Peacock, Lucy Blue and assisted by Julian Whitewright. Oxford: Archaeopress, BAR International Series 2286: 11-34.
- 2011b. Terracotta Figurines. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 2*, ed. David Peacock, Lucy Blue and assisted by Julian Whitewright. Oxford: Archaeopress, BAR International Series 2286: 79-83.
- Tomber, Roberta. 2000. Indo-Roman Trade: The Ceramic Evidence from Egypt. *Antiquity* 74 (285): 624-631.
- 2004. Rome and South Arabia: New Artefactual Evidence from the Red Sea. *Proceedings of the Seminar for Arabian Studies* 34: 351-360.
- 2005. Trade Relations in the Eastern Mediterranean and Beyond: The Egyptian-Indian Connection. In *Trade Relations in the Eastern Mediterranean from the Late Hellenistic Period to Late Antiquity: The Ceramic Evidence*, ed. Maria B. Briese and Leif E. Vaag. Odense: University Press of Southern Denmark: 221-233.
- 2007a. Bishops and Traders: The Role of Christianity in the Indian Ocean during the Roman Period. In *Natural Resources and Cultural Connections of the Red Sea*, ed. Janet Starkey, Paul Starkey and Tony Wilkinson. Oxford: Archaeopress: 219-228.
- 2007b. Rome and Mesopotamia – Importers into India in the First Millennium AD. *Antiquity* 81: 972-988.
- 2008. *Indo-Roman Trade: From Pots to Pepper*. London: Duckworth.

- 2009. Beyond Western India: the Evidence from Imported Amphorae. In *Migration, Trade and People: Part 1*, ed. Roberta Tomber, Lucy Blue and Shinu Abraham. London: The British Academy: 42-57.
- Tomber, Roberta., David Graf, John. F. Healy and contributions by Christiane Römer-Strehl and Grzegorz Majcherek. 2011. Pots with Writing. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 2*, ed. David Peacock and Lucy Blue: Oxford: Archaeopress, BAR International Series 2286: 5-10.
- Tripati, Sila. 2011. Ancient Maritime Trade of the Eastern Indian Littoral. *Current Science* 100 (7): 1076-1086.
- Turner, Eric. G. 1950. Papyrus 40 'della Raccolta Milanese'. *JRS* 40: 57-59.
- Turner, Paula. J. 1989. *Roman Coins from India*. London: Royal Numismatics Society Special Publication No.22.
- Turner, Paula. J. and Joe Cribb. 1996: Numismatic Evidence for the Roman Trade with Ancient India. In *The Indian Ocean in Antiquity*, ed. Julian Reade. London: British Museum: 309-319.
- Van Der Veen, Marijke. 2011. *Consumption, Trade and Innovation*. Frankfurt am Main: Journal of African Archaeology Monograph Series vol. 6.
- Van Rengan, Wilfried. 2011. The Written Material from the Greco-Roman Period. In *Myos Hormos - Quseir al-Qadim Roman and Islamic Ports on the Red Sea: Volume 2*, ed. David Peacock and Lucy Blue: Oxford: Archaeopress, BAR International Series 2286: 335-338.
- Verhoogt, Arthur. M. F. W. 1998. Greek and Latin Textual Material. In *Report of the 1996 Excavations at Berenike*, eds. Steven E. Sidebotham and Willamina Wendrich. Lieden: Centre for Non-Western Study. 193-198.



- Villeneuve, François. 2007. L'armée romaine en mer Rouge et autour de la mer Rouge aux II<sup>ème</sup> et III<sup>ème</sup> siècles apr. J.C.: à propos de deux inscriptions latines découvertes sur l'archipel Farasan. In *The Late Roman Army in the Near East from Diocletian to the Arab Conquest*, ed, Ariel S. Lewin and Pietrina Pellegrini. Oxford: BAR international Series 1717: 13-28.
- Vogt, Burkhard. 1996. Bronze Age Maritime Trade in the Indian Ocean: Harrappan Traits on the Oman Peninsula. In *The Indian Ocean in Antiquity*, ed. Julian Reade. London: Kegan Paul International: 107-132.
- Wallace-Hadrill, Andrew. 2008. *Rome's Cultural Revolution*. Cambridge: Cambridge University Press.
- Warburton, David A. 2007. What Happened in the Near East Ca 2000 BC?. In *The Indian Ocean in the Ancient Period*, ed. Eivind H. Seland. Oxford: Archaeopress: 9-21.
- Ward, Walter. 2007. Aila and Clysma: The Rise of Northern Ports in the Red Sea in Late Antiquity. In *Natural Resources and Cultural Connections of the Red Sea*, ed. Janet Starkey, Paul Starkey and Tony Wilkinson. Oxford: Archaeopress: 161-171.
- Warmington, Eric H. 1928. *The Commerce between the Roman Empire and India*. London: Cambridge University Press.
- Wheeler, Robert. E. M. 1954. *Rome Beyond the Imperial Frontiers*. London: G. Bell and Sons, Ltd.
- Whitcomb, Donald. S. 1979. Trench Summaries. In *Quseir al-Qadim 1978 Preliminary Report*, ed. Donald S. Whitcomb and Janet H. Johnson. Cairo: American Research Center in Egypt, Inc: 11-65.
- 1982. Roman Ceramics. In *Quseir al-Qadim 1980 Preliminary Report*, ed. Donald S. Whitcomb and Janet H. Johnson. Malibu: American Research Center in Egypt, Inc. 51-115.

- Whitehouse, David. 1989a. Begram Reconsidered. *Kölner Jahrbuch für Vor- und Frühgeschichte* 22: 151–57.
- 1989b. The Periplus and Gandharan Art. *JRA* 2: 93-100.
- Whitewright, Julian. 2008. *Maritime Technological Change and the Ancient World: The Invention of the Lateen Sail*. Southampton University: PhD Thesis.
- Whittaker, Charles. R. 2004. *Rome and Its Frontiers: The Dynamics of Empire*. London: Routledge.
- Will, Elizabeth. L. 2004. The Mediterranean Shipping Amphoras from the 1989-92 Excavations. In *The Ancient Port of Arikamedu. New Excavations and Researches 1989-1992. Volume Two*, ed. Vimala Begley. Paris: École Française d'Extrême-Orient: 325-404.
- Williams, David and David Peacock. 2005. The Eruption of Vesuvius and Campanian Dressel 2-4 Amphorae. In *Terra Marique*, ed. John Pollini. Oxford: Oxbow Books: 140-148.
- Wilson, Andrew. 2009. Approaches to Quantifying Roman Trade. In *Quantifying the Roman Economy*, ed. Alan Bowman and Andrew Wilson: Oxford: Oxford University Press. 213-249.
- Wood, Frances. 2002. *The Silk Road: Two Thousand Years in the Heart of Asia*. London: University of California Press.
- Young, Gary. K. 2001. *Rome's Eastern Trade International Commerce and Imperial Policy, 31 BC - AD 305*. London: Routledge.