

**BRIDGING THE GULF**  
*Maritime Cultural Heritage of the Western Indian Ocean*



# **BRIDGING THE GULF**

*Maritime Cultural Heritage of the Western Indian Ocean*

Edited by  
**HIMANSHU PRABHA RAY**

Foreword by

**KAPILA VATSYAYAN**



IIC



MANCHAR

Edited by

**HIMANSHU PRABHA RAY**

# Archaeology of Indo-Gulf Relations in the Early Historic Period: The Ceramic Evidence

ANJANA L. REDDY

## INTRODUCTION

The countries connected with the Indian Ocean form a series of relationships based on sea communication. These are reflected above all in trade. The Indian Ocean is one of the world's most ancient trading systems. Its existence as a cultural entity was first defined by K.N. Chaudhuri in his book titled *Trade and Civilisation in the Indian Ocean: An Economic History from the Rise of Islam to 1750*. He recognized that the Indian Ocean has a unity of civilization that is equivalent to that perceived of the Mediterranean by Fernand Braudel (Chaudhuri, 1985). Of all the seas, the Indian Ocean is perhaps a late entrant in historical studies. One reason for this may be the complexity of the subject, owing to the diversity of cultures prevailing in the Indian Ocean, which would make it a subject of study for many lives of many historians (Kejariwal, 2006). This is what Chaudhuri (1990: 11) explains has led to

. . . the specialist historians of Asia, each examining his own narrow chronology and field, are often unable to see the structural totality of economic and social life and are inclined to treat the experience of their own regions as unique or special . . . historians of Asia, whether working on the Middle East, India, China, or Japan, seem to be much more interested in comparing the course of their history with that of Western Europe rather than with other regions of Asia.

Subsequently, Indian Ocean studies relating to the Early Historic period have focused on the Early Roman 'India Trade' with emphasis particularly on the role of the Red Sea, East African and South Arabian ports. Studies so far tend to ignore the Arabian Gulf extension of the Indian Ocean area, or rather previous research has had the propensity to focus on these trading sites in isolation and seldom made the effort to include them in the Indian Ocean trading network. It is striking that no attempt has been made to conduct a detailed study of possible Indian material particularly the ceramics found in the sites within the Gulf arm of the Indian Ocean (Reddy, 2014: 16). The anonymous *Periplus Maris Erythraei* or the *Periplus of the Erythraean Sea* is the most explicit text to describe the ports of the Indian Ocean in the first

century AD. The *Periplus*, however, has several omissions, particularly in that the ports and market towns of the Arabian Gulf are barely mentioned in the text (see also Salles, 2005: 121). However, what this book lacks in detail and clarity especially with reference to the Arabian Gulf and its commercial ties with India can be fulfilled through a multidisciplinary approach combining historical data with archaeological evidence. The present paper seeks to corroborate the evidence of Indian pottery in the Arabian Gulf to explore inter-regional, international and assessment of trade networks, to define key source/provenance areas for particular vessels types from the subcontinent as well as to establish the position of the Arabian Gulf as more than an intermediary of Indo-Roman trade.

### *Geographical Parameters of Research*

The limits of the Indian Ocean are most clearly defined on its western and northern shores where it runs up against the coasts of East Africa, Arabia and Iran with extensions running deep into the Middle East formed by the Red Sea and the Arabian Gulf (Plate 1.1). As Tomber points out (2008: 109), of all the regions involved in Indo-Roman trade, the Gulf was the most separate, both geographically and politically, and only two ports are mentioned: Apologos, at the head of the Gulf (PME 35) near modern Basra (Iraq), and Omana (PME 36-7), on the Arabian side. The location of Omana has been much debated between the sites of the Arabian Gulf: Ed-Dur in Umm al Qaiwain (Potts, 1990: 309; Haerinck, 1998: 275) and Dibba al-Hisn in Sharjah (Jasim, 2006). According to the *Periplus* both ports (i.e. Apologos and Omana) carried out trade in pearls, purple cloth, dates, wine, gold and slaves (PME 36) with Barygaza in western India. From this perspective, both Ed-Dur and Dibba have been included in this paper, notwithstanding the numerous quantities of Indian pottery unearthed during excavations at the two sites. The geographical parameters of study are not simply bound by the Arabian Gulf littoral, and ports in general are dependent on their hinterland to varying degrees (Power, 2010: 25). In this case, the site of Mleiha, located inland in the emirate of Sharjah, known archaeologically from the third century BC, has been included. In south-eastern Arabia, by the fourth century AD even the limited areas of occupation at Ed-Dur and Mleiha had disappeared and the two sites had been completely deserted. Occupation dating to the late Sassanian period has so far has been identified in the UAE and Oman. Kush, a small coastal tell in the modern Emirate of Ras al Khaimah (Kennet, 1997) has been included in the parameters of this study pertaining to its material evidence of 'India trade' in the early historic period as well as medieval trade links.

From the earliest times, South Arabia had closer ties with East Africa than the Roman world (Singer, 2007: 10-13). For the sea trade, the *Periplus Maris*

*Erythraei* (Casson, 1989) names Muza (PME 21), Okelis (PME 25), Eudaimon Arabia or Aden (PME 26), Kane/Qana or Bir Ali (PME 28), Syagros or Socotra (PME 30) and Moscha Limen or Khor Rori (PME 32). Of these only Muza, Qana and Moscha are described as ports and only Qana and Khor Rori, established when the incense trade began to shift from overland to seaborne routes, are known archaeologically. Qana and Khor Rori form an integral part of this study concerning Indian pottery data from South Arabia.

In the east, the Indian Ocean's limits are far more imprecise, for beyond India it runs against the coasts of the island complex south and east of the Malay Peninsula and in the south-east against the coast of Australia (Geoffrey King, personal communication). The parameters of this study, however, have their geographical limits set predominantly within peninsular India, although mention is made of sites in Sri Lanka (Plate 1.1). As a region, India presents the greatest challenge because of its geographical diversity and in this case the ambiguity of Early Historic Indian pottery spread across the varied regions. The present paper will focus on the three main regions of peninsular India, which follow Roberta Tomber's description of the geographical parameters (Tomber, 2008: 124-32). These includes Gujarat and the Konkan coast, which is the main area of the Western Kshatrapas (AD 35-405) in the modern states of Gujarat and the coastal area of Maharashtra, incorporating foci of the western coast such as the Indus delta, Saurashtra and the Konkan (Thapar,

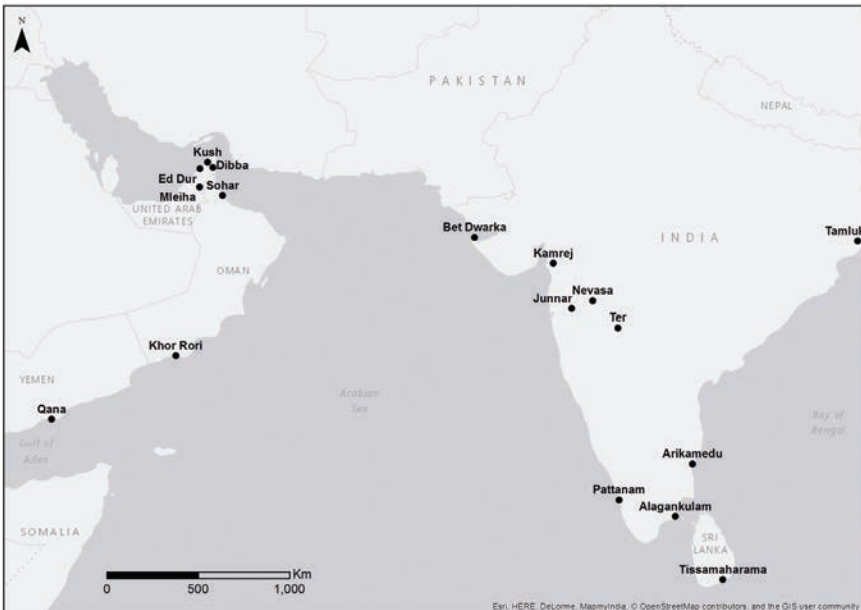


PLATE 1.1: LOCATIONS OF ARCHAEOLOGICAL SITES IN ARABIA AND INDIA IN THE EARLY HISTORIC PERIOD MENTIONED IN THIS STUDY (ESRI ARCGIS 10.2.2/BASEMAP ARCGIS ONLINE\_WORLD LIGHT GRAY CANVAS)

2002: 46); the Deccan, including the area between the Krishna and Godavari rivers and encompassed the Satavahana Empire (200 BC-AD 250); and Tamilakam, which comprised the three chiefdoms of Chola, Pandya and Chera.

*Chronological Parameters of Research*

The chronological extent of Indo-Arab relations in the Early Historic period begins with the third century BC which marks the Indian campaign of Alexander the Great (c. 327-325 BC) and the exploration of the Red Sea route to India by the Ptolemies. Further the backdating of several important trading sites in the Red Sea region (Berenike), Africa (Adulis), South Arabia (Khor Rori), Sri Lanka (Tissamaharama) and India (Arikamedu) to the third century BC indicates their founding at least four centuries earlier than the heyday of Roman trade (Pavan and Schenk, 2012: 191) (Table 1.1). The evidence from Khor Rori in South Arabia as well as sites in the Arabian Gulf and the Red Sea of Indian pottery dating indisputably to the centuries BC further corroborates the early trade relations between Arabia and India (Pavan, 2011: 102-3). This period also saw the rise of important sites in south-eastern Arabia; Mleiha (c. third century BC-mid third century AD), Ed-Dur (c. first century BC/AD-third century AD) and Dibba (c. first century AD-mid third century AD) (dating based on Mouton and Cuny, 2012), in what is commonly referred to

TABLE 1.1: CHRONOLOGICAL TERMS AND TENTATIVE PERIODIZATION OF SITES IN THE EARLY HISTORIC PERIOD

<i>Chronological Terms</i>	<i>Date (circa)</i>	<i>Examples of Sites</i>
Late Pre-Islamic (PIR A)	3rd-mid 2nd cent BC	Mleiha, Ed-Dur & Dibba
Late Pre-Islamic (PIR B)	Mid 2nd-1st cent BC	
Late Pre-Islamic (PIR C)	1st-end 2nd cent AD	
Late Pre-Islamic (PIR D)	2nd-mid 3rd cent AD	
Hellenistic	3rd cent BC-1st cent BC	Mleiha, Ed-Dur, Dibba, Khor
Graeco-Roman period	3rd cent BC-7th cent AD	Rori, Qana, Suhar, Quseir,
Early Roman	1st cent BC-mid 3rd cent AD	Berenike, Ras Hafun,
		Tissamaharama
Late Roman Civilization	4th cent AD-mid 6th/7th cent AD	Kush, Suhar, Berenike, Ras Hafun
Early Byzantine	4th/5th centuries AD	
Long Late Antiquity	c. 300-830 AD	
Islamic period	8th cent AD-16th/17th cent AD onwards	Kush, Suhar, Manda, Kilwa, Pate, Shanga
Early Historic (north India)	5th cent BC-3rd cent AD	Ter, Nasik, Kamrej, Bet Dwarka
Early Historic (south India)	terminated in 500 AD	Pattanam, Arikamedu
Early Medieval/Early Islamic	6th/early 7th cent AD	Akota, Vadnagar, Timbarva

as the Late Pre-Islamic period by archaeologists in the UAE. The end of this era in south-eastern Arabia is placed during the Sassanian period that marks the decline of the three main sites in south-eastern Arabia (around *c.* third/fourth century AD) and the rise of Kush in the fourth/fifth century AD until the medieval period (*c.* thirteenth century AD), with evidence of Indian pottery and continuing trade/contact with the subcontinent (Kennet, 2004).

For the subcontinent, the period of Roman contact is subsumed mostly within the Early Historic period in India, whose parameters vary as a result of different cultural developments (Tomber, 2008: 118). During the third century BC, most of north and south India belonged to the Mauryan Empire (*c.* 325-184 BC). In the south, the early historic period marked the transition from the megalithic to a more urbanized society as a result of inter-regional trade (Champakalakshmi, 1996: 92). The Early Historic period in the north was terminated between AD 300 and 500 during the time of the Gupta Empire and based on the end of Roman contact with India, while in southern India, the Early Historic Period ends by *c.* AD 500 (Selvakumar and Darshana, 2008, cited in Tomber, 2008: 120). However, as Tomber (2008: 120) points out, Roman finds continue into the sixth- early seventh century or early medieval period. So whether Roman contact with India ended in AD 300 or whether this is an appropriate measure to define the Early Historic period must be considered, and requires ongoing review.

#### ARCHAEOLOGY OF INDO-GULF TRADE: THE CERAMIC EVIDENCE

The archaeological evidence that we are dealing with in terms of Indo-Arab trade of the Early Historic period does not involve an elaborate list of artefacts. But it is the question of integrating this evidence to create a coherent narration of the broader Indian Ocean networks, which makes the study all the more challenging. Foreign and local pottery comprises the largest body of evidence, followed by coinage. Then, epigraphic evidence forms a large part of the archaeological data, particularly from South Arabia and India. And finally, archaeo-botanical remains indicate a culinary change and introduction of new food items from India into Arabia. The focus of this paper however will be the data derived from pottery and archaeo-botanical evidence of trade.

Pottery provides tangible archaeological evidence for the study of trade and contact in the Indian Ocean world. A large amount of imported ceramics have been found during the excavations of several important Indian Ocean trade sites in the Red Sea region, East Africa, Arabia and India, that have been the subject of documentation and analysis. Roberta Tomber's recent study *Indo-Roman Trade: From Pots to Pepper* (2008) includes a rare synthesis of the late Roman Red Sea 'India trade' based largely on the ceramic evidence (Power,

2010: 12). The issue of Indian pottery is complex and problematic, beginning with its definition. The term 'Indian pottery' is used for materials of great diversification in fabric and form and is widespread in the Indian subcontinent as well as in different sites along the coasts of the Indian Ocean and the Red Sea. Less attention had been reserved, therefore, for a comprehensive study of Indian material. As the key focus in the present paper, the Indian assemblage discovered in the various sites in the Indian Ocean has already formed the subject of investigation.

The detailed study of Early Roman Indian pottery in the Red Sea region was first undertaken in 1997 by R. Tomber and V. Begley at Berenike by classifying and illustrating both fine and coarse wares and citing parallels primarily from the site of Arikamedu in south India (Begley and Tomber, 1999). Tomber consequently undertook preliminary sourcing studies of the Indian ceramics found at Roman Berenike in 2000 (Tomber, 2000a; 2002). In the same year, Indian pottery vessels were amongst the collection of 'non-Roman wares' recorded and published at Quseir al-Qadim (Tomber, 2000b).

The presence of Indian pottery as far as the Red Sea garnered interest in the assemblages closer to home. From south-eastern Arabia, Indian pottery forms have been identified and recorded briefly from excavations at Ed-Dur (Rutten, 2006; Haerinck, 2001 and 2003), Mleiha (Mouton, 1992; Mouton and Cuny, 2012; Mouton et al., 2012) and Dibba (Mouton and Cuny, 2012; Jasim, 2006). Late Roman- and Islamic-period Indian wares dating from the fourth/fifth to sixteenth/seventeenth centuries were identified and documented into different classes at Kush by D. Kennet and quantitative comparisons were drawn with Indian assemblages from Shanga and Pate in Kenya (Kennet, 2004: 88-96). From South Arabia, imported 'RPW' was the first Indian ceramic to be identified and reported from Khor Rori (Yule and Kevran, 1993: 91; Zarins, 1997; 2001). A reassessment of the Indian pottery from Khor Rori was undertaken in the following years through the publication of Khor Rori reports 1 and 2 (Sedov and Benvenuti, 2002; Avanzini (ed.), 2002a; 2008).

The evidence of Indian ceramics from the eastern Arabian seaboard and the Red Sea indicates the trade of not merely the pottery itself but in the contents of these vessels. Botanical commodities of trade are of particular interest in this study as it is likely that these were transported or stored in pottery vessels. Historical sources such as the *Periplus* and Alexandrian Tariff was issued by the emperor Marcus Aurelius between AD 176-80. The document enumerates a vast number of imports and exports to and from Berenike including a wide variety of plant parts: root, wood, bark; plant secretions such as resins, gums, oils and wine as well as leaves, flower, seeds, fruits and whole plants (Cappers, 2006: 3 quoted in Reddy, 2014: 269). Given the lack of an extensive archaeo-botanical record in the Arabian context, the aspect of culinary change, i.e. the adoption of new foodstuffs and new forms of food preparation/

consumption is indicated in part by the Indian ceramic evidence and changes in the range of vessel forms (and usage of trade ceramics) through time (see Fuller, 2005 quoted in *ibid.*: 277).

#### RECORDING PROTOCOL OF INDIAN POTTERY: CLASSIFICATION OF FORMS AND FABRIC ANALYSIS

The recording protocol for Indian forms varies slightly based on the individual sites in Arabia. On the whole the information that was recorded includes sherd number, context, description, rim diameter, munsell colour, decoration, etc. Additional recording procedures included pottery drawing, photographic documentation and cross-referencing with ceramics from Indian sites through examination of excavation reports and actual pottery collections (Reddy, 2014: 21-2; 2015: 254).

Next, the methodology involving fabric study was given particular importance. This study was especially essential in the case of Indian fabric due to the use of generalized terms to define ware classes in India. For example, the nomenclature used in Indian site contexts is based on the colour and texture of the fabric – red, black, grey, coarse, fine, etc. – which is not scientific and is highly subjective. In addition, the type of surface treatment is often used to describe the fabric, e.g. red slipped wares, black burnished wares, etc., without identifying variations in the fabric (see Nanji, 2011). The fabric study involved an examination of the core and surface of several pottery samples using the hand-held Dino-lite microscope (AM 4113ZT) with a magnification range of 10x-200x. Photographic images of the fabric were recorded using Dino-capture software with a resolution of 1.3M pixels. Inclusions and other particles in the fabric were measured in mm or microns. Based on the fabric variations, sub-groups or sub-classes of fabric were created (Reddy, 2015: 254). These variations are based on the visual identification of principal inclusions (naturally occurring in clay or added temper, voids, etc.), texture, sorting parameters, size of the inclusions, frequency, grain-size classifications, etc. In terms of additional evidence to prove its import or imitation status, results from petrographic analysis were used to provide more precise indicators of the geographical origin of the wares and more particularly the geological provenance of the raw material (Reddy et al., 2012).

#### INDIAN POTTERY IN ARABIA: IMPORTED VS. IMITATION WARES

The present paper constitutes a major part of the author's own doctoral research on the subject (Reddy, 2014). The overall research looked into the examination of Indian ceramic assemblages from three archaeological sites located in the south-eastern part of the Arabian Gulf within modern-day UAE (Mleiha,



Ed-Dur and Kush) and one site in South Arabia (Khor Rori) in the Dhofar region of Oman. One of the objectives of the research thesis was to document this pottery evidence including description and classifications of vessel morphologies as well as the results from the visual examination of various fabric types and petrographic analysis. Though form parallels are a significant aspect of studying the cross-cultural influx of pottery types, Begley and Tomber (1999) were right in observing that fabric is the more important criterion for determining the source of the pottery.

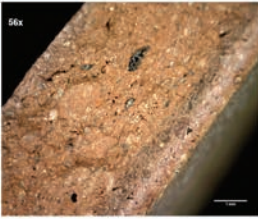
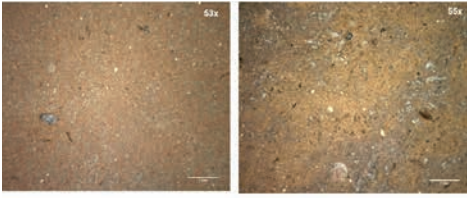
The documentation process revealed two categories of Indian pottery identified from the Arabian context: Actual imports, relating to source or production centres from India, and secondly, local imitations of Indian pottery that employ the same techniques as attested in the subcontinent, but using locally available raw materials or clay (Reddy, 2015: 253). Several vessel forms and fabric types were identified in the course of the study that fit into the categories of actual imports and local imitations of Indian vessels. For the purpose of this paper however, the focus will be on two case studies or examples of imported and imitation wares:

*Case Study 1: Imported Indian Pottery – Indian Micaceous Ware (Fabric 2)*

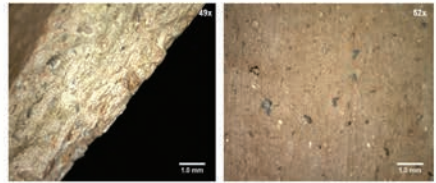
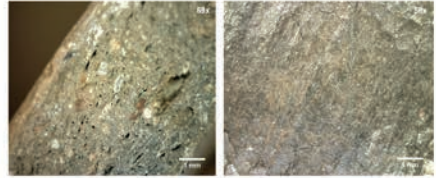
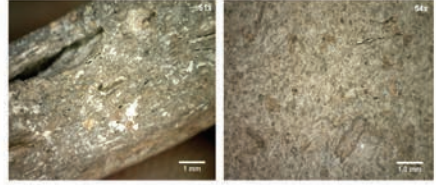
Indian micaceous ware or Indienne micassée is a red ware with a dark grey or black core (indicative of ill-firing) and tempered with mica particles. This fabric is mostly recorded in forms representing carinated *handi* vessels as well as a few examples of storage jars, cooking pots and flasks at Mleiha and Ed-Dur. The exterior is often covered with a thick red slip in a majority of these wares and the surface is often 'strip burnished' with a series of streaks seen on the slipped surface. Decoration usually comprises a number of incised lines recorded on carinated *handis* immediately above the point of carination (Reddy, 2014: 42).

The fabric is hard with a hackly fracture and rough texture indicating that it is a type of coarse ware. The principal inclusions in the fabric are dominated by an abundance of white mica particles (muscovite) dotted with occasional medium-sized particles of dark mica (biotite) (ibid.: 43). Several variations can be noted in these wares based on the fabric and principal inclusions (Plate 1.2)

In terms of its import status, it is gathered that mica is often present in the original clay source, especially from sites in western India. The Indian micaceous ware from Mleiha, however, appears to have been intentionally tempered with mica indicative of glistening flakes visible on the surface and in the core of the samples. Micaceous ware or mica-tempered pottery is part of a long tradition of pottery technique from Gujarat since the Chalcolithic period and continues into the Late Pre-Islamic. Additionally the surface treatment is represented by specific techniques of 'strip burnishing' visible on the external



**Fabric 2(A) with predominantly mica particles and infrequent inclusions of clay pellets**



**Fabric 2(B) with irregular sized white limestone and quartz/quartzite grains with vegetal temper and some mica**



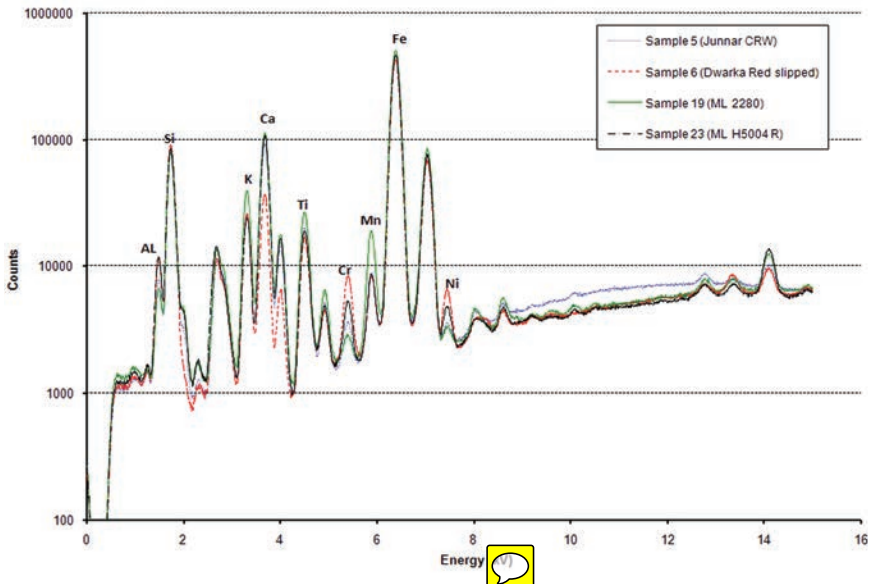
**Fabric 2(C) with grit or grain-sized white inclusions in combination with mica particles and grains of red quartz/quartzite and iron oxide**

PLATE 1.2: INDIAN MICACEOUS WARE (FABRIC 2) FROM MLEIHA WITH VARIATIONS (SAMPLES COURTESY: FRENCH ARCHAEOLOGICAL EXPEDITION AT MLEIHA/PHOTOGRAPH: ANJANA REDDY).

slip of the vessels similar to pottery traditions in parts of western India. Working techniques recorded on particular vessels from Mleiha are known even today to potters in north India and Kerala and involve the use of bamboo tools to hollow the inside and define the rim and neck of the vessel which is beaten internally to achieve the desired thickness (Saraswati and Behura, 1966 quoted by Tomber, 2008: 47). These bamboo marks are still visible on the interior of the vessel from Mleiha. Carinated *handis* or Wheeler-type 24s have been recorded from the Red Sea area that demonstrates a similar technique (ibid.). It is therefore likely that many of the carinated *handis* and slipped cooking pots/storage jars from the Arabian Gulf could signify their origin from western India (Reddy, 2014: 43-4).

*Sourcing Indian Ceramics in Arabia: Petrographic Analysis*

In order to further prove its import status, seven samples of Indian pottery from Mleiha (including fragments of cooking pots in Indian micaceous ware) were compared and analysed with 21 samples from key sites in the Gujarat and Maharashtra regions of western India (Ter, Nevasa, Junnar, Padri, Dwarka, etc.) using X-Ray fluorescence (CRF) spectrometry analysis (Reddy et al., 2012). The results indicated that two (out of seven) sherds from Mleiha had strong correlations in chemical/elemental composition with thirteen sherds from sites in western India (Graph 1.1), signifying more than a 90 per cent



GRAPH 1.1: EXAMPLES OF XRF SPECTRA PLOTS OF PHOTON COUNTS (LOG) VERSUS PHOTON ENERGY (KEV) THAT SHOW HOW WELL INDIAN POTTERY SAMPLES (5 & 6) CORRELATE WITH MLEIHA POTTERY SAMPLES (19 & 23) (ANALYSIS BY: GAFFAR ATTAELMANAN/ UNIV. OF SHARJAH)

probability that they are from the same environment/clay source (*ibid.*: 4). This scientific evidence further corroborates the position of western India as a key source of Indian pottery in Arabia.

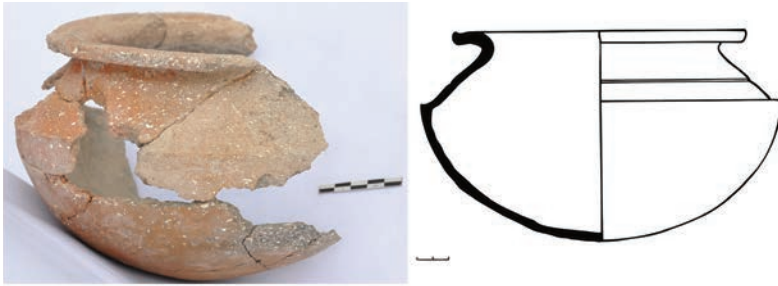
*Case Study 2: Imitation Indian Pottery – Shell-tempered Ware (Fabric 3) and Fine Indian Red Ware (FIRW).*

This category of coarse ware fabric has quantities of roughly crushed shell fragments in the clay. The fabric ranges from buff to reddish-brown and occasionally grey, while the shell inclusions are identified by their flat/lamellar (plate-like) or curved features (Reddy, 2015: 265) (Plate 1.3). Shell-tempered ware is well attested as a local fabric from several sites in the Dhofar region of Oman, including at Khor Rori (Avanzini (ed.), 2008; Pallecchi and Pavan, 2011: 84-5), from south-eastern Arabia at Mleiha (Reddy 2014: 45-6) and from Ras Hafun (Somalia) where ‘quantities of coarsely crushed shell fragments in the clay’ have been reported (Smith and Wright, 1988: 122).

In terms of identifying the source of shell-tempered wares, this ware group could be designated as part of the Dhofari tradition of pottery, which are characterized by pottery with reddish/buff fabrics, never wheel-made and that usually employ crushed shells as temper (Pallecchi and Pavan, 2011: 85). The recent work by the Italian Mission to Oman (IMTO) researched the local raw materials used in the manufacture of pottery indicated that samples of locally made Dhofari pottery besides comprised microfossil calcareous fragments and shells as its main components (*ibid.*).

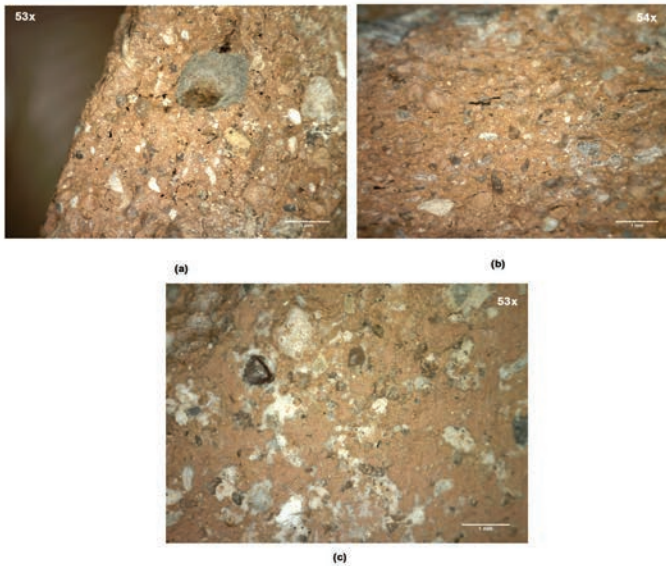
Although the Dhofar region of Oman may seem to be the most likely source of this ware group, the question of possible local Arabian imitations of typical Indian cooking vessels by utilizing this locally available fabric is more complex. The forerunner in this category are a group of carinated *handi* vessels from Mleiha manufactured using this shell-tempered clay (Plate 1.3). Although shell is occasionally present in natural clay sources from coastal/riverine sites in India, so far there is no pottery industry known in India that employs the addition of medium to large fragments of crushed shell as a tempering agent to the clay (Reddy 2015: 258). It may be safe to speculate that this vessel type of shell-tempered Indian-inspired *handis* with everted rims may have been manufactured for Indian residents/traders within Arabia who for cultural reasons perhaps preferred to use their own familiar cooking vessel forms (see Kennet, 2004: 96).

A detailed study of pottery fabric has essential merits in not only defining the source of the ceramic, but in identifying certain wares often mistaken to represent a different pottery group. An example of this is a category of fine red wares nearly identical to Indian red polished wares (RPW), but for the quality of the pieces, especially the weak treatment of surfaces and poor firing. These were referred to instead as Indian-style table jars at Khor Rori (Sedov



**Carinated 'handi' type shell-tempered vessel from Mleiha**

**photograph courtesy of the French Archaeological Expedition at Mleiha  
pottery drawing V. Bernard/French Archaeological Expedition at Mleiha**



**Khor Rori shell-tempered fabric sample (photograph: Anjana Reddy)**

**(a) to (b) sample core section with curved shell features, quartz/quartzite and igneous grains**

**(c) surface section of sample with flat lamellar shell fragments**

**PLATE 1.3: LOCAL IMITATIONS OF INDIAN POTTERY: SHELL TEMPERED  
'HANDI-TYPE' VESSELS FROM MLEIHA AND SHELL-TEMPERED  
FABRIC SAMPLES FROM KHOR RORI**

and Benvenuti, 2002: 187) and at Ed-Dur as 'fine red slipped' and 'fine reddish brown and grey slipped' wares (Rutten 2006). The term Fine Indian Red Ware or FIRW was coined by Kennet (2004: 90) based on evidence from the site of Kush, where it was classified as a separate class of wares from RPW.

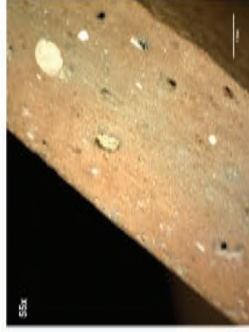
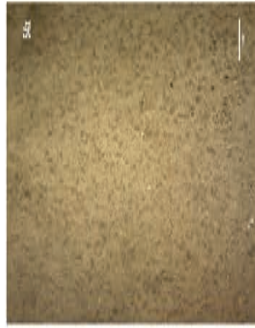
To corroborate this, samples of FIRW and RPW from Kush were examined microscopically (Reddy, 2014: 80). What is interesting is that the RPW from Kush, as Kennet points out, is from securely dated levels of the seventh-eighth centuries AD when it was thought to have ceased production in India (Kennet 2004: 89). The microscopic examination of samples from both wares revealed

that RPW from Kush was coarser with a greater range of inclusions than FIRE which had smaller mineral inclusions and a fine clay matrix. The external slip and burnishing of RPW was of superior quality (Reddy, 2014: 226-7) (Plate 1.4). This fine red ware category could represent either imitations from the Gulf itself or actual imports from India. To determine this, a detailed study is required from the Indian excavations in order to classify 'fine red wares' as a separate category from Indian Red Polished Wares (Reddy, 2015: 265).

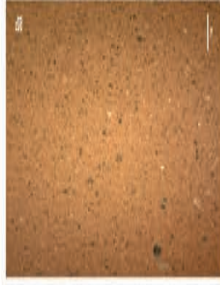
#### ARCHAEO-BOTANICAL EVIDENCE OF INDO-ARAB TRADE

The evidence of Indian ceramics from the eastern Arabian seaboard and the Red Sea indicates the trade of not merely the pottery itself but in the contents of these vessels. Botanical commodities of trade are of particular interest in this study as it is likely that these were transported or stored in pottery vessels. Historical sources such as the *Periplus* and Alexandrian Tariff enumerate evidence of archaeo-botanical remains and research from Berenike and Quseir al Qadim that are of exceptional international importance owing to the excellent preservation condition of most specimens as well as the size of the data set and the high species diversity (Cappers, 2006; van der Veen, 2011a; van der Veen et al., 2011b). On the other hand, the evidence of botanical remains is mostly absent in the archaeological records from the Arabian context and in this case, the study relies on historical sources and ceramic data to envisage the various commodities of trade. This ceramic evidence also indicates changes in the range of vessel forms through time, suggesting the development or adoption of new forms of food preparation and consumption (see e.g. Fuller, 2005) resulting from trade with peninsular India.

A comparison between the Alexandrian Tariff and the *Periplus* shows that they have a small quantity of commodities of botanical origin in common. Together, they mention 45 different trade items, of which only 9 are mutual trade items ranging from sources in Arabia and India. Exports from the Arabian harbours to Berenike concerned aloe, frankincense and myrrh, while items traded from India to Berenike were indigo, long and black pepper, lykion, costus, nard, bdellium and malabathron. In terms of the commodities exported from the south-west India, the *Periplus* mentions, 'ships in these ports of trade (Muziris and Nelkynda) carry full loads because of the volume and quantity of pepper and malabathron . . .' (PME 56; Casson, 1989: 85). The route to India required big and strong ships, which according to the author of the *Periplus* was the rationale behind such uncommon dimensions of the ships that sailed from Egypt to the Malabar coast to accommodate the exceptional quantities of pepper and malabathron being transported to Egypt (De Romanis, 2012: 75). Similarly a closer examination of the 'Muziris papyrus', although fragmentary, can identify three cargo items from India (Gangetic nard, black pepper and malabathron) as part of the unidentified cargo on the *Hermapollon*



Padari (Gujarat)



Navasa (Maharashtra)



Navasa (Maharashtra)

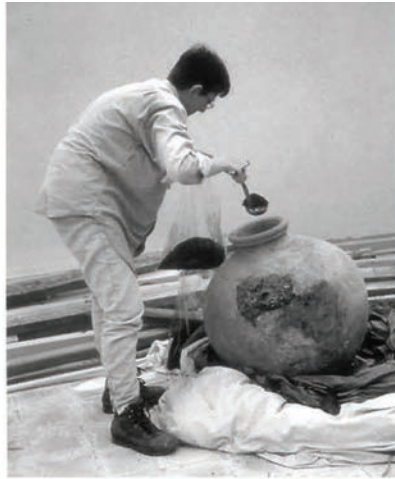
Fine Indian Red Ware (FIRE) samples from Kush  
(samples courtesy: Derek Kennell Photograph: Anjana Reddy)

Indian Red Polished Ware (RPW) samples from Kush  
(samples courtesy: Derek Kennell Photograph: Anjana Reddy)

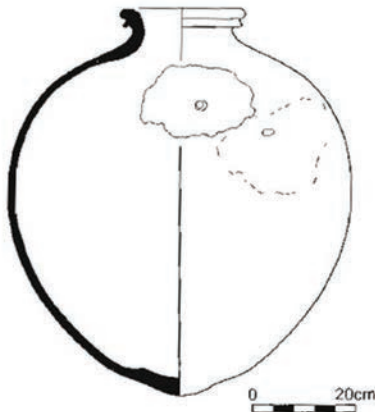
RPW samples from Gujarat & Maharashtra  
(samples courtesy: Deccan College Photograph: Anjana Reddy)

PLATE 1.4: COMPARISONS OF FIRW AND RPW POTTERY SAMPLES FROM KUSH WITH SAMPLES OF RPW FROM INDIA

(name of the shipping vessel). Theoretically, black pepper could be measured either by some container unit (such as sacks) or by actual weight and nearly 87 per cent of the cargo on the *Hermapollon* was pepper (ibid.: 75-101). Pepper was understandably an important eastern commodity of export from India and excavations at the Red Sea port of Berenike revealed nearly 7.5 kg of black peppercorns in an Indian dolium (storage jar) recovered from a late first century BC or early first century AD courtyard in the Serapis temple at the site (Cappers, 2006: 114-15) (Plate 1.5). In the Arabian Gulf context, an



Emptying a dolium filled with 7.5 kg of black pepper at Berenike - *Piper nigrum*  
Cappers 2006: Fig. 4.58



Indian storage jar from Berenike that contained 7.5 kg of pepper  
(Tomber 2008: Fig. 14)

PLATE 1.5: INDIAN STORAGE JAR FROM BERENIKE THAT CONTAINED 7.5 KG OF PEPPER (AFTER CAPPERS 2006: FIG. 4.58/ TOMBER 2008: FIG. 14).



exception to the case is the site of Mleiha where the food remains are generally well preserved because they were charred as a result of fire in the final phase of the site. In several rooms and in the courtyard, the concentrations of carbonized grain most probably resulted from the storage of food in bags or baskets and likely to have been cultivated locally in the al-Madam plain (Mouton et al., 2012: 214).

The *Periplus* mentions important food items imported from India into Arabia: grain (PME 14, 31, 32), rice (PME 14, 31), sesame oil (PME 14, 32), cotton cloth, ghee and cane sugar (PME 14). The rice mentioned in the *Periplus* is reported as being exported from the Gulf of Cambay in north-west India and near modern-day Karachi in Pakistan (PME 41) and from these regions, rice was brought to the ports at the entrance of the Red Sea, on the northern coast of Somalia and on Socotra, with Roman ships directly collecting rice from these ports (van der Veen, 2011a: 47). The import of rice could also be interpreted as evidence for the presence of South Asians/Indians at the sites in Arabia, who preferred to eat this commodity even when away from their home country. Additionally rice is well known for its good preservation conditions and could be easily transported over long distances. Whether the local Arabian population consumed rice is still questionable, although it is clear that by the Islamic period it was being cultivated locally in Egypt and was well inducted into the Arab cuisine (ibid.: 80). Other food items mentioned in the *Periplus* such as ghee and sesame oil could easily be stored for long periods during transportation and at the port of destination. Also ghee as a commodity solidifies when left for a time and was therefore not prone to spillage when transshipped.

Distinct forms of Indian pottery vessels entered the archaeological record of the Arabia in the Early Historic period. These could be connected either to the adoption of new food items or to the elaboration of ways of preparing those already present (see Fuller, 2005: 767). As Kennet (2004: 96) explains, ‘. . . a notable aspect of the Indian pottery from all of these sites (in Arabia) are not high-quality wares which might be traded for their own value but traded for use as cooking pots by communities of South Asians in the Gulf who, perhaps for cultural reasons, used vessels manufactured in South Asia.’ Cooking pots are generally used to prepare boiled food, especially rice and occasionally lentils in India. Strabo (*Geography*, 15.1.53) states that most of the Indian food consisted of rice porridge and that Indians made a beverage from rice that is known as *arak* (cited in Cappers, 2006: 105). Evidence from Mleiha suggests large Indian cooking and storage vessels with soot remains and probable food residue (Plate 1.6). This could indicate the preparation of food or community-style cooking at the site. Furthermore, the site located in the fertile Al-Madam plain has produced preliminary archaeo-botanical evidence of large quantities of hulled barley (*Hordeum vulgare*) and free-threshing wheat of the bread wheat type (*Triticum aestivum*), lentils (*Lens*



PLATE 1.6: FOOD RESIDUE AND SOOT REMAINS INSIDE A LARGE INDIAN COOKING POT FROM MLEIHA (IMAGE COURTESY: FRENCH ARCHAEOLOGICAL EXPEDITION AT MLEIHA)

*culinaris*), etc., cultivated locally. It is not implausible to assume therefore that introduced varieties of food grains/seeds from the Indian subcontinent were also perhaps cultivated locally at Mleiha to compensate for the rising food demands made by the ever-increasing population of traders/visitors to the site. Further archaeo-botanical studies are required to corroborate this.

#### INDIAN CERAMICS IN ARABIA: KEY PROVENANCE AREAS AND PATTERNS OF TRADE

From the available evidence of Indian pottery, four key areas or zones from the Indian subcontinent were identified in the present research (Reddy, 2014: 316-22) that indicate possible source areas as well as transit/transportation centres for these particular vessel groups found in the Arabian contexts:

##### *Key Area 1 (Western India)*

Gujarat and Maharashtra regions in western India are now accepted in this study as the two main sources for the Indian vessels regularly discovered in

the assemblages of sites like Mleiha, Ed-Dur Khor Rori and further at Red Sea sites like Berenike and Quseir.

*Key Area 2 (North-Western Frontier)*

The north-western part of India including the Indus region as well as the Pakistan-Baluchistan areas. The Indus-region is a likely source of some of the fine Indian red wares found in Ed-Dur (see De Paepe et al., 2003) and Indian black-and-grey wares discovered at Mleiha (M. Mouton, personal communication).

*Key Area 3 (South-Western Coast)*

Along south-western or Malabar coast, a source from the site of Pattanam in Kerala can be attributed to some Indian cooking and storage vessels from Red Sea ports of Berenike and Quseir that display working techniques like 'internal wiping' and 'scooping' using bamboo/organic tools (Tomber and Begley, 2000). Similar vessels were also documented in Arabia including at Khor Rori and Mleiha.

*Key Area 4 (Eastern and Southern India including Sri Lanka)*

Two types of Indian pottery in the South Arabian port of Khor Rori suggest a source from eastern and southern India: Rouletted Ware (RW) and Paddle-impressed Ware. A source in eastern India particularly Bengal may be attributed to the RW from Egypt, Arikamedu and other sites based on a personal examination of the fabric by Roberta Tomber (see Tomber, 2008: 44). Also recent research by Magee (2010) identified two distinct workshops for RW, i.e. Group A produced somewhere in south-eastern India (c. 500 BC-AD 300) and Group B produced somewhere in Sri Lanka, probably in the northern part of the island (c. after 200 BC-AD 300).

Reconstructing Indian Ocean trade routes is an important aspect in the archaeo-historical analysis. Trade goods of course do not necessarily travel a straight course or take the shortest route (Salles, 2005). The distribution pattern for Indian vessels in Arabia (and Red Sea region) suggests the following seaborne routes from India:

*Route A: India-South Arabia*

As part of Route A, ships made their way from Bengal and south India by way of Sri Lanka or via Pattanam (Kerala) to Khor Rori in South Arabia. Then they proceeded to the Red Sea port sites of Berenike and Quseir, when the winds were favourable. According to Pavan and Schenk (2012: 200),

distribution pattern of rouletted ware, paddle impressed ware and cooking pots (Wheeler Type 24) reflects the trade routes that traversed India, but the principal route ran along the eastern coast from Bengal down to the island of Sri Lanka. Rice-tempered wares, along with RPW, could have reached South Arabia directly from the Gujarat region.

*Route B: India-Gulf*

Route B includes trade routes starting from Gujarat or western India and circumnavigating the Arabian Gulf. The Indian material first reached Suhar or Dibba port in the eastern Arabian Gulf. It was then re-exported from either south Mesopotamia or Iran to Ed-Dur and Mleiha in the UAE. From southern Mesopotamia the Indian material also reached the Mediterranean via the camel caravan route through Syria.

*Route C: Overland Arabia*

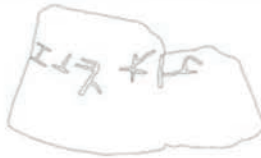
Frankincense routes form a very important component of overland routes traversing the Arabian peninsula. Kennet (2007: 109) indicates four possible overland routes with Gerrha (Thaj Oasis, Saudi Arabia) acting as the conduit: (i) South Arabia to Petra via Gerrha, carrying South Arabian incense, (ii) South Arabia to Palmyra, carrying South Arabian incense overland to Gerrha and then by sea and river, (iii) Gerrha to Petra, carrying Indian goods brought to Gerrha by sea, and (iv) South Arabia to Persia via Gerrha, carrying South Arabian incense.

These overland routes may also have been used to supply Gulf sites with Indian material from South Arabia.

So how did this Indian material reach the Gulf? Depictions of sailing ships have been identified in epigraphic records and archaeological remains of shipwrecks. In the Red Sea area, there is archaeological evidence from sites like Berenike and Quseir including hull planks, wooden and horn brail-rings, deadeyes, block sheaves, wooden toggles and fragments of sail-cloth of Indian origin (Blue et al., 2011). The data also includes examples from Arabia comprising sailing vessels inscribed at a number of Dhofar hill sites (Zarins, 2001: 134) and from the Brahmi inscriptions/ship graffito at the Hoq cave on the island of Socotra (Yemen) pointing towards the presence of Indian sailors in Arabia from the end of the second-fourth centuries AD (Strauch and Bukharin, 2004). Pottery and plaster also serve as a medium and a particular example is the ship graffito at Khor Rori (Sumhuram) carved into wall plaster near the gate and represents an ancient sailing vessel with two masts, engaged in what appears to be whaling (Plate 1.7). The depiction is similar to that of two-masted ships found stamped on coins minted by the Satavahana/Andhra dynasty sometime between the second/first century BC and the second



**Ship graffito on plaster from Khor Rori  
(after Avanzini 2007)**



0 10 CM

ᱚᱤᱨᱤᱰᱤᱦᱚᱱ

ᱚᱤᱨᱤᱰᱤᱦᱚᱱ  
ᱚᱤᱨᱤᱰᱤᱦᱚᱱ

**Tamil Brahmi ostraca from Khor Rori  
(Rajan 2012)**

PLATE 1.7: PLASTER WALL INSCRIPTION OF INDIAN  
EARLY HISTORIC SHIP AND TAMIL-BRAHMI  
OSTRACA FROM KHOR RORI

century AD (Ray, 1986; Avanzini, 2007: 27; Fig. 4). With regard to Tamil-Brahmi ostraca in South Arabia, a potsherd was found in the residential area of Sumhuram (Khor Rori). The sherd itself was part of a lid made by reusing the shoulder of an amphora. Soot traces visible along the external ridge suggest the use of the lid for a cooking pot, found in the first century AD context or earlier. The ostraca is inscribed with 'nantaikiran', signifying a personal name with two components. The first part '[n] antai' is an honorific suffix to the name of an elderly person. The second component 'kiran' stands for a personal name. More than 20 poets of the Tamil Sangam age (c. third century BC to third century AD) have 'kiran' as part of their personal names. The broken piece of the pot probably carried the personal name of an important trader who commanded high regard in the community (Rajan, 2012) (Plate 1.7).

## CONCLUSION

The archaeological evidence of trade routes could be further enhanced by the theoretical approach proposed by Chase-Dunn and Hall (1997) and Hall and Chase-Dunn (1999) as a 'comparative world-systems perspective' wherein 'important networks of interaction impinge upon a local society and condition social reproduction and social change'. Accordingly, in most inter-societal systems there are several important networks of interaction:

1. Information Networks (INs) – Information is light and it travels a long way, even in systems based on down-the-line interaction.
2. Prestige Goods Networks (PGNs) – A smaller interaction network is based on the exchange of prestige goods or luxuries that have a high value/weight ratio.
3. Political/Military Networks (PMNs) – The largest interaction net composed of polities that are allying or making war with one another.
4. Bulk Goods Networks (BGNs) – A network based on production and trade of basic everyday necessities such a food and raw materials.

To apply this theory within the Indian Ocean sphere, prestige or elite goods networks involved various partners in the Indian Ocean, particularly Rome and India. It is this direct interest in prestige goods that led the Romans to establish political or military networks in South Arabia, in order to control this trade and the trade in aromatics. As historic records show, this was attempted through the invasion of South Arabia and the adjacent Arabian Gulf by the Roman governor of Egypt, Aelius Gallus in 25-24 BC. This military mission proved to be a failure, attributed partly to an over-extension of supply lines from Egypt. Large quantities of food and water to sustain the Roman troops in Arabia were unavailable owing to poor guides that led the army through long circuitous routes that avoided wells and provisions (Ball, 2000: 110-12). Moreover this disastrous Roman mission shows that local food

production in Arabia by the first century BC-AD had to be supplemented by an influx of food items from India and Roman Egypt. This was to cater to the growing demands from the increased number of visiting traders. Food and bulk goods networks (BGNs) were therefore more important to Indo-Arab trade than so-called prestige goods.

The collation of large quantities of Indian pottery data from the Arabian sites as part of the present research indicates two main points: (a) these were not just residual containers that belonged to traders on their way to Rome or back to India, suggesting that these were probably transported and used by Indian or South Asian residents in Arabia during the early centuries AD, and (b) the trade in bulk essentials (rice, grain, cloth, ghee, sesame oil, etc.) from India to Arabia was probably more important for the sustenance of local residents and visiting traders than prestige goods from Rome or the Indian subcontinent. This goes to show, as Avanzini (2002b: 23) had previously indicated that as far as the Indian route is concerned, the role played by Rome though important, is overestimated. Particular preferences of specific forms like cooking and storage vessels could indicate a small South Asian population in Arabia. This led to the small-scale manufacture of imitation Indian vessels in Arabia as a means of the local economy adapting to the needs of the visiting traders. Moreover, there is a marked increase in the size of Indian cooking vessels during this period, indicating communal cooking practices of a perhaps small Indian merchant population in Arabia. These Indian merchants brought with them not only material goods, but also information networks. This includes introduction of new pottery styles, food items or bringing a variety of cultural influences into Arabia. The study therefore concludes that the Arabian Gulf was more than an intermediary of Indo-Roman trade and was a direct participant in the Indian Ocean trade networks.

#### POSSIBLE FUTURE GOALS AND RESEARCH ACTIVITIES IN INDO-ARAB STUDIES

In terms of possible future goals and objectives, the current research on Indo-Arab trade could be integrated into the conceptual framework of 'Project Mausam' and other such macro-level projects (Ray, 2014). Second, the aspect of Indo-Arab or Indo-Gulf trade should go beyond the focus on the Harappan or Indus connection, and successfully link the third millennium BC with the maritime trade of the early historic period. This could be achieved by addressing gaps in the present research on trade routes and historical exchange between India and the Gulf. Moreover, maritime-related industries like traditional ship-building and related products must be revived or enhanced by research scholars and government organizations alike.

It is essential at this stage to first establish strict documentation and research

methods. This is particularly due to the disparity in the methodology used to document trade mechanisms across the Indian Ocean. This then creates difficulties in compiling and relating the evidence for a coherent narration of trade relations. Once these research standards are established, they could lead to more successful international collaborations. Finally of course, one has to remember that it is not possible to create such cosmopolitan links if important data is not published. So publication must be an essential part of all future research activities.

## REFERENCES

- Avanzini, Alessandra (ed.). 2002a. 'Khor Rori Report 1', *Arabia Antica*, vol. 1. Pisa: Edizioni Plus.
- Avanzini, Alessandra. 2002b. 'Incense Routes and Pre-Islamic South Arabian Kingdoms', *Journal of Oman Studies* 12: 17-24.
- . 2007. 'Sumhuram: A Hadrami Port on the Indian Ocean'. In Eivind Heldaas Seland (ed.), *The Indian Ocean in the Ancient Period: Definite Places, Translocal Exchange*, BAR International Series 1593. Oxford: Archaeopress, 23-31.
- Avanzini, A. (ed.). 2008. *A Port in Arabia between Rome and the Indian Ocean (3rd c. BC-5th c. AD)*. Khor Rori Report 2. Roma.
- Ball, W. 2000. *Rome in the East: The Transformation of an Empire*, London: Routledge.
- Begley, Vimla and Roberta Tomber. 1999. 'Indian Pottery Sherds'. In Steven E. Sidebotham and W.Z. Wendrich (eds.), *Berenike '97. Report of the 1997 Excavations at Berenike and the Survey of the Egyptian Eastern Desert, Including Excavations at Shenshef*. Leiden: Centre for Non-Western Studies, 161-82.
- Blue, Lucy, Julien Whitewright and R. Thomas. 2011. 'Ships and Ships' Fittings'. In D.P.S. Peacock and Lucy Blue (eds.), *Myos Hormos – Quseir al-Qadim Roman and Islamic Ports on the Red Sea. Volume 2: Finds from the Excavations 1999-2003*, BAR International Series 2286. Oxford: Archaeopress, 179-209.
- Cappers, R.T.J. 2006. *Roman Food Prints at Berenike: Archaeobotanical Evidence of Subsistence and Trade in the Eastern Desert of Egypt*. Los Angeles: Cotsen Monograph Series 55.
- Casson, Lionel. 1989. *The Periplus Maris Erythraei*. Text with introduction, translation and commentary. New Jersey: Princeton University Press.
- Champakalakshmi, R. 1996. *Trade, Ideology and Urbanisation: South India 300 BC to AD 300*. Delhi: Oxford University Press.
- Chase-Dunn, C. and T.D. Hall. 1997. *Rise and Demise: Comparing World-Systems*. Boulder: Westview Press.
- Chaudhuri, K.N. 1985. *Trade and Civilisation in the Indian Ocean: An Economic History from the Rise of Islam to 1750*. Cambridge: Cambridge University Press.
- . 1990. *Asia before Europe: Economy and Civilisation of the Indian Ocean from the Rise of Islam to 1750*. Cambridge: Cambridge University Press.
- de Paepe P., Rutten K., L. Vrydaghs and E. Haerinck. 2003. 'Petrographic, Chemical and Phytolith Analysis of Late Pre-islamic Ceramic from ed-Dur, Umel-Kawein (U.A.E.)'. In D. Potts, Hasan Al Naboodah H., P. Hellyer (eds.), *Archaeology of the United Arab Emirates*, Trident Press: 207-29.
- De Romanis, F. 2012. 'Playing Sudoku on the Verso of the "Muziris Papyrus": Pepper,



- Malabathron and Tortoise Shell in the Cargo of the *Hermapollon*', *Journal of Ancient Indian History*, 27: 75-101.
- Fuller, D.Q. 2005. 'Ceramics, Seeds and Culinary Change in Prehistoric India', *Antiquity*, 79: 761-77.
- Haerinck, Ernie. 1998. 'International Contacts in the Southern Persian Gulf in the late 1st century BC/1st century AD: Numismatic Evidence from Ed-Dur (Emirate of Umm al-Qaiwain, U.A.E.)', *Iranica Antiqua*, 33: 273-302.
- . 2001. *Excavations at ed-Dur (Umm al-Qaiwain, United Arab Emirates)*, Vol. II: *The Tombs*. Leuven: Peeters.
- . 2003. 'Internationalisation and Business in Southeastern Arabia during the Late First Century BC/First Century AD: Archaeological Evidence from Ed-Dur (Umm al-Qaiwain, UAE)'. In Daniel T. Potts, Hassan al-Naboodah and Peter Hellyer (eds.), *Proceedings of the First International Conference on the Archaeology of the United Arab Emirates*. London: Trident Press, 195-206.
- Hall, T.D. and C. Chase-Dunn. 1999. *The Chesapeake World-System: Complexity, Hierarchy and Pulsations of Long-Range Interaction in Prehistory*. A paper presented at the annual meeting of the American Sociological Association, Chicago, 10 August 1999. [Online]. Available at: <http://wsarch.ucr.edu/archive/papers/c-d&hall/asa99b/asa99b.htm>
- Jasim, Sabah. 2006. 'Trade Centres and Commercial Routes in the Arabian Gulf: Post-Hellenistic Discoveries at Dibba, Sharjah, United Arab Emirates', *Arabian Archaeology and Epigraphy*, 17: 214-37.
- Kejariwal, O.P. 2006. 'Foreword'. In Himanshu P. Ray and Edward A. Alpers (eds.), *Cross Currents and Community Networks: The History of the Indian Ocean World*. Delhi: Oxford University Press.
- Kennet, Derek. 1997. 'Kush: A Sasanian and Islamic-period Archaeological Tell in Ras al-Khaimah (U.A.E.)', *Arabian Archaeology and Epigraphy*, 8: 284-302.
- . 2004. *Sasanian and Islamic Pottery from Ras al-Khaimah: Classification, Chronology and Analysis of Trade in the Western Indian Ocean*. Society for Arabian Studies Monographs No. 1. BAR International Series 1248. Oxford: Archaeopress.
- . 2007. 'The Decline of Eastern Arabia in the Sasanian Period', *Arabian Archaeology and Epigraphy*, 18: 86-122.
- Magee, Peter. 2010. 'Revisiting Indian Rouletted Ware and the Impact of Indian Ocean Trade in Early Historic South Asia', *Antiquity*, 84: 1043-54.
- Mouton, Michel. 1992. 'La Péninsule d'Oman de la fin de l'âge du fer au début de la période Sassanide (250av. - 350 ap. JC)'. PhD thesis, Université de Paris I (Pantheon-Sorbonne).
- Mouton, Michel and Julien Cuny. 2012. 'The Oman Peninsula at the Beginning of the Sasanian Period'. In Daniel T. Potts and Peter Hellyer (eds.), *Fifty Years of Emirates Archaeology: Proceedings of the Second International Conference on the Archaeology of the United Arab Emirates*. Abu Dhabi: Ministry of Culture, Youth and Community Development, 171-85.
- Mouton, Michel, Margarethe Tengberg, Sterenn Le Maguer, Anjana Reddy, Soulié Delphine, Bernard Vincent, Mallika Le Grand, and J. Goy. 2012. 'Building H at Mleiha: New Evidences on the Late PIR.D Phase in the Oman Peninsula (2nd-mid. 3rd c. AD)', *Proceedings of the Seminar for Arabian Studies*, 42: 205-22.
- Pallecchi, P. and Alexia Pavan. 2011. 'Local Raw Materials Used by Craftsmen and in the Development of the City of Sumhuram'. In Alessandra Avanzini (ed.), *Along the Aroma and Spice Routes: The Harbour of Sumhuram, its Territory and the Trade between the Mediterranean, Arabia and India*. Roma: L'Erma di Bretschneider, 81-95.

- Pavan, Alexia. 2011. 'Sumhuram as International Centre: The Imported Pottery'. In Alessandra Avanzini (ed.), *Along the Aroma and Spice Routes: The Harbour of Sumhuram, its Territory and the Trade Between the Mediterranean, Arabia and India*. Roma: L'Erma di Bretschneider, 99-112.
- Pavan, Alexia and Heidrun Schenk. 2012. 'Crossing the Indian Ocean before the Periplus: A Comparison of Pottery Assemblages at the Sites of Sumhuram (Oman) and Tissamaharama (Sri Lanka)', *Arabian Archaeology and Epigraphy*, 23: 191-202.
- Potts, Daniel. 1990. *The Arabian Gulf in Antiquity*. Vol. 2: *From Alexander the Great to the Coming of Islam*. Oxford: Clarendon Press.
- Power, Timothy. 2010. 'The Red Sea Region During the "Long" Late Antiquity (AD 500-1000)'. PhD thesis, Faculty of Oriental Studies, University of Oxford.
- Rajan, K. 2012. 'Potsherd with Tamil Brahmi Script found in Oman', *The Hindu*, 28 October 2012 [Online]. Available at: <http://www.thehindu.com/news/national/potsherd-with-tamilbrahmi-script-found-in-oman/article4038866.ece> [accessed on 13 March 2013].
- Ray, Himanshu Prabha. 1986. *Monastery and Guild: Commerce Under the Satavahanas*. Delhi: Oxford University Press.
- Ray, Himanshu Prabha (ed.). 2014. *Mausam: Maritime Cultural Landscapes Across the Indian Ocean*, National Monuments Authority and Aryan Books.
- Reddy, Anjana, Attaelmanan, A. Gaffar and Michel Mouton. 2012. 'Pots, Plates and Provenance: Sourcing Indian Coarse Wares from Mleiha using X-ray Fluorescence (XRF) Spectrometry Analysis'. Paper presented at the *International Conference on the Use of X-ray (and related) Techniques in Arts and Cultural Heritage (7-8 December 2011)*, Sharjah, United Arab Emirates, *IOP Material Science and Engineering (MSE) Conference proceeding series 3*. [Online]. Available at: <http://iopscience.iop.org/1757-899X/37/1/012010>.
- Reddy, Anjana. 2014. 'Looking from Arabia to India: Analysis of the Early Roman "India Trade" in the Indian Ocean during the Late Pre-Islamic Period (3rd century BC-6th century AD)'. Unpublished PhD thesis, Deccan College Post-Graduate & Research Institute, Pune, India.
- . 2015. 'Sourcing Indian Ceramics in Arabia: Actual Imports and Local Imitations', *Proceedings of the Seminar for Arabian Studies*, 45: 253-71.
- Rutten, Katrien. 2006. 'Het Aardewerk Van Ed-Dur (Umm al-Qaiwain, V.A.E) Uit De Late 1<sup>ste</sup> Eeuw V. Tot De Vroege 2<sup>de</sup> Eeuw N. Chr.' (Technologische, typologische en vergelijkendestudie met een analyse van de ruimtelijkeverspreiding en handel in en voorbij de Perzische Golf tijdens de laat Pre-islamitische periode (3rd eeuw v. - 6th eeuw n Chr.)). Unpublished PhD thesis. Ghent University.
- Salles, J.F. 2005. 'The Periplus of the Erythraean Sea and the Arab-Persian Gulf'. In M-F Boussac and J-F Salles (eds.), *Athens, Aden, Arikamedu: Essays on the Interrelations Between India, Arabia and the Eastern Mediterranean*. Delhi: Manohar (rpt.), (1st pub. in *Topoi* 3/2: 493-523), 115-46.
- Sedov, A.V. and C.H. Benvenuti. 2002. 'The Pottery of Sumhuram: General Typology'. In Alessandra Avanzini (ed.), 'Khor Rori Report 1', *Arabia Antica*, vol. 1. Pisa: Edizioni Plus, 177-248.
- Singer, Caroline. 2007. 'The Incense Kingdoms of Yemen: An Outline History of the South Arabian Incense Trade'. In D.P.S. Peacock and David Williams (eds.), *Food for the Gods: New Light on the Ancient Incense Trade*. Oxford: Oxbow, 4-29.
- Smith, M.C. and H.T. Wright. 1988. 'The Ceramics from Ras Hafun in Somalia: Notes on a Classical Maritime Site', *Azania*, 23: 115-41.

- Strauch, I. and M.D. Bukharin. 2004. 'Indian Inscriptions from the Cave Hoq on Suqutra (Yemen)', *Annali*, 64: 121-38.
- Thapar, Romila. 2002. *The Penguin History of Early India: From the Origins to AD 1300*. London: Penguin Books.
- Tomber, Roberta. 2000a. 'Indo-Roman Trade: The Ceramic Evidence from Egypt', *Antiquity*, 74: 624-31.
- . 2000b. 'The Pottery', In D.P.S. Peacock, L. Blue, N. Bradford and S. Moser, (eds.), *Myos Hormos – Quseir al-Qadim: A Roman and Islamic Port Site on the Red Sea Coast of Egypt Interim Report*. Southampton: University of Southampton.
- . 2002. 'Indian Fine Wares from the Red Sea Coast of Egypt', *Man and Environment*, 28 (1): 25-31.
- . 2008. *Indo-Roman Trade: From Pots to Pepper*. London: Duckworth.
- Tomber, Roberta and Vimla Begley. 2000. 'Indian Pottery Sherds'. In Steven E. Sidebotham and W.Z. Wendrich (eds.), *Berenike 1998: Report of the 1998 Excavations at Berenike (Egyptian Red Sea Coast) and the Survey of the Egyptian Eastern Desert, including Excavations in Wadi Kalalat*. Leiden: Research School of Asian, African and Amerindian Studies (CNWS), 149-67.
- van der Veen, M. 2011a. *Consumption, Trade and Innovation: Exploring the Botanical Remains from the Roman and Islamic Ports at Quseir al-Qadim, Egypt*. Frankfurtam-Main: Africa Magna Verlag.
- van der Veen, M.A. Cox and J. Morales 2011b. 'The Plant Remains – Evidence for Trade and Cuisine'. In D.P.S. Peacock and Lucy Blue (eds.), *Myos Hormos – Quseir al-Qadim. Roman and Islamic Ports on the Red Sea. Vol. 2: Finds from the Excavations 1999-2003*. University of Southampton Series in Archaeology No. 6, Oxford: Archaeopress, 227-34.
- Yule, Paul and Monique Kervran. 1993. 'More than Samad in Oman: Iron Age Pottery from Suhar and Khor Rori', *Arabian Archaeology and Epigraphy*, 4(2): 69-106.
- Zarins, Juris. 1997. 'Persia and Dhofar: Aspects of Iron Age International Politics and Trade'. In G.H. Young, M.W. Chavalas and R.E. Averbeck (eds.), *Crossing Boundaries and Linking Horizons*, Bethesda: CDL Press, 615-89.
- Zarins, Juris. 2001. *The Land of Incense: Archaeological Work in the Governorate of Dhofar, Sultanate of Oman 1990-1995*. Archaeology and Cultural Heritage Series, vol. 1. Oman: Sultan Qaboos University Publications.