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)

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CERTIFICATE

Certified that the work incorporated in this thesis "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)", submitted by Ms. Anjana Reddy. L, was carried out by the student under my supervision. Such material as has been obtained from other sources has been duly acknowledged in the thesis.

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ABSTRACT

This study examines the Early Roman 'India trade' in the Indian Ocean during the Late Pre-Islamic period through a holistic overview of excavated trading sites with an emphasis on ceramic studies. It attempts to look at the economic relations between the southeast Arabian seaboard and India, and enquires into the development and nature of the trade. This has been executed through the documentation of forms and detailed fabric analysisand quantification of Indian pottery assemblages from three sites in the UAE (Mleiha, Ed-Dur and Kush) and three sites from South Arabia and Oman (Khor Rori, Qana and Suhar). This research seeks to develop a more reliable definition of the types of wares based on an evaluation of morphology and fabric. The results are compared with select parallels of Indian pottery from a number of trading settlements particularly in western and southern India, combining both coastal and hinterland sites.

The thesis also includes a technical sourcing investigation into the origin of the Indian wares occurring in the Arabian and Indian contexts using XRF analysis.

Finally this thesis attempts a desk-based assessment of published data concerning ceramics from excavated sites from the Red Sea region, African ports and Arabia, particularly the sites with archaeological and historical evidence indicating trade with Peninsular India. The thesis thus constitutes a wider regional case study of Indian ceramic data as a reliable indicator of Indian Ocean trade in the Late Pre-Islamic period.

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CHAPTER 1

INTRODUCTION TO THE CONTEXT OF STUDY

1. 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', who recognised 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." It is therefore the generalists' opinion that traditional studies of Asia, Africa and the Red Sea have tended to obscure the existence of the Indian Ocean as an identifiable entity, its sheer size and the range of expertise required to address it all as an academic subject, has tended to prevail against its study as a totality.

Braudel (1982) who described society as "a sum of all things that historians encounter in the various branches of our research" put this question on generalist versus specialist approach into perspective. He states, "Typically, the economy is taken as a homogenous reality that can be separated and measured apart from the

messy societal context from which it emerges". This is an analytical choice made by practitioners and scholars. Societal context is a thick and expansive shadowy zone of multiple human acts that is difficult to assess and qualify. Yet, this social complex envelops the observable reality of 'the economy'. Or rather, the economy is an integral part of the social. Society is a 'set of sets,' (Braudel 1982: 459), of which the economy is one. Splitting the totality into subsets is, Braudel points out, 'a way of making research manageable'. This present research follows the specialists' approach by focusing on a particular study region i.e. the eastern seaboard of the Arabian Peninsula and branch of research i.e. the archaeological study of Indian ceramics. This approach is also partly owing to the research and time constraints that are set in order to fulfill the requirements of a PhD thesis. To attempt a totality approach, the study also extends to other areas of the Indian Ocean world from the Red Sea region to East Africa and the Indian subcontinent set across a regional timeframe, as incorporated within the geographical and chronological parameters of research (sections 1.2 and 1.3).

(i) The formation of the Indian Ocean and Arabian Gulf

The geological processes that formed the present Indian Ocean and its coasts arose from a re-distribution of continental plates that began in the early Palaeozoic (c. 540 million years BP), when Arabia then formed part of a megacontinent called Gondwana, which included Australia, Antarctica, India, Africa and South America. Gondwana was separated from eastern Asia by an ancient ocean called Tethys (Smith et al. 1981). Their gradual separation saw the westwards shift of Africa and Arabia (Fig.1), the isolation of Australia, Antarctica and South America, and the abutting of India against the landmass of East Asia to create the Himalayas. By the Miocene period (25 - 12 million years BP), the Indian Ocean was approaching the shape that it has today, when the deep trench of the Red Sea opened and the Afro-Arabian continent finally separated.

The Arabian Gulf is the second youngest sea in the world with flooding of the basin commencing only between 14,000 and 12,000 years ago, as a result of the rapid melting of the ice caps of the north and south poles. This led to the water of the Indian Ocean flooding through the straits of Hormuz to create the Arabian Gulf

(Environment Agency - Abu Dhabi 2011 URL - http://www.environmentalatlas.ae/). As a result of these cumulative geological processes, the Red Sea gave access to Egypt and the Arabian Gulf became navigable as far as the coast of modern Iraq, which made it possible in historical times to sail from the heart of the Middle East as far as India and China, to help create the geographic context which allowed the development of an Indian Ocean civilization (Geoffrey King pers. comm.).

(ii) Sea-level changes

Comprehending change in sea levels of the Arabian Gulf is vital if we are to understand changes in human settlement patterns and activities in the coastal zone (Beech 2004: 9). Sea levels at the last glacial maximum (about 19,000 to 20,000 years ago) were between 120–130 metres below today's levels. As the Tigris Euphrates river system wound through the Gulf basin, it would have passed through a series of lakes. From the northern Gulf, it flowed southeastward and, upon reaching Qatar, its course shifted closer to the Iranian side of the Gulf, before eventually flowing out into the Gulf of Oman through the Strait of Hormuz. About 14,000 years ago, the Earth's climate began to warm markedly. The glaciers and ice sheets melted rapidly, raising global sea levels. Seawater once again flooded into the Gulf, peaking between 4,000–5,000 years ago at 1–2 metres above today's sea level before dropping to present levels around 1000 AD (Environment Agency - Abu Dhabi 2011 URL - http://www.environmentalatlas.ae/) (Fig.2).

The Arabian Gulf has a total area of 227,000 square kilometres and extends for 1,000 kilometres from the 46 kilometre wide Strait of Hormuz in the east to the Shatt al Arab delta in the northwest. It is 360 kilometres across at its widest point and has an average depth of 35 metres, rarely exceeding 100 metres. Evaporation of water is high; between 144 and 500 centimetres per year and in shallower waters along the Abu Dhabi coastline this can exceed 2,000 centimetres per year. The only significant supply of freshwater comes from major rivers such as the Tigris, Euphrates and Karun. At the head of the Gulf, the input of freshwater partially restores salinity towards more normal levels (Fig.3) (Environment Agency - Abu Dhabi 2011 URL - http://www.environmentalatlas.ae/).

(iii) Environment and climate in the Eastern Arabian Seaboard

Within the confines of a relatively narrow area, the southeastern part of the Arabian Gulf or modern UAE straddles five different topographic zones. Moving from west to east, these are (1) the sandy Gulf coast and its intermittent sabkha (salt-flats); (2) the desert foreland; (3) the gravel plains of the interior; (4) the Hajar mountain range; and (5) the eastern mountain piedmont and coastal plain which represents the northern extension of the Batinah of Oman (Potts 2001: 28). By c. 4000 BC, sea level in the Arabian Gulf reached its peak around .5m higher than it is today (Lambeck 1996), and until c. 3000 BC a more humid environment prevailed, largely as a result of wind systems which were weaker than those at present, 'permitting convection-induced thunder storms in coastal and mountainous areas' (Glennie et al. 1994: 3). After 3000 BC today's arid regime set in and although there have been minor climatic adjustments since that time, it is safe to say that the basic pattern observable in the region today has prevailed for the past five millennia (Potts 2001: 32). In southeastern Arabia, due to the surrounding arid landmasses, the summers are hotter and winters colder than in most other subtropical zones. Air temperatures can reach extremes of around 10 degrees C in winter and 50 degrees C and above in summer (Beech 2004: 8). Similarly Oman is included in the subtropical zone of arid climates. With the exception of the highest parts of Jabal Akhdar, temperatures remain high all the year round, while average rainfall remains very low, ranging from an annual 171 mm at Nizwa to 36 mm at Suhar, well below the 250 mm conventionally accepted as the boundary of aridity (Cleuziou & Tosi 2007: 8). The marine environment would, quite naturally, have proved the focus for human activity, assuming freshwater sources existed in the vicinity. Even today, in perhaps the driest period the UAE has ever experienced, there are still potable supplies, including on some of the offshore islands where rain itself rarely falls. (The island of Dalma, as can be recalled by many still today, once provided drinking water to the fishing settlement which later grew to become the city of Abu Dhabi, capital of the UAE). Recent anecdotal accounts provide confirmation of a long-suspected assertion that submarine freshwater springs would once have been utilized to sustain certain coastal and island communities (Aspinall 2001: 277). The tropical waters of the Arabian Gulf are also home to a large biomass making it one of the world's richest

fishing grounds, in sharp contrast to the barren emptiness of the desert lands of the interior (Cleuziou & Tosi 2007: 13).

In South Arabia, the climate is mainly influenced by two factors: the south-western monsoon rain or Khareef from May/June to September, and the mountain range extending eastwards parallel to the coast for 250 km from Yemen border, that pose a natural barrier, stopping fog and rain from penetrating inland. This moisture and local orography support abundant vegetation of trees and scrubs along the southern slopes of the mountains. The northern slopes are scarcely affected by the monsoon, and gradually sink into a dry plateau with cliffs, numerous wadis and a vast desert to the north with rocky hills and gravel plains. Here the vegetation is scarce mostly with scattered trees of *Boswellia sacra* or frankincense. Towards Saudi Arabia, the rocky desert changes into sandy deserts with level lands and dunes (Raffaelli et al. 2011: 17). Palynological studies at Sumhuram in levels dated between 204 BC and 130 AD indicate that the palaeo-landscape of the region was characterized by the presence of fresh water habitats and repeated occurrence of pollen of exotic plants of Arabic or African origin (e.g. *Juniperus* from the mountains of Yemen or central-eastern Africa and *Alnus* and *Quercus* transported over longer distances (ibid 2011: 23-24). Previous archaeological data from Yemen also indicates that vast forests covered the country (e.g. species like *Doberaglabra, Tamarixaphylla, Combretummolle* etc.) (Hepper & Wood 1979). Much of the decrease in several types of wild scrubs and woodland species can be ascribed to human activities including cutting and use of these plants as fuel, building activities, grazing of animals etc. (ibid 1979)

(iv) Monsoonal winds: The north-east and the south-west monsoon

The English term "monsoon" stands for Classical Arabic *mawsim* and the word is applied by Arabs to mean a general fixed time whereby dhows sail from one port to another, also called the monsoon route. The north-east and south-west monsoon divided the year into two halves, following the Indian Ocean solar calendar of Persian origin: from about May to September is when the south-west monsoon sets in and sailing is in an eastward direction and from about October to April is the north-east monsoon, and sailing in the opposite direction with the light winds and fine weather associated with high pressure. From June to August the winds are so strong

that no ship can sail to the ports on the west and east coasts of India (Agius 2005: 193). The north-east monsoon wind is the major player, a sailor's delight, which blows virtually continually, never at gale force, almost never dropping to a flat calm. For thousands of years, it wafted sailing ships from the Red Sea and Arabian Gulf to India and East Africa, and from the incense shore of South Arabia as far as the Maldive Islands. One can imagine similar voyages along the desolate shores of what are now Iran and Pakistan – laden sailing ships coasting close inshore, trimming their sails to the twists and turns of the north-east wind, maximising soft land breezes, conning their way from one headland to the next without charts or compasses, just the stars overhead familiar to every mariner and desert traveller. Storms came with the more powerful southwesterly monsoon of summer, which sometimes delivered gale-force winds and heavy rainstorms. This was not a good sailing breeze by north-east monsoon standards, but a well-equipped ship could make a fast passage from East Africa to Arabia or India within a relatively short time. However, most coasting dhows stayed ashore, for their high rigs were potentially lethal in the face of hard-blowing squalls (Fagan 2012).

In the Gulf of Aden, the north-east monsoon begins in October or early in November; the steadiness of wind and weather offers a great contrast to the south-west monsoon (Fig. 4). Winds from the ENE and E prevail, turning SE near the entrance of the Red Sea. In late December and early January, it frequently attains moderate gale force and may be accompanied by heavy rain. During the remainder of January, February and March, E and ENE winds prevail. These are the 3 months of heaviest trade in this region and the weather is generally clear and cool with occasional rain. The Southwest Monsoon begins about the middle of April, somewhat earlier in the west and in the east part of the Arabian Sea (Fig. 5). From its inception and throughout the whole of May, the monsoon is feeble, but on the whole SW winds predominate during June and these winds increase progressively and prevail with great regularity during the months of June, July and August. During September, the winds remain predominately SW, but with some variable winds and periods of calm interspersed. The south-west monsoon is very strong and is accompanied by thick hazy weather over the area between Ras Air and Socotra, while the north-east monsoon brings

much lighter winds and fair weather (National Geospatial Intelligence Agency 2006: 141).

1.1 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 eastern Africa, Arabia and Iran with extensions running deep into the Middle East formed by the Red Sea and the Arabian Gulf (Fig. 6). In the first leg, the geographical parameters of this research extend from the western side of the Egyptian Red Sea coast down to East Africa through the Bab al Mandab strait to reach Somalia and South Arabia. The two important port sites focused in this thesis in the Red Sea region include Berenike, which lies at the south-eastern extremity of Egypt, sheltering in the crook of Ras Banas, and Quseir al- Qadim (Periplus Myos Hormos). The historical sources from the Periplus to the Islamic period accounts of al-Masudi describe that navigation along the Red Sea as 'dangerous, without harbours and with bad anchorages' (PME 20; Casson 1989) and 'most dangerous of the seas and gulfs… sterile shores and depths of the sea…(where) ships sail only by day… (for) its darkness and the fear it inspires (al-Masudi 2007: 61-62 quoted by Power 2010: 23). In his PhD dissertation however, Timothy Power (Power 2010: 23-25) states that the Red Sea was not nearly as dangerous as has traditionally been understood and that the 'danger' could be generally ascribed to the overcrowding of the vessels by the greed of their owners. As for anchorages, the prominent Byzantine scholar Procopius in the 5th century AD states that 'there are harbours there (in the Red Sea) and great numbers of them, not made by the hand of man, but by the natural contour of the land, and for this reason it is not difficult for mariners to find anchorage wherever they happen to be' (Procopius 1914, 1.19.1-7 quoted by Power 2010: 24).

On the way to Somalia and South Arabia, passing along the Ethiopian ports of Aksum and Adulis, the first hurdle was through the Bab al-Mandab, sailing along the Gulf of Aden to Cape Guardafaui. This area of coastline, in modern Somalia was subject the same broad sailing regimes as the Red Sea (Whitewright 2007) with conditions improving as ships turned south and travelled down the east coast of Africa and towards Ras Hafun (Periplus Opone) (Tomber 2008: 95). From Opone to

Rhapta is the geographical territory of Azania, the remaining coast covered by the Periplus (PME 15-17), but is not within the purview of this study.

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 names Muza, Okelis, Eudaimon Arabia (Aden), Qana (Bir Ali), Syagros (Socotra) and Moscha Limen (Khor Rori). 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. Eudaimon Arabia of the Periplus, generally considered to be located in Aden, is only discussed briefly in this thesis, owing to the lack of archaeological evidence, particularly regarding the 'India trade'. The involvement of Periplus Syagros, the island of Socotra in the 'India trade' will be discussed in this thesis based on evidence of Indian Brahmi inscriptions from cave Hoq (Strauch & Bukharin 2004).

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, and Omana (PME 36-7), on the Arabian side. The location of Omana has been much debated between the sites of 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 of trade (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 study, 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 (see Power 2010: 25). In this case, the site of Mleiha, located inland in the emirate of Sharjah known archaeologically from the 3rd century BC, has been included in the study. 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 Sasanian

period has so far been identified at only three sites: Suhar, Khatt and Kush. Recently however, Kennet (2007: 99) has shown that there is absolutely no convincing archeological evidence for Sasanian-period occupation at Suhar. The port of Suhar, located on the southeastern coast of Oman and the site of Kush, a small coastal tell in the modern Emirate of Ras al Khaimah, have been included in the parameters of this study pertaining to their material evidence of 'India trade' in the Early Islamic periods as well as medieval trade links.

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 SE against the coast of Australia (Geoffrey King pers. comm.). The parameters of this study however have their geographical limits set predominantly within peninsular India, although mention is made of sites in Sri Lanka as well as the Northwest frontier (Pakistan and Afghanistan) (Fig.8, Table 2). References have also been made to sites in Southeast Asia including Thailand (Chansen, Dvaravati and Khao Sam Kaeo) (Manguin 2002), Sambor Prei Kuk in Cambodia and Oc-Eo in Vietnam (Malleret 1960; Bong 2003) etc. with regard to Indian-inspired ceramic forms recorded at these sites. 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 geographical features of India have facilitated both overland and sea migration of foreigners and at the same time ensured their assimilation (Subbarao 1956 quoted by Tomber 2008). Following Subbarao (1956: 7), and Thapar (2002: 39), India is divided into three main regions: The Himalayan uplands, the Indo-Gangetic plains and peninsular India (cf. Tomber 2008: 117). The present study will focus mainly on the three main regions of peninsular India, which follow Tomber's geographical parameters (Tomber 2008). These includes Gujarat and 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 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 (Tomber 2008: 124 - 132).

From Gujarat and the Konkan coast, two sites are often mentioned in the Periplus: Barbarikon (PME 39), a port located on the mouth of the Indus in modern Pakistan that served as the royal capital at Minnagar, at an unspecified spot, and Barygaza, located on the northern bank of the Narmada river near modern Bharuch (Tomber 2008: 124-125). Archaeological evidence in terms of long-distance interest including early and late Roman finds and particularly Mesopotamia amphorae are particularly disappointing from these areas and in this regard, additional sites like Dwarka, Bet Dwarka, Devnimori, Kamrej, Nagara etc. have been selected for this study.

In the Deccan, the sites included in this study are Ter (Periplus Tagara PME 51), Nevasa, Kolhapur, Nasik etc. Finally, from Tamilakam, the sites of Arikamedu, Alagankulam and Pattanam are mentioned in this thesis. This selection of these sites from peninsular India is more so based on the evidence of Indian wares, which find parallels with the assemblages of India origin in Arabian and Red Sea regions.

The geographical parameters of this study also extend to parts of north-western India to sites like Taxila and Begram, which formed a crossroads for caravan routes between the Mediterranean and India and parallels for some of the Indian material especially from Mleiha and Dibba in southeast Arabia. From the north-east of India, mention has been made in this study of sites like Chandraketugarh and Tamluk, especially with reference to the source of fine wares like rouletted ware etc. which are evident at South Arabian sites like Khor Rori. And finally some medieval sites, especially from the Gujarat region (e.g. Akota, Vadnagar etc.) have been cited to reference the Indian materials from late Roman/Islamic period sites like Kush and Suhar in the Arabian Peninsula.

(i) Notes on nomenclature: Geographical terms used in this study

The geographical terms used in this thesis include both ancient names and modern political boundaries. In some cases, the use of geographic terms is flexible, to fit within the context of study. The term **Southeastern Arabia** has been used in this thesis to include present-day United Arab Emirates (UAE) and its seven Emirates (Abu Dhabi, Dubai, Sharjah, Umm al Qaiwain, Ras al Khaimah, Fujairah and Ajman). **South Arabia** as a general term refers to several regions as currently

recognized, in chief the Republic of Yemen, yet it has historically also included the region of Dhofar presently in Oman. **Dhofar** is the historical region in southern Oman, extending from Ras Al-Sharbatat on the coast of the Arabian Sea southwestward to the Oman-Yemen border that includes for the purpose of this study mainly the site of Khor Rori (Sumhuram) with brief references to Indian pottery recorded at other sites including Shisr and Ain Humran. Further west is **Hadramawt**, the ancient South Arabian kingdom that occupied what are now southern and southeastern Yemen, and included in this study the port sites of Qana and Aden. In the general context, the **Arabian Gulf** can broadly be divided into three distinctive regions: the northern Arabian Gulf basin, the Interior Platform (the modern day Eastern Province of Saudi Arabia, Bahrain and Qatar), and the shallow southern third of the Gulf (Beech 2004: 5). This study focuses particularly on the southern Gulf with extends from Qatar to UAE (southeastern Arabia). On the other hand, the term **eastern Arabian seaboard** has been used where the area extends to include parts of Southern Arabia and Oman. **Peninsular India** is a geographic term often used to describe the Deccan Plateau and the four Dravidian states of Karnataka, Andhra Pradesh, Tamil Nadu and Kerala (Ray 1996), but in this thesis the term also goes to include Gujarat and the Konkan coast. Alternatively, the **Indian subcontinent)** in this context (interchangeable with the generic term **'India'**), comes to include the entire landmass of India, including Sri Lanka in the south, the eastern region/states of India as well as the north-western frontier (Pakistan, Baluchistan etc.).

The term 'South Asian' pottery has been used in this thesis when the pottery source is presumed to exist beyond the present-day geographic and political boundaries of the Indian subcontinent. In most cases, it is interchangeable with the term 'Indian pottery'. Similarly, the term 'ceramics' has been used in the course of this thesis in a general sense, as is the term 'pottery', and the use of these does not indicate any technologically specific group.

1.2 Chronological parameters of research

The chronological extent of this thesis that begins with the 3rd century BC has been selected in order to encapsulate the various historical processes and archaeological evidence relating to the early beginnings of 'India trade'. This period 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 3rd century BC indicates their founding at least four centuries earlier than the heyday of Roman trade. 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. From the southeast Arabian context, the 3rd century BC marks the beginning of the late Pre-Islamic period, following the Iron Age III period (600 - 300 BC) (e.g. Potts 2001: 48). This period saw the rise of the important sites in southeastern Arabia; Mleiha (c. 3rd cent BC - mid 3rd cent AD), Ed-Dur (c. 1st cent BC/AD - 3rd cent AD) and Dibba (c. 1st cent AD - mid 3rd cent AD) (dating based on Mouton & Cuny 2012). The end of the Late Pre-Islamic era in southeastern Arabia is placed during the Sasanian period between the 3rd-7th centuries AD with archaeological evidence that showed that the region underwent a marked and sustained decline after a peak of development in Hellenistic/Parthian times (Kennet 2007). This period also marks the decline of the three main sites in southeastern Arabia (around c. 3rd/4th century AD) and the rise of Kush in the 4th/5th century AD until the medieval period (c. 13th cent AD), with evidence of Indian pottery and continuing trade/contact with the subcontinent.

With regard to chronological terms used in the thesis (Table 3), **'early Roman'** in the archaeological context is often used to define the chronological period from 1st century BC to mid 3rd century AD. Historically speaking, the Hellenistic and early Roman periods saw the marked increase in the integration of the Red Sea region with Indian Ocean networks and when the Red Sea became the main artery linking the Mediterranean to the Indian Ocean (Tomber 2008; Sidebotham 2011; Power 2010). Several ports in the Eastern Desert of Egypt like Quseir al-Qadim, which once

carried the Graeco-Roman trade continued as an important emporia during the early Roman period (Peacock & Blue 2006). The term **early Roman 'India trade'** is used to describe the early Roman era when maritime commerce with South Arabia, India, Sri Lanka and coastal sub-Saharan Africa reached its zenith (Sidebotham 1999: 685). Although not explicitly mentioned in this research, the **'Hellenistic' period** that begins from the 3rd century BC until 1st century BC is included within the purview of this thesis and is instead defined within the chronological extent of the **'**Late pre-Islamic period'. The **'Late Pre-Islamic period'** is a chronological term coined by archaeologists working in the Arabian Gulf at the two major sites of Mleiha and Ed-Dur where a local culture had been defined and divided into four-sub periods (Late Pre-Islamic A, B, C, D) (Mouton & Cuny 2012). The earliest phases PIR.A (3rd - mid 2nd century BC), PIR.B (mid 2nd - 1st century BC) and roughly cover the chronological extent of the Hellenistic period. The later phases, PIR.C (1st century AD - end of 2nd century AD) and PIR.D (2nd - mid 3rd century AD) included within the time frame of this thesis, overlaps with the chronological limit of the early Roman period. More generally, however, the 'Late Pre-Islamic period' is loosely termed and comes to represent the period preceding the Islamic conquest of Arabia i.e. up to the 6th/7th century AD. In the archaeological terms the Late Pre-Islamic period is therefore contemporaneous to the **Graeco-Roman period** (3rd century BC - 7th century AD).

Again though not explicitly stated, part of the thesis also covers the **late Roman period** and **late Roman 'India trade'.** The excavations at Berenike in the Red Sea have uncovered more material from the late Roman period than any other phase in the city's history (Sidebotham 2002: 218). With regard to the 'India trade', the late Roman commercial renaissance did not reach the levels it had in early Roman times… trade with India and Sri Lanka was extensive, though what amount was direct 'Roman Egypt – South Asian' and how much was conducted through 'non-Roman' middle men like the Aksumites, South Arabians and others cannot be determined" (Sidebotham 2002: 230-234).

The Late Roman civilization begins from the 4th century AD until mid 6th century AD, which includes the Early Byzantine periods (i.e. 4th/5th centuries AD).

However with regard the perception of the chronological limits, according to Timothy Power (pers. comm.) there is a fundamental difference between late Roman rule in terms of its political and military dominion which ends in the middle of the 7th century AD and a continuation of pottery tradition and assemblages bearing a late Roman influence right up to the 9th century AD. Customs, languages and ceramic traditions of the late roman period continued up to the 9th century AD. In his PhD dissertation, Power (2010: 17-18) states that it is erroneous to assume that the late Roman period abruptly ends with the 'Arab conquests'. The concept of **Late Antiquity** (Brown 1971 quoted by Power 2010) stressed the broad continuation and slow transformation of social and cultural systems from the Late Roman Empire through the migration period, wherein the late Roman and early Islamic periods may be grouped together as the 'long' Late Antiquity. Averil Cameron has pushed this upper chronological boundary of Peter Brown's Late Antiquity, with a conceptual shift towards a **'long' Late Antiquity** that is proposed stretching five hundred years from c. 300 - 830 AD (Cameron 2002: 165-191 quoted by Power 2010: 17-18). The late Roman and early Islamic periods may be grouped together as the 'long' Late Antiquity.

As Tomber (2008: 118) states, chronologically 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. During the 3rd 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. 500 AD (Selvakumar & Darshana 2008 quoted by Tomber 2008: 120). However, as Tomber (2008: 120) points out, Roman finds continue into the 6th - early 7th 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.

From Arabia and the Red Sea region, the well-known published sites included within the chronological parameters of the Early Roman period with reference to the 'India trade' include Mleiha, Ed-Dur and Dibba in Southeastern Arabia; Khor Rori, Qana and Aden in South Arabia; Quseir al Qadim and Berenike on the Egyptian Red Sea coast and Ras Hafun in East Africa. With reference to the late Roman period and Late Roman 'India trade', some overlap occurs with sites like Berenike that show successive levels of trade with India. In Southeastern Arabia, the site of Suhar in Oman presents some evidence of Indian pottery, which according to the dating of levels I-IV by Mouton (1992: 175-181) dates from the 3rd cent AD - mid 7th cent AD. A revised dating by Kennet (2007: 97-99) instead suggests that the Suhar sequence below Level V is datable to the 8th century AD or alternatively Levels 0 and I may represent occupation of the 1st/2nd century, within which some 8th century AD material was mixed during excavation. The chronology at the site of Kush (Ras al Khaimah) (4th/5th century AD, with a re-occupation in the late 16th/ early 17th century) in Southeastern Arabia is datable from the Late Roman to the Islamic period. The Indian pottery evidence begins from the 5th/6th AD levels, but the wares increase in the early and later Islamic levels (7th/8th century AD up to 16th/17th centuries AD). The Indian evidence from the later Islamic levels from Kush, although not strictly within the chronological scope of this thesis, has been examined and documented as evidence of the 'India trade'. This is to ensure that the research is not totally confined within 'artificially created' upper chronological limits and to provide comprehensive material evidence of continuing trade and contact with India, albeit with different markets, merchants and merchandise.

1.3 Research objectives and scope

The specific research questions in this thesis are:

- What role did the eastern seaboard of the Arabian Peninsula play in the Indian Ocean trade network between the Red Sea region and the Indian subcontinent?
- Can the documented evidence of Indian pottery establish the position of the Arabian Gulf as more than just an intermediary of Indo-Roman trade?
- Can we establish geographic locations/regions in this study as key provenance

areas for the Indian ceramics found in the Arabian Peninsula?

- Is it possible to identify distinguishing features between 'actual imports' and 'local imitations' of Indian ceramics in Arabia based on data from morphological and fabric analysis?

- What can the distribution of the Indian pottery assemblages in Arabia tell us about the patterns of sea and overland trade?

Chapters 2, 3 and 4 provide the archaeological data in the form of Indian pottery assemblages from the eastern Arabian seaboard and the Red Sea region. The analysis of the pottery will be presented in chapters 5, 6 and 7 including quantitative study, source identification and discussion on imported and imitation wares. Chapter 8 discusses the respective roles of the Arabian Peninsula and India with reference to archaeological data from Indian pottery and corroborative historical records to establish the patterns of trade in the Indian Ocean.

With and above research objectives in mind, the current scope of the research is as follows:

- Indian Ocean studies relating to the Late Pre-Islamic period have focused on the Early Roman 'India Trade' with emphasis particularly on the role of the Red Sea 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 to conduct a detailed study of possible Indian material particularly the ceramics found in the sites within the Gulf arm of the Indian Ocean.

- 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 1st century AD. The Periplus however has several omissions particularly the ports and market towns of the Arabian Gulf are barely mentioned in the text. However what this text 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.

- This research will provide for the first time the detailed documentation of Indian pottery form and analysis of ceramic fabric from the eastern Arabian seaboard as well as a desk-based collation of Indian assemblages from the Red Sea Region and African coast. A special focus will be on the study of pottery fabric to provide a reliable classification of ware types as well as indicators of probable source areas.

- To corroborate the Indian pottery evidence found in the Arabian Gulf by comparisons with the early historic ceramic assemblages from trading sites in the Indian subcontinent.

- To explore inter-regional interactions and patterns of exchange within the eastern Arabian seaboard based on distribution and changing quantities of Indian pottery. These changing patterns will also be used to determine the routine use of specific Indian pottery vessels in the Arabia including transition from their increased usage to decreasing use, production and circulation.

- The assessment of trade networks and cultural contacts between India, Arabia and the Red Sea on the basis of ceramic evidence.

1.4 The study of Indian pottery in the Indian Ocean context: a brief methodological review

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 of the 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 sub-continent 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 research thesis, 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 & Tomber 1999). Tomber consequently undertook preliminary sourcing studies of the Indian ceramics found at Roman Berenike in 2000 (Tomber 2000a; Tomber 2002). In the same year, the 'non-Roman wares' including the Indian vessels from Quseir al-Qadim were catalogued and published (Tomber 2000b). Previously, M.C. Smith and H.T. Wright undertook a study on the ceramic fabric (including Indian pottery) and their stratigraphic distribution along the Somali coast at the site of Ras Hafun (Smith & Wright 1988).

The presence of Indian pottery as far as the Red Sea and East Africa, garnered interest in the assemblages closer to home. From southeastern Arabia, Indian pottery forms have been identified and recorded briefly from excavations at Ed-Dur (Rutten 2006; Haerinck 2001; Haerinck 2003), Mleiha (Mouton 1992; Mouton & Cuny 2012; Mouton et al. 2012) and Dibba (Mouton & Cuny 2012; Jasim 2006). Late Roman and Islamic period Indian wares dating from the 4th/5th to 16th/17th 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; Horton 1996). From South Arabia, imported 'RPW' was the first Indian ceramic to be identified and reported from Khor Rori (Comfort 1960; Yule & Kevran 1993: 91; Zarins 1997; Zarins 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 & Benvenuti 2002; Avanzini ed. 2002a; Avanzini ed. 2008). Joint projects have been launched to study the Indian pottery in Khor Rori. In 2007 collaboration had started with Dr. Sunil Gupta, co-

director of the Museum of Allahabad (India) and director of the excavations at Kamrej (Gujarat), that is a harbor roughly contemporary to Sumhuram where similar materials were being discovered. More recently, in 2011, a second collaboration started with Dr. Heidrun Schenk, co-director of the archaeological mission in Tissamaharama (Sri Lanka) (Pavan 2011; Pavan & Schenk 2012). At Qana, Indian pottery has been recorded in the various stratigraphic periods as a result of several seasons of excavations (Sedov 1992, 1996, 1997, 2007; Salles & Sedov 2010) and in Suhar through the results of the French excavations from 1980-86 (Kervran & Hiebert 1991; Kervran 1996; Kervran 2004).

Provenance studies had been undertaken as part of the methodology in recording Indian pottery particularly with regard to technical sourcing investigations of specific wares. These include thin-section and SEM analysis of rice-tempered pottery from the Quseir, Berenike and Khor Rori (Tomber et al. 2011a; Lippi et al. 2011), thin-section and petrographic examination of Indian coarse wares from underwater surveys of Qana (Davidde & Petriaggi 1998; Davidde et al. 2004), XRD and thin-section of black wares from Ed-Dur (Gupta 1997), petrographic, chemical and phytolith analysis of RPW and black wares from Ed-Dur (De Paepe et al. 2003) More recently, the sourcing of Indian coarse wares from Mleiha was undertaken using XRF Spectrometry analysis (Reddy et al. 2012), the results of which will be discussed in Chapter 6 of this thesis.

1.5 Methodology

The recording protocol in the present thesis for the study of Indian assemblages includes both a ‘hands-on’ approach for the sites particularly in southeastern Arabia as well as a corroborative desk-based regional study of Indian ceramics in the eastern Arabia seaboard and the Red Sea region. An attempt was made to gather all studied and unstudied Indian pottery assemblages within the study region dating from the 3rd century BC to the early Islamic period. To a great extent this was determined by the availability of material, as well as the cooperation of a number of international teams of archaeologists working in the region. Some assemblages studied come from ongoing excavation projects and are therefore not yet published in full (e.g. Mleiha and Kush). A major advantage of the ceramic retrieval process in a majority of the

archaeological excavations particularly in southeastern Arabia is that all pottery including non-diagnostic body sherds are retrieved, documented (e.g. Kush) and occasionally reassembled (e.g. Mleiha), which aids greatly in the quantification of the assemblages. The selection of the Indian pottery assemblages will be discussed in more detail in the following section.

1.5.1 Selection of Indian pottery assemblages

The distribution of the sites analysed in this present study from the Arabian Peninsula, Red Sea and East Africa are presented in Figure 7 and also listed in Table 1. The documentation and analysis of Indian assemblages from the site of Mleiha PIR.D (2nd - mid 3rd century AD) provides new data that adds to our existing knowledge of Indian pottery in southeastern Arabia. Also, the presence of Indian pottery documented from the PIR.A levels (3rd - 2nd century BC) demonstrates the earliest evidence of trade or contact between SE Arabia and the Indian subcontinent in the Late Pre-Islamic period. The selection of Ed-Dur is based on the existing data available on Indian pottery assemblages (c. 1st century BC/AD - 2nd century AD) (Rutten 2006), but which required re-evaluation especially with regard to a more detailed examination of the fabric and reclassification of forms. Although slightly outside the chronological purview of the present study, the selection of Kush (4th/5th - 16th/17th century AD) and the examination of its Indian assemblage provide evidence relating to the perpetuation of trade and contact with India. From South Arabia, Khor Rori (Sumhuram) presents important Indian pottery data (from 3rd century BC onwards) available from the primary fabric analysis of sherd samples and desk-based study of published sources. This is corroborated by a desk-based study of Indian assemblages from other sites of Qana in Yemen and Suhar in Oman. The selection of the three main sites from South Arabia and Oman (Sumhuram, Qana and Suhar) is based on the availability and documentation of Indian ceramics resulting from excavations and surveys and any site omitted from this study does not reflect its significance in the trade network. This particular reason behind the selection also holds true for sites in the Red Sea region and East Africa. These include the sites of Quseir al-Qadim (Myos Hormos) and Berenike in the Egyptian Red Sea coast and Ras Hafun in Somalia, East Africa. The collation of desk-based data on Indian

pottery from these sites will aid in presenting a cohesive picture of Indo-Roman trade in particular the roles of Arabia and India. From the perspective of India, the selection of sites particularly from western and southern India is mainly based on archaeological evidence particularly ceramics indicating trade, results from preliminary provenance analysis and partly due to their mention in the Periplus (Fig. 8, Table 2). The selection has also been influenced by availability and access to comparative Indian assemblages from stored collections as well as published excavation reports from these parts of India.

1.5.2 Recording protocol

The methodology devised for the primary collection of Indian pottery is based on data retrieved by the researcher directly from participation in field excavations and site visits as well as the data recorded from pottery repositories from previous excavations. These retrieval methods include the researcher's participation in the 2010-2011 season of the French excavations at Mleiha, frequent trips to the Falayah 'dig-house' in Ras al Khaimah in order to study the Indian pottery from the Kush excavations as well as visits to Umm al Qawain to inspect the Ed-Dur Indian material. A brief site visit to Salalah was also taken to examine the Indian pottery from Khor Rori (Sumhuram). At sites where primary data could not be accessed, desk-based collation of both published and unpublished data was utilised. Due to variations in the excavation methods and finds records for the different sites, minor distinctions have been applied in the recording protocol for Indian pottery in this thesis:

1.5.2.1 Classification of forms

1. For the Mleiha assemblage, each Indian sherd or assembled fragment has been sorted and registered on the basis of sherd number, sector, locus, description of form, fabric, idem and Munsell colour (wherever available).

2. Similarly for Kush, the information presented under the categories of type of wares includes - form, sherd number (K number), excavation context number, decoration, rim diameter.

3. For Ed-Dur, a re-evaluation of Rutten's (2006) classification of Indian wares was attempted by re-grouping the vessels into 'form' categories that are compatible with the ceramic morphology used in India

4. Pottery drawings of rim and other diagnostic elements (including painted ware, decorations etc.) as well as photographic documentation of all Indian sherds from Mleiha and Kush.

5. Desk-based collation of Indian pottery forms in the eastern Arabian seaboard and the Red Sea region from published material including excavation reports, articles, PhD dissertations, edited books etc. For morphological parallels, published excavation reports of Indian sites and articles were referenced.

6. Cross-referencing the Indian assemblages from Arabia with similar material from other sites in India and abroad has been undertaken by referencing published material and with the consultation of subject experts.

7. Registering individual sherds from the primary study of Indian ceramics at Mleiha, Ed-Dur and Kush to generate a database for quantification and statistical analysis. The statistical data is represented by bar graphs/charts and tables.

8. The terminology used in classification of Indian pottery forms in the Arabian Peninsula (e.g. *handi*, bowls, lids etc.) follows the general terminology of similar vessel forms from excavations of Early Historic sites in India. Wherever nomenclature has been formulated (e.g. lamp or lid variety etc.), it has been done taking into account the most distinctive feature of the vessel type.

1.5.2.2 Fabric analysis

Next, the methodology involving fabric study was given particular importance. This was especially essential in the case of Indian fabric due to the use of generalised 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 (see Nanji 2011). Also 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 based firing

technology, tempering material etc. International nomenclature for similar Indian wares found outside India are instead based on detailed examination and analysis of the fabric. For example, Indian rice-tempered wares, most likely to be have been sourced from the Gujarat region, were first identified not in India, but in the Red Sea port of Berenike (Tomber et al. 2011a). Careful examination of the Indian fabric by scholars working in Arabia has also led to the identification of variations in fabrics of so-called RPW with examples of a type of Fine Indian Red Ware (FIRE) reported from sites like Kush (Kennet 2004) and Khor Rori (Sedov & Benvenuti 2002). Therefore in this thesis, methodology will include the study of the Indian fabric using a microscopic lens with observation of inclusions (aplasic or tempering material and natural inclusions), texture, production technology, firing etc. (Orton et al. 1993) The visual identification methodology has been modified from DPS Peacock's study of Roman ceramics (Peacock 1977), grain-size classification (after Adams et al. 1984), sorting parameters, firing technology (modified from OS Rye 1981), inclusion roundness classes and inclusion frequency charts (modified from Fitz Patrick 1984) (Fig.9).

9. The pottery fabric (core and surface) has been studied and documented using the portable Dino-lite Premier microscope (AM 4113ZT) with a magnification range from 10x-200x. Photographic images of the fabric have been recorded using the Dino-capture software with a resolution of 1.3M pixels and polarization function. Inclusions and other particles in the fabric have been calculated using the measuring function available in the Dino-capture software (Fig.10).

10. The details noted in each fabric class from the individual sites are presented as follows: (i) general definition/description of the ware, (ii) shapes and forms, (iii) surface treatment and decoration, (iv) fabric analysis - inclusions, temper, production and firing technology etc., (v) discussion and (vi) parallels from other sites in Arabia as well as India, the latter used to ascribe likely provenance or source areas.

11. Sub-groups or sub-classes are created within the fabric wherever variation has been noted. 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.

12. Petrographic analysis of the fabrics was undertaken to provide more precise indicators of the geographical origin of the wares and more precisely geological provenance of the raw material. Two separate analysis were done as part of provenance studies of Indian wares in the Arabian Peninsula:

a. A total of 21 sherds from various key sites in Western India were compared with 7 different 'Indian' coarse-ware vessels sampled at Mleiha using X-ray fluorescence (XRF) spectrometry. The analyses were conducted on powdered samples collected from the core of each sherd. Each sample was irradiated for 1000 seconds using a 1.2 mm diameter X-ray beam. The resulting spectra were used for quantification of the X-ray intensity and elemental concentration. Levels of correlation in the elemental ratios of the sherds were statistically tested using an F-test as well as a Chi-test. XRF analysis was carried out by Dr. Gaffar Attaelmanan at the National X-ray Fluorescence Laboratory (NXFL), University of Sharjah.
b. In the next phase of analysis, questions arose regarding the source of 'actual imports' of Indian pottery found in Arabia and to identify wares that may have been imitated using local clays. Seven samples of Indian pottery (shell tempered ware, fine red ware and black wares) from Mleiha, Al Ain and Khor Rori were submitted along with five similar fabric samples from Western India (Dwarka, Nagara, PrabhasPatan) and South India (Alagankulam). These samples are currently in the process of analysis using a combination of X-ray Diffraction (XRD) and Scanning Electon Microscopy (SEM). Dr. Vijay Sathe from Deccan College will be carrying out the analysis in collaboration with the Tata Institute of Fundamental Research (TIFR). The results from these analyses are unavailable in the present thesis but will be published shortly in a scientific journal.

The results of the above-mentioned petrographic analysis and likely provenance of the Indian material in Arabia will be discussed in Chapter 6 of this thesis.

1.6 Summary of chapters

Following the introduction to the context of study, the present thesis has been organised into the following chapters:

Chapter 2 examines the Indian ceramic assemblages from four archaeological sites located in the southeastern part of the Arabian Gulf. Each of the archaeological sites is described in turn (Mleiha, Ed-Dur, Kush, including a short discussion on the site of Dibba). Information is provided concerning the documented pottery including description and classifications of vessel morphologies as well as the results from visual examination and categories of various fabric types.

Chapter 3 firstly outlines the historical background to the aromatics trade followed by documentation of Indian pottery forms from two sites in southern Arabia (Khor Rori and Qana) and one in Oman (Suhar). Each site and respective assemblages are described and recorded separately. The data also includes results from the desk-based assessment of pottery forms in addition to primary study of the Indian ceramic fabrics by the author from one of the sites (Khor Rori).

Chapter 4 covers the desk-based analysis of two port sites in the Red Sea region (Berenike and Quseir al-Qadim) and one site along the East African coast (Ras Hafun Main/Ras Hafun West), with reference to the identification and recording of Indian assemblages based on data from published sources. Some examples of Indian trade ceramics from other East African port sites (Kilwa, Pate, Shanga etc.) from the medieval period are also recorded and discussed.

Chapter 5 covers the quantitative analysis of the Indian pottery assemblages from southeastern Arabia (Mleiha, Ed-Dur, Kush and Suhar). A majority of the data is from securely dated contexts with the exception of Suhar, Oman. Information is provided concerning the relative increase or decrease in usage of particular vessel types through the sequences as well as proportion and distribution of Indian wares across the various sites.

Chapter 6 examines the petrographic analysis and technical sourcing investigation data pertaining to Indian ceramic samples from the site of Mleiha using X-Ray

Fluorescence (XRF) analysis. Evidence for provenance or source is evaluated and the identification of possible production centers in India and Arabia is reviewed.

Chapter 7 examines the evidence of specific vessel forms and fabric based on archaeological data, visual examination and results from petrographic study of pottery samples. This includes a discussion of possible import status relating to sourcing or production centers from India as well as manufacture in different sites by adopting the techniques as attested in the Indian sub-continent.

Chapter 8 analyses the evidence of trade in the Indian Ocean from the perspectives of India and Arabia based on the data from archaeological and historical sources. The chapter is divided into different sections each focusing on a particular source of evidence. This includes historical documents (classical texts, Indian sources, inscriptions), ceramic evidence (ostraca, pottery and its contents and evidence of pre-Periplus ceramics), sailing vessels in Arabia and India (from literary, archaeological sources and inscriptions) and analysis of Indo-Arab trade routes.

Chapter 9 is the concluding chapter that summarises the overall results of this study.

CHAPTER 2

SOUTHEAST ARABIA AND THE INDIAN OCEAN TRADE: THE INDIAN POTTERY ASSEMBLAGE

The aim of this chapter is to provide evidence of Indian pottery in the form of primary data studied by the present author from three sites located in southeast Arabia or modern-day United Arab Emirates: Mleiha (Emirate of Sharjah), Ed-Dur (Emirate of Umm al-Qaiwain) and Kush (Emirate of Ras al-Khaimah) (Fig.11). The chapter outlines the classification of Indian vessels forms from these sites as well as the detailed study of pottery fabric. The chapter is divided into four main sections: Mleiha (Section 1), Ed-Dur (Section 2), Dibba (Section 3) and Kush (Section 4) respectively. The Indian pottery from the site of Dibba has also been discussed very briefly in section 3. The archaeological background to each site is first summarised which includes information about the excavations at Mleiha and the 3 settlement areas (section 1.1), Background to research at Ed-Dur and system of excavation, structures and other evidence of trade (section 2.1-2.3) and excavations at Kush with chronology (section 4.1). This is followed by the documentation of Indian pottery forms (morphology, description of sherd/sample, context, rim diameter if available etc.) as well as detailed analysis of the fabrics (description, surface treatment/decoration, inclusions, fabric variations, parallels with Indian sites etc.) from each of the three sites. The intra-site distribution of the material in commented upon if it is significant (e.g. Ed-Dur). All individual vessels forms have been recorded separately in the Appendices section of this thesis: Mleiha Indian forms (Appendix 1), Ed-Dur Indian forms (Appendix 2) and Kush Indian forms (Appendix 3).

1. Mleiha (Emirate of Sharjah, United Arab Emirates)

The site of Mleiha (Emirate of Sharjah) is located in the western foothills of the Oman mountains, in the plain between Dhaid and Al Madam (Benoist et.al 2003: 59;

Mouton 2009: 195). In ancient times, this is approximately two days travel for a loaded camel from the eastern and western shores. Mleiha is the only settlement known following the abandonment of the Iron Age villages of the Oman peninsula and excavation of the site revealed four successive occupation phases from the 3rd century BC - mid 3rd century AD (Mouton & Cuny 2012: 174). The palaeo-environment and landscape of this area combine a certain number of favourable criteria that could have influenced the long occupation of the site. The site is protected from being engulfed in sand by Jebel Fayah, the limestone chain that blocks the sand dune field to the west (ibid 2012). This local geological context is also favourable to natural water storage in the form of groundwater, while the open cuts in the sedimentary formations show the importance of alluvial drainage debris caused by the main *wadis*, Wadi Nayassa and Wadi Niyam, which could be theevidence of agricultural activity during ancient times (Dalongeville 1997: 7). As a result it was hypothesised that Mleiha with its rich agricultural produce shared a symbiotic relationship with Ed-Dur, which was the port for Mleiha and the supplier of foreign goods (Haerinck 1998: 275); a theory challenged by others accounting for the lack of evidence of sea-borne trade at Ed-Dur (Mouton 1999). The trans-Arabian caravan route probably supplied the foreign imports reported at Mleiha from the 3rd century BC onwards including dozens of sherds of Greek amphora and stamped amphora handles occurred that were made in Rhodes in the late 3rd - early 2nd century BC (Bourcharlat & Mouton 1991: 25). Mesopotamian Glazed Ware and Torpedo jars dominate other imported ceramic finds at Mleiha.

It is at the final period of occupation of the site, the period PIR.D (early 2nd - mid 3rd c. AD) that Indian vessels come to represent a large part of the pottery assemblage. At this time, the settlement concentrates between two major fortified buildings, residences of the elite that have been excavated in area CW to the south and area H to the northeast. In between, a dwelling area was partially unearthed in area DA. The ceramics presented here were collected in these three areas.

Chapter 2

1.1 Excavations at Mleiha and Settlement Areas

J.C. Wilkinson first noticed the site in the 1960s as a result of the discovery of an inscription in the South-Arabian script. Mleiha was excavated for the first time by an Iraqi team directed by T. Madhloom in 1973 who partially excavated a small mound called Area IV including part of a building (Building H) and a grave (Madhloom 1974; Taha 1974).

Some areas have been excavated by the Department of Antiquities of Sharjah under the direction of S. Jasim from 1993 - 94 (Benoist et al. 2003: 59). The Belgian Archaeological Excavations in Mleiha carried out two seasons of fieldwork in 2009 and 2010 (Haerinck & Overlaet 2011a, 2011b). The site has been regularly excavated by a French expedition from 1986 to 2000, and again in 2010 and 2011 (Boucharlat & Mouton 1993; Mouton 2008; Méry & Mouton 2011a, 2011b).

The French excavations at Mleiha have provided a chronological and cultural frame for the study of the late pre-Islamic period (four phases from PIR.A - PIR.D) in the Oman peninsula (Mouton et al. 2012: 174). Excavation of the successive occupation phases, based on the stratigraphically established pottery sequence has revealed the process of sedenterisation of a group that was probably of nomadic origin (Mouton 2009: 195; Mouton & Cuny 2012: 174). The dwellings of the earliest period PIR.A (3rd - mid 2nd century BC) were movable and built of light materials as indicated by the numerous post-holes visible in the hardened sediment (ibid 2012). Funerary monuments of the same period were built of mudbrick, contrasting the seasonally built dwellings from the prestigious and lasting tombs (Mouton 2009: 195). Craft activities of PIR.A involved two areas (Areas K and BF) to the north-west of the site where chlorite was worked and installations for copper working and manufacture of shell beads in Area E to the east of the site (ibid 2009). It was only from the PIR.B period (mid 2nd–1st century BC) onward that dwellings were built of mudbrick, becoming progressively more complex and multi-cellular (with the construction of partition walls) (Mouton & Cuny 2012: 174). Each house consisting of several separate units (5m) was separated from the others by open spaces for domestic activities. The dwellings were organised as groups reflecting a social organisation

characterised by extended families or clans (Mouton 2009: 196). Craft activities in PIR.B included ironworks in Area BS and continuation of the soft-stone and bone workshops from the previous phase in the north-western sides of the site (ibid 2009). Beginning in period PIR.C (1st-mid 2nd century AD) larger houses with courtyards co-existed alongside modest one or two room dwellings, with associated huts partially made of perishable materials (Mouton 2009: 195; Mouton & Cuny 2012: 174). No craft workshops dated to this period were identified.

The final period at Mleiha PIR.D (2nd-mid 3rd century AD) is of most interest to the present research owing to the evidence of Indian pottery in the ceramic assemblage. This is the period of densest urbanisation with dwellings adjacent to each other or separated by narrow lanes (Mouton 2009: 197). This period also marks the sudden abandonment or desertion of the site as indicated by occupation floors littered with complete luxury vessels and large storage jars amongst other objects (Mouton et al. 2012: 209-210, 215) and evidence of 'burning' at Building H. Three main areas or sectors limited to the central part of the site characterise the PIR.D phase at Mleiha (Fig.12a), the latest phase of occupation ending with the abandonment of the site:

(i) The Fort (Area CW)

The fort was discovered during public works carried out in 1990 along the modern road from Dhaid to al-Madam (Fig.12b). The fort was built over an area occupied during the PIR. B and C periods and the occupation of the fort can be divided into three main phases. The material including the pottery comes from the first and second phases dating to the Late Pre-Islamic period when the fort was occupied as a defensive building (Benoist et al. 2003: 64). It is built entirely of mud-brick, is fairly square in shape and measuring 60 x 65 cm. It is surrounded by a thick fortification wall (1.90 m in thickness), with eight towers placed at the four corners and one in the middle of each side of the wall (Bourcharlat & Mouton 1993; Benoist et al. 2003: 60). Rooms were built on the interior against the fortification wall around a large central courtyard (Benoist et al. 2003: 60, 64). Pits and postholes indicate human activity in the courtyard, and animals (camels, horses, cattle and goats) also occupied

a part of the area. Various crafts were also practiced in the rooms of the fort (ibid 2003: 66).

(ii) House/Dwellings (Area DA)

Work was first undertaken in 1994 in the occupation area to the north-east of the fort to better understand the latest phase of occupation of the site, revealing four houses although only one of the houses was fully excavated (Mouton 1994: 8). This house in area DA had six rooms and an enclosed courtyard, divided in two by a low wall, while the house next door revealed five separate rooms. The corners of two other houses nearby with the contiguous rooms were also excavated (Mouton 2009: 197). These houses were constructed very close to each other contrasting the dwellings from the earlier period, which were spaced far apart. This indicates an interesting change in the settlement pattern, signifying an urban settlement dating to the first centuries AD and probably connected to the functioning of the fort (Mouton 1994).

(iii) Fortified Building (Area H)

Two seasons of excavation (2010 and 2011) have completed the excavation of area H, which had been partially excavated by the Iraqi mission in 1973 (Madhloom 1974; Méry & Mouton 2011a, 2011b). Area H located in the northeast of the archaeological area of Mleiha, encloses a large space of about 65-70 m on each side with building H in the middle, with eight towers at each corner and middle of each side of the wall (Fig.12c). This defensive wall compares with the fort excavated in area CW with the same trapezoidal shape. Building H (32 x 30 m) comprises fifteen rooms arranged around the four sides of the central courtyard (c. 20 m per side) (Mouton et al. 2012: 205-207). Previously, soundings were undertaken on the site of the house and indicated that the building appeared to have been burnt (Mouton 1994). The evidence gathered in the 2010-11 seasons indicated that the destruction levels were marked by ashy deposits, charred wall plasters and the large quantity of burnt beams (palm trucks) from the roof, lying on the floor (Mouton et al. 2012: 209).

1.2 Indian Pottery from PIR.A period

Since the earliest period at Mleiha (PIR.A) (3rd - mid 2nd century BC), Indian pottery reached the site but in much lesser quantity than the pottery from the west (Parthian, Characenian etc.) that were carried along the trans-Arabian caravan route. During the following periods (PIR.B - PIR.C), however no pottery found at Mleiha could be confidently related to the Indian sub-continent. The Indian pottery of PIR.A is a distinctive variety of high-necked vessels with horizontal grooves along the neck, well-levigated clay and highly burnished red slip amounting to almost 870 sherds from these earlier excavations at Mleiha, although it is uncertain if an Indian origin can be ascribed to all the excavated sherds. Mouton (2008: 45) identifies and describes these vessels as characteristic forms of the PIR.A period with thick everted or incurved rims and fluted neck with a red or brown slip. This fluted neck form recalls similar shapes of vessels of Thaj grey ware (Parr 1964: 21 Fig. 2) while slipped pottery was manufactured locally based on evidence from Iron Age Period II at Rumeilah (Lombard 1985: 180). However the Iron Age forms are not quite similar to the PIR.A pottery from Mleiha (Mouton 2008: 45). Additionally an Indian origin was proposed for these wares based on identical forms and fabric from Nevasa and Navdatoli in Western India (ibid 2008). In the present study morphological parallels for these wares have also been obtained from sites notably in western India. Petrographic analysis (XRF analysis) of samples of high-necked vessels from Mleiha revealed the provenance of these wares as located in the areas of Maharashtra and Gujarat in Western India (Reddy et al. 2012) (Chapter 6). The morphological and scientific study of the high-necked vessels from Mleiha and its importance to the formative period of Indian Ocean Trade in the centuries BC is discussed in detail in Chapter 8.

1.3 Indian ceramic assemblage at Mleiha: Forms

The identification of Indian coarse ware at Mleiha is based on two primary aspects: form and fabric. The ceramics that appear in the late PIR.D contexts first discovered during the 1994 season of work were increasingly associated with forms that compared with Indian pottery industries. This determination was progressive; these coarse wares were first more appropriately described as vessel forms or wares that

closely resembled Indian pottery types. For that reason, precise quantification is not available for the material collected in areas CW and DA. Area H was excavated after definitive identification of the fabrics, and then Indian pottery quantification was possible: by counting the registered shapes it represents 18.5% of the ceramics found in the fortified building. All the ceramics presented here appear at Mleiha exclusively in PIR.D contexts (2nd - mid. 3rd c. AD).

Close parallels with ceramics from India can be listed in the Mleiha repertoire based on both unusual as well as typical Indian pottery forms. These include carinated cooking vessels or *handis*, ridged carinated vessels, globular vessels with ridged carination, carinated plates, lamps or lids, flasks or funnel-mouthed vessels, and large storage jars or cooking pots. However parallels cited in this paper for the Mleiha Indian vessel forms are primarily from those sites in India where pottery from excavations is published in considerable detail, in addition to availability and access to pottery samples for source identification (XRF) analysis. All individual Indian vessel forms from Mleiha have been recorded and listed in Appendix 1 of this thesis.

1.3.1 Carinated Indian Vessels

The common Indian cooking vessel or *'handi'* is identifiable in the Mleiha ceramic assemblage by its familiar shape which includes a prominent flanged rim, carination at the shoulder and rounded base which is often sooted, thereby confirming its use as a vessel for cooking. Parallels (in this study) have been drawn from several sites in Western and Southern India including Ter (Chapekar 1969: Types 22F Fig.11, 31A Fig.16 & 42 Fig.21), Nasik (Sankalia & Deo 1955: Type 9 Fig. 14), Brahmapuri (Kolhapur) (Sankalia & Dikshit 1952: Type 37 Fig.17), Bhokardan (Deo & Gupte 1974: Type 39A Fig.8), Junnar (Shinde et al. 2007: fig. 19), Somnath (Nanavati *et al.* 1971: Type V F1 Fig.32), Kamrej (Gupta 2004: fig.12 XI Type I & II Fig. 12), Jokha (Mehta & Chowdhary 1971: Type 117 & 120 Fig.16), Arikamedu (Wheeler *et al.* 1946:Wheeler Type 24 Figs. 19 & 20), Nagara (Mehta & Shah 1968: Type 34, 36 fig. 21), Nevasa (Sankalia et al. 1960: T48 fig. 118, T73 fig. 129), Baroda (Subbarao 1953: Type 35 fig. 16, Bet Dwarka (Gaur et al. 2005: Type 48 fig. 36) The Mleiha examples of this ware is firmly dated to PIR. D phase. This coincides with the dating

of these vessels from contemporary Early Historic sites in India (Ter Period II, Nasik Period IIB, Arikamedu AK II, AK V etc.). The 'handi' shape generally is widespread in most Indian sites and can be dated from the first century BC – 11th century AD (Begley & Tomber 1999: 172). Certain common features like the series of ridges at the shoulder, just above the point of carination, the externally extended rim (to afford an easy grip of the vessel), and the occasional decoration at the shoulder of the vessel are all present in most of the carinated vessel forms in Mleiha. The external surface is slipped and sometimes without a slip. Burnished slip sometimes covers the rim and exterior of the vessel, which were mostly horizontally ('strip') burnished. The core is generally grey and is ill-fired and contains white mineral temper. The upper body including the rim and neck was possibly wheel made while the lower portion or base was handmade or mould pressed.

Based on slight variations in shape, carinated vessels at Mleiha have been divided into three sub-categories: carinated 'handis' (Figs. 13 - 15: 1-14), ridge carinated vessels (a variation of the carinated 'handi') (Fig. 16 - 17: 17-22), and globular vessels with ridge carination (Fig. 18: 23-26). Each of these sub-categories will be explained separately.

(i) Handi Vessels

The handi is the most common type of the carinated cooking vessel from India. It is widely used in all parts of the subcontinent and is referred to by other names such as 'chatti' in South India. In the 'handi' category, 16 samples of nearly complete vessels and diagnostic fragments have been recorded at Mleiha Building H and Areas CW (the fort) and DA all from the Period PIR. D phase (see Appendix 1 nos. 1 - 16)

(ii) Ridge Carinated Vessels

A variation in the 'handi' form is recorded with the presence of a secondary ridge or rib just above or below the point of carination. These ridge carinated vessels have parallels in Indian sites like Prakash (Thapar 1967: type 9), Bhokardan (Deo & Gupte 1974: fig. 8 type 36A), Paunar (Deo & Dhavalikar 1968: fig. 18 type 118) in Maharashtra as well as in Gujarat at Dhatva (Mehta & Chowdhary 1975: fig. 14: 92), Kamrej (Gupta 2004: fig. 8 IX), Nagara (Mehta & Shah 1968: Type 32, 35, 37 fig.

21; Type 332 fig. 36), Amreli (Rao 1966: Type 49 fig. 17). A total of 6 samples of ridged carinated vessels were recorded at Mleiha Building H (see Appendix 1 nos. 17-22)

(iii) Globular Vessels with Ridged Carination

This form counts among the 'large vessel' category in the Mleiha PIR.D assemblage. The distinguishing feature in this variety of storage containers and/or cooking vessels is the pronounced secondary 'ledge' or 'ridge' along the shoulder of the vessel, just above or below the point of carination or in the middle of the belly. Minor ridge lines are sometimes visible just below the neck of the vessel. This form is quite similar to the ridged-variety in the carinated vessels or 'handi' category, but with a slight variation in the shape of the rim, and larger size of these vessels. A total of 4 vessels were recorded (Appendix 1 nos. 23-26). The parallels for this form among the Indian sites include Nevasa (Sankalia *et al*. 1960: T69 fig. 128), Brahmapuri (Sankalia & Dikshit 1952: Type 76 fig. 19), Prakash (Thapar 1967: Type 16 fig. 30), Kamrej (Gupta 2004: Type I fig. 8, Type VIII fig. 10), Nagara (Mehta & Shah 1968: Types 12 & 13 fig.19; Type 19 fig. 20).

1.3.2 Carinated Plates or Dishes

Form parallels for carinated plates or shallow dishes in Mleiha (Fig. 19 - 20: 27-34; Appendix 1) can be gathered from several sites in India including Arikamedu (Wheeler *et al*. 1946: Wheeler Type 25 fig. 21), Nevasa (Sankalia *et al*. 1960: Type 86 fig. 135), Ter (Chapekar 1969: Type 4D fig. 5; Type 86 fig. 185), Brahmapuri (Sankalia & Dikshit 1952: Type 9 & 10 fig. 15), Bhokardan (Deo & Gupte 1974: Type 20 fig. 6), Dhatva (Mehta & Chowdhary 1975: Type 100 fig. 15), Baroda (Subbarao 1953: Type 57, 57a fig. 18). The fabric too is comparable with several sites in Western India with a greyish red core and occasionally covered with a red slip or wash, and sometimes no slip. Variations include examples of v-shaped and flanged dishes without carination.

1.3.3 Bowls

The bowls recorded from Mleiha comprise both convex-sided and carinated forms (Fig. 21: 35-44). All Indian-type bowls seem to have been recorded from sectors CW and DA. A total of 10 bowl forms were recorded from Mleiha (Appendix 1 nos. 35-44).

1.3.4 Lids or Lamps (Oil Lamps)

This is a well-represented type of vessel at Mleiha. Its fabric corresponds closely to the previous carinated plates, brown ware with sandy or mineral temper, and is not often slipped. The shape is of a concave shallow vessel, with round bottom, oblique walls, thickened rim and a round concavity in the centre. Many of the pieces found at Mleiha, and in others sites of the eastern shore of Arabia, where reused as lamps, the central cavity serving as an oil container. This shape, culturally linked to the Indian morphological repertoire of pottery, was well diffused all around the Indian Ocean. In south-east Asia, lids of this type are produced in Thailand as early as the 4th - 2nd c. BC at Khao Sam Kaeo; the latest evidence were found in Vietnam at Oc-Eo in a contexts dated to the late 1st c. BC to the 3rd c. AD (Malleret 1960: type 55; Mang Fauin 2002). In India, the shape is commonly referred to as cup-and-saucer shaped lid (Arikamedu) or ink-pot type lid (Bet Dwarka). The Mleiha examples are closest to type 38c and 38a in the Arikamedu context with a wide flaring rim and well-preserved shallow cup (Wheeler *et al.* 1946: fig. 23; Begley 1996: 32), the Bet Dwarka lid type 12 (Gaur *et al.* 2005: fig. 39), the type 34H at Ter (Chapekar 1969: type 34H fig. 18) and type XXXIV at Kamrej (Gupta 2004: fig. 6). Identical shape, in a comparable fabric, as described in publications, are also found along the Arabian eastern coast, at Qana in contexts dated 2nd - 4th c. AD (Sedov 1992: fig. 3: 6-7), in Somalia at Ras Hafun dated 1st - 3rd c. AD (Smith & Wright 1988: 137), in Egypt and Nubia where they are most frequent at sites like Nag el-Schiema (Bietak & Schwartz 1987: 171-172, fig. 24, 42, 44, 50, 65) and Abou Mina, east of Alexandria (Negm 1998; fig. 12). At Berenike they are described as originating from Egypt or south Arabia (Begley & Tomber 1999: 171), as the form is not very common at Indian sites and could have been introduced to the Coromandel Coast from Egypt or Arabia after the middle of the first century AD, surviving into

medieval times (ibid 1999: 171). Therefore an Indian source to the particular fabric found at Mleiha is still a matter of discussion, as it seems more predominant in the Red Sea and Arabia contexts, than in India. Thirty-two samples of lamp/lid forms were recorded at Mleiha out of which twenty-eight samples have been illustrated (Figs. 22 - 27: 45-73; Appendix 1 nos. 45-76):

1.3.5 Lids (Variation)

Another lid-type found in the Mleiha PIR.D context with a more convincing Indian origin, has precise form parallels from several Indian sites including Arikamedu (Wheeler *et al*. 1946: Types 29-31 fig. 22), Ter (Chapekar 1969: Type 26 A-C fig. 13; Type 34 A-E fig. 17), Nasik (Sankalia & Deo 1955: Type 23 fig. 20. Type 74 fig. 33), Paunar (Deo & Dhavalikar 1968: Type 54 fig. 9 & Type 95 fig. 14), Prakash (Thapar 1967: Type 1 fig. 27) etc. The standard features of this vessel form include projected edge and higher base, and made in two parts, joined at the flange. This ware was used either as a lid or a casserole and can be dated from the middle of the 1st century AD to medieval times (Begley & Tomber 1999:172). Similar lids are also found at Ed-Dur. A total of 4 lid fragments were recorded at Mleiha and 3 samples have been illustrated (Fig. 28: 78-80; Appendix 1 nos. 77-80):

1.3.6 Flasks or funnel-mouthed vessels

Another vessel form from Mleiha PIR. D assemblage that leans toward a probable Indian source is the jar with a funnel-shaped mouth, narrow neck and a globular body. However corresponding forms from Indian sites occur only rarely (at least based on the pottery repertoire of the sites listed in this paper). The nearest form parallel can be suggested from Bet Dwarka (Gaur *et al.* 2005: Type 28 fig. 34), Amreli (Rao 1966: Type 50, 52 fig. 11), Bhokardan (Deo & Gupte 1974: T. 29 fig. 7), Nevasa (Sankalia et al. 1960: T80 e fig. 132). These bear a close resemblance to the vessel type referred to as ‘sprinklers’ or ‘spouts’ based on the pottery repertoire from Amreli described as ‘a small jar (?) with a beaded rim and short grooved neck (Type 52) and as a ‘sub-type with a narrow concave neck as in a funnel, but the mouth is fairly wide’ (Type 50). Based on the shape of the body, surface treatment and funnel mouth, it appears that the flask forms from Mleiha were used mainly to

store liquids or served as a water dispenser vessel. Two variations occur in a red ware fabric: One with a reddish-grey core with red slip, slightly burnished and the other, reddish orange ware with sandy or mineral temper, no slip. Four forms of this ware were identified and recorded from Mleiha (Fig. 29: 81-84; Appendix 1 nos. 81-84):

1.3.7 Storage Jars and/or Cooking Pots:

Several varieties of storage jars and cooking pots (besides the carinated varieties) are recorded from Mleiha. The distinction between storage and cooking purposes among these vessels is drawn from the evidence of soot stains or a blackened base visible internally, at base of the vessel, resulting from cooking activities in the latter. The common feature in these vessel forms at Mleiha is the short or constricted neck and a large globular, ovoid or bulbous body. Variations are evident in the profile and contour of the rim and in the fabric type. The fabric varies from buff to orange coarse ware, sometimes with a red or grayish core. Some of the vessels are covered with a micaceous red slip and are sometimes burnished. The others contain sandy temper with mineral inclusions and no slip or are occasionally tempered with shell particles. Some of these storage/cooking pots from Mleiha share similarities with Indian vessel forms discovered in Red Sea sites like Berenike and Myos Hormos (Chapter 4). Although these storage vessels from Mleiha clearly indicate an Indian origin based on form and fabric, it was not possible to find absolute parallels for all of the individual forms from the current range of published ceramic drawings from India at the disposal of the authors.

Parallels have been noted for forms ML10013 from Amreli (Rao 1966; Type 12 & 24 Fig. 10 RPW), Bhoji-Kadwar (Pinto-Orton 1992; No. 4 Fig. 4.7), Kamrej (Gupta et al. 2004: Type RPW III Fig. 1); ML10068 from Amreli (Rao 1966: Type 24 fig. 15); ML10209 similar in form to pottery discovered at the site of Pattanam in Kerala (R. Tomber pers. comm.); ML10211 from Ter (Chapekar 1969: Type 40I fig. 17), Paunar (Deo & Dhavalikar 1968: Type 101 fig. 15), Bhokardan (Deo & Gupte 1974: Type 46C fig. 9), Dwarka (Ansari & Mate 1966: Type 81 fig. 20), Kamrej (Gupta 2004: Type XI fig.12); ML10242 & 10243 from Arikamedu (Wheeler et al. 1946:

Types 17 & 18 fig. 18); ML10256 from Bet Dwarka (Gaur et al 2005: Type 44 fig. 35); ML10317 from Somnath (Nanavati et al. 1971: Type VD3 fig. 32); ML4567 from Somnath (Nanavati *et al.* 1971: Type IV G2 & IV G3), Paunar (Deo & Dhavalikar 1968: Type 46D fig. 8), Ter (Chapekar 1969: Type 6B fig. 6, 13A fig. 7); ML4457 from Pattanam (Muziris) type (R. Tomber, pers. comm.) and ML3644 from Taxila (Ghosh 1948: Type 76-77 fig. 14); Shaikhan Dheri (Dani 1966, fig. 35); Arikamedu (Wheeler *et al*. 1946: Type 72 fig. 28), Kamrej (Gupta 2004: Type VI Fig. 5). Thirty-six samples of storage jars and cooking vessels were recorded from Mleiha (Fig. 30 - 31: 85-91; Fig. 32 - 33: 92-102; Fig. 34: 103-106; Fig. 35: 107-113; Fig. 36: 114; Fig. 37: 115-119; Appendix 1 nos. 85-120):

1.4 Indian Fabric from Mleiha

The second more important determinant in the identification of Indian pottery is fabric. Though form parallels are a significant aspect of studying the cross-cultural influx of pottery types, Begley & Tomber (1999) were right in observing that fabric is the more important criterion for determining the source of the pottery, in spite of the fact that coarse ware fabrics are very rarely published in detail. By carefully examining the fabric from the surface and core of these Indian vessels, several variations in the fabric types are observed at Mleiha. Previous references to coarse 'Indian' wares from Mleiha had a tendency to assign generic terms to the fabric, referring to them as 'brown ware with chalky/shelly/sandy grits' (see Benoist et al. 2003: 69, Cuny & Mouton 2009: 100; 2009) or 'a red ware with a black core and micaceous temper' (Benoist et al. 2003: 69). The latter fabric can be further categorized into coarse red or grey wares (depending on the colour of the clay and firing conditions) and red slipped wares. As the name suggests coarse red or grey wares have gritty fabric tempered with sand inclusions or white mineral temper or quartz grains and sometimes shell particles. The Red Slipped Ware also has a coarse to medium coarse fabric, in addition to the application of a thick coating of red slip, which is burnished. These variations are evidence of the same type of wares being produced in different workshops, but always with the same type of slip. Examples include the carinated vessel forms from Mleiha that are generally wheel made and

show uncontrolled but even firing in oxidizing conditions. Besides the coarse red ware, the colour of the fabric varies from brown to buff and occasionally orange (orange or reddish-orange fabric has been ascribed to several vessels of the lamp/lid variety).

Presently, based on visual examination, Indian red ware from Mleiha can be classified under three broad categories: Fabric 1 - Brown reddish sandy ware with white chalky/gritty inclusions, Fabric 2 - red ware with black core and micaceous temper and Fabric 3 - Brown reddish ware with 'shelly' temper (Reddy et al. 2012: 3).

1.4.1 Fabric 1 - Indian Sandy Ware (Ware Code: SANDY)

Description: The generic term of Indian sandy ware or Indienne sableuse is applied to vessels ranging from a buff to reddish-brown or reddish-grey ware and occasionally orangish clay, tempered with sand particles and with white chalky/gritty inclusions.

Shapes and Forms: The Indian vessel forms classified under this fabric category range from bowls to storage jars and cooking vessels and carinated forms of plates and sometimes '*handis*'. Lamp or lid forms are often recorded in sandy or sand-tempered fabric with white inclusions.

Surface Treatment: In most cases, the colour notation for the core and surface ranges from grey (5YR 6/1) and reddish yellow (5YR 6/6) to light brown to reddish-yellow or brown (7.5YR 6/4 to 6/6) and pale brown (10YR 7/4) with a brownish-yellow surface (10YR 6/6). The surface is occasionally slipped or treated with a wash.

Fabric: The fabric is hard with a hackly fracture and rough texture. Careful study of various samples of sandy ware under a microscope revealed non-plastic inclusions. The majority of the principle mineral inclusions resembled angular or rounded lumps of white limestone and white quartzite, while some samples of the fabric comprise translucent white and red grains of quartz/quartzite crystals and sedimentary rock. Other inclusions including ferromagnesian minerals (volcanic rock) and mica are visible in very small quantities in the samples. Voids are present in the fabric that

mainly comprise elongated cavities with striations down the length indicating some vegetal temper or plant fibre in the clay that burnt out during the firing process. Other voids indicate air holes. The inclusions are moderately to poorly-sorted and their frequency is moderate (10-15%). The size of the limestone inclusions ranges from 0.22 - 0.25mm to 0.47- 0.51mm at 55x. The translucent white and red quartz/quartzite particles measure from 0.21 - 0.49mm at 54x. The hard red grains are prominent particles that range from 1.16 - 1.2mm at 54x and 56x respectively. The ferromagnesian minerals and other hard black grains range from 0.47mm at 54x, 0.26 - 0.42mm and 0.75 mm at 51x.

Based on the variation in fabric and inclusions, Fabric 1(A) comprises a thick coarse reddish-grey ware with large white grits, limestone inclusions and occasional vegetal temper and occasional red grains (Fig. 38). Fabric 1(B) is a variation of the reddish-grey ware predominantly with translucent white and red quartz/quartzite grains and occasional mica particles, vegetal temper and ferromagnesian minerals (Fig. 39).

Discussion and Parallels: A large number of storage jars and cooking pots from Mleiha belong to this category of fabric. Parallels for many of the forms especially the jars can be derived from sites in India, Arabian Gulf and the Red Sea region. For example the fabric of the big storage jar ML3644 from the fort area CW (Fig. 36: 114), discovered from the upper levels of occupation (PIR.D) represents the typical characteristics of Fabric 1 from Mleiha. Parallels in form can be cited from Qana (Yemen) from the Middle Period level dating from the 2nd to 4th century AD (Sedov 1992: fig. 3 no. 1). At Khor Rori (Dhofar, Oman) three almost identical copies were recorded from A8 Square Area A, US 22 daring from the 2nd cent BC - 3rd cent AD (Buffa & Sedov 2008: Pl.13 nos. 1-3). From the site of Quseir al-Qadim (Egypt) a 'red, grey core tempered with common coarse sand' (similar to Fabric 1A from Mleiha) has been recorded in a Roman villa dated from 1st - 3rd century AD levels (Whitcomb & Johnson 1982: Pl. 13:f). In the Indian subcontinent parallels from Taxila (Pakistan) (1st cent. BC to 2nd cent AD) include a large storage jar (Type 76) with a heavy rim and elliptical body tapering down to a blunt point. Fabric is a thick coarse reddish-grey ware, tempered with large grits, limestone chips and wheat straw (Ghosh 1948; p.67, Fig.13: 76). Form parallels can also be derived from Arikamedu

(India) based on Wheeler's Type 72 (Wheeler 1946: p.77: Fig.28: 72), although the fabric is recorded as a grey ware.

1.4.2 Fabric 2 - Indian Micaceous Ware (Ware Code: MICA)

Description: 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.

Shapes and Forms: This fabric is mostly recorded in forms representing carinated *handi* vessels at Mleiha as well as a few examples of storage jars, cooking pots and flasks.

Surface Treatment: The exterior is often covered with a thick red slip in a majority of these wares. The munsell colour for the surface and core ranges from yellowish-red (5YR 5/6) and reddish-orange core (7.5YR 6/8) to dark reddish grey (2.5YR 4/1) and coarse grey core (7.5 YR 6/1). The slip hues range from red (5YR 5/8; 2.5YR 4/6-4/8) to dusky red (10R 3/4). Decoration usually comprises a number of incised lines recorded on carinated *handis* immediately above the point of carination. The surface is often 'strip burnished' with a series of streaks seen on the slipped surface. One of the large slipped cooking vessels (ML4457) displays internal wiping with organic material considered to be a by-product of bamboo tools, still used today in India particularly at the site of Pattanam, Kerala (Tomber 2008: 47).

Fabric: The hardness, fracture and texture of this fabric are similar to the Indian sandy ware. The principle inclusions however are dominated by an abundance of white mica particles (muscovite) dotted with occasional medium sized particles of dark mica (biotite). White inclusions are noticeable in the fabric and can be distinguished into grit or grain-sized particles as well as clusters of irregular-sized inclusions that denote limestone or occasionally plate-like or curved resembling shell particles. Red inclusions are also noted in the fabric comprising transparent or translucent hard red grains indicating quartz or quartzite crystals as well as reddish-orange, clay-like, rounded, soft grains representing grog or clay pellets. More infrequent are red grains that resemble well-rounded particles of red iron oxide. Other mineral inclusions comprise white quartz/quartzite grains and rare particles of

black ferromagnesian minerals. Voids are only occasionally seen in the fabric indicating vegetal temper and are more often air holes. The inclusions are well to moderately-sorted and comprise mostly sub-rounded and rounded sediments. Their frequency ranges from common (20%) to very common (30%). The size of the white mica (muscovite) inclusions ranges from small-sized (0.046 - 0.093 at 53x) to medium particles (0.15 - 0.20mm at 50x). The biotite (dark mica) measures 0.57mm at 53x. The hard black inclusions including the ferromagnesian minerals range from 0.36 - 0.80mm at 56x, the red grains (iron oxide and clay pellets) are generally 0.67mm at 50x, red quartz/quartzite measures from 0.15 to 0.44mm at 55x and white quartz/quartzite at 0.77mm at 50x.

Several variations can be noted in these wares based on the fabric and principle inclusions. Fabric 2(A) comprises a red ware tempered with predominantly mica particles and infrequent inclusions of clay pellets (Fig. 40). Fabric 2(B) represents a light grey fabric with a thin red 'strip burnished' slip. The inclusions comprise clusters of irregular sized white limestone and quart/quartzite grains with vegetal temper and some mica (Fig. 41). Fabric 2(C) indicates fabric samples of slipped carinated *handis* that consist of grit or grain-sized white inclusions in combination with mica particles and grains of red quartz/quartzite and iron oxide (Fig. 42).

Discussion and parallels: 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 slip of the vessels similar to pottery traditions in parts of western India. Working techniques as recorded in vessel ML4457 are known even today only to potters of North 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 & Behura 1966 quoted by Tomber 2008). These bamboo marks are still visible on the interior of the vessel from Mleiha. Carinated *handis* or

Wheeler type 24's have been recorded from the Red Sea area that demonstrates a similar technique (Tomber 2008: 47). It is therefore likely that many of the carinated *handis* and slipped cooking pots/storage jars could signify their origin from western India.

1.4.3 Fabric 3 - Shell-tempered Ware (Ware Code: SHELL)

Description: This fabric has a buff to reddish-brown paste tempered with abundant plate-like and curved shell particles.

Shapes and forms: Shell-tempered ware is primarily depicted in the form of cooking pots and carinated vessels (handis, globular and ridge-carinated) from Mleiha as well as a few examples of storage jars.

Surface treatment: The surface of shelly ware is usually devoid of any slip but occasionally samples of storage jars have surfaces with a light red wash or red slip. The core and surface of some carinated vessels possess a dull grey colour indicative of its use as a cooking vessel. The Munsell hues for shelly wares range from light buff-brown colour tone (2.5 Y 5/4-5/6) to reddish yellow/orange (7.5YR 6/4-6/6) and grey surface (7.5YR 5/1-6/1).

Fabric: The shelly-tempered fabric is hard with a hackly fracture and has an abrasive/harsh texture or surface feel. The principle inclusions in the fabric comprise of shell particles identified by their plate-like and laminated or curved features. In some examples the temper appears to be a combination of ground shell and mineral grits. Additional inclusions, in smaller quantities, visible under a microscope include transparent and translucent quartz/quartzite and limestone. The shell temper is present throughout the exterior and interior of the vessel including the rim. The average size of the shell inclusions ranges from 2-3mm. These are well-sorted and their frequency is abundant (40%).

Based on the composition of shell inclusions, Fabric 3(A) buff to light brown clay comprising primarily flat, lamellar plate-like shells in the temper and Fabric 3(B) is a reddish-brown fabric sometimes grey in places consisting powdered or ground shell temper in combination with mineral grits (Fig. 43).

Discussion and parallels: The existence of small particles of shell in the vessel fabric is recorded in some vessel types along the western Indian coast as a result of naturally occurring shell fragments in the local clay. The Mleiha shelly ware however, comprises abundant inclusions of unusually large shell particles that seem to have been intentionally added to the temper. No precise parallels could be cited for the shelly ware from any particular ceramic industry in India. However references have been made to the pottery repertoire in the Dhofar region where in terms of ceramics, associated material appears to be primarily either grit or shell-tempered (Zarins 2001: 87). According to Pallecchi and Pavan (2011), the Dhofar group is characterised by "pottery with reddish/buff fabrics which usually employs, as temper, crushed shells or calcareous microfossils" The occurrence of this fabric in local repertoire of ceramics at Khor Rori will be discussed in detail Chapter 3.

1.5 Absence of Indian fine wares from Mleiha

Finally, the absence of Indian fine wares at Mleiha, and the very small number recorded in the other sites in southeastern Arabia, must be underlined. Red Polished Ware (RPW) and Rouletted Ware (RW) were frequently found in the Red Sea and south Arabian ports. Indian coarse wares, on the other hand, can be difficult to identify (provenance and date) since the knowledge of common potteries in India, especially the containers, remains rather poor and some were produced from the Early Historic period to the present day all over the subcontinent (Tomber 2008: 46). The distinctive nature of Indian fine wares exported to the west, both forms and fabrics, make it fairly certain that all sherds recovered can be identified and recorded (Begley & Tomber 1999). Fine wares have been recorded from other sites contemporary to Mleiha in southeast Arabia. These include sherds of so-called RPW or Fine Red ware from the coastal sites of Ed-Dur (this chapter) and from the early layers at Suhar (Chapter 3). Additional fine wares albeit in smaller quantities include a class of 'very fine greyish red slipped ware' (Rutten 2006) similar to Indian Black-and-Red Ware from Ed-Dur and rare fragments of 'Fine Red Ware' and a fragment of Black Indian Polished Ware from Suhar (Kervran 2004). The fact remains that the distribution of RPW (and other fine wares) imported to the Gulf is unsurprisingly, limited to coastal sites (Whitehouse & Williamson 1973: 38-39).

Chapter 2

2. Ed-Dur (Emirate of Umm al-Qawain, United Arab Emirates)

The site of Ed-Dur (Emirate of Umm al-Qawain on the west coast of the Oman peninsula, is the largest known coastal site between Qatar and the Strait of Hormuz for the last decades of the 1st c. BC until the 4th c. AD (Boucharlat *et al*. 1988: 2, Potts 1990: 274-291, Haerinck *et al.* 1991, 1992a, 1992b; Haerinck 1992, 1993, 1994). The site lies in a flatter area behind the high dune and stretches c. 1 km inland. The site during its heyday may have witnessed an occupation of some 2 - 3 sq. km or more (Haerinck 2001: 3).

The site had been occupied in prehistory, during the Umm an-Nar period and later during the Iron Age, after which it was deserted. For some centuries there was no settlement at Ed-Dur, since none of the typical 'Hellenistic' objects that occur at Mleiha were ever found there (Haerinck 2003: 200). From the last decades of the 1st century BC or maybe only from the 1st century AD the site was re-occupied. Imported Roman pottery could indicate that occupation began towards the end of the 1st century BC (Haerinck 2001: 3–5; Rutten 2007: 19). But the main occupation dates to the 1st-2nd c. AD, and the later evidence is a fortified building signifying the residence of an elite at the site until the 3rd century AD. Its abandonment seems to be contemporary with the desertion of Mleiha, the major site in the region (Mouton & Cuny 2012: 179). A small community related with the site came to bury their dead in the ruins of this late building until the first half of the 4th c. AD. Lecomte et al. also proposes that the most extensive period of occupation here was during the first and early second centuries AD, continuing until the fourth century AD in a much more restricted area (Lecomte et al. 1989; Potts 1990: 274-91).

Scholars underline the important volume of imports found at the site during the various seasons of excavations carried out by an international expedition (Belgium, Denmark, France and Great Britain from 1987 - 1995) to interpret the site as a central harbour in antiquity (Haerinck 2003: 201, 204). Others challenged this interpretation, stating that there is little evidence for sea-borne trade at Ed-Dur, and that its location at the end of a shallow lagoon difficult access for boats, suggesting instead that the site presents the characteristics of a regional centre of a tribal group,

concentrating its sanctuary, cemeteries and probably a seasonal market which perhaps attracted few merchant vessels to distant anchorage (Mouton & Cuny 2012: 178). It has been surmised that a large part of the imported finds at both Mleiha and Ed-Dur could result from the trans-Arabian caravan trade supplying the region in goods from Mesopotamia, Mediterranean Sea, Levant and South-Arabia since the 3rd c. BC, while the increasing of volume of material from Indo-Pakistani sphere in the first centuries AD been much possibly related with the foundation of Dibba on the eastern coast (Mouton 2009: 201).

2.1 Background of Research at Ed-Dur and System of Excavation

The site of Ed-Dur was discovered in 1973 by an Iraqi team during the archaeological survey of the United Arab Emirates, where brief soundings by the team revealed a small squarish fort with round corner towers and 20 m walls. The preliminary results of the survey were published in journal Sumer (Salman 1974). Following this initial discovery, Salles conducted an extensive survey of the site in 1980 and 1981 and published an article on the pottery collected from the surface (Salles 1984).

The site was disturbed by development activity in the early 1970s by the construction of the coastal highway linking the Northern Emirates with the rest of the UAE, the effects of which was a deep cut in the western part of the site (Haerinck 2001: 2). However it was a bigger threat of the construction of the new airport at Umm al Qaiwain that mobilised a European consortium of four countries (Belgium, Denmark, France and Great Britain) at short notice, to launch a full-scale excavation at the site in 1987. The teams worked on a rotating basis. The Belgian team from the University of Ghent conducted nine continuous seasons at Ed-Dur from 1987 - 1995, excavating several areas of the site, leading to the discovery of complex structural and occupational remains as well as large amounts of pottery and other objects.

The areas on the site excavated by the Belgian team were based on a system of 10 x 10 m squares (part of the major grid system laid in 1987), although smaller squares and longer trenches were also made. Each area received a letter of the alphabet and

in the course of the various seasons two letters were used. Areas were selected based on the surface concentration of pottery and stones, in some cases of a small mound (Area M or the temple), while in others no special remains could be detected on the surface (Area AV). Large exposures (eg. Areas BQ, BO, BR and BS) (Figs 44a-c) were made in different parts of the site (mostly southern and central parts) to understand the pattern of settlement at Ed-Dur (living quarters, industrial areas, burial areas etc.). All structural remains or features received locus numbers. For graves, the locus numbers received an additional letter 'G'. All remains (fireplaces, shell concentration, skeleton, pottery) were also each given a 'UF' number (Unite de fouille/ excavation number), to represent levels or artificial divisions, so that they could be related to each other, both horizontally and vertically. All objects were registered with the area where they were found and were recorded in different lists: object (m), pottery (c), sample (s) etc. (Haerinck 2001: 5-6).

2.2 Structures

Prior to the Belgian team's work, the only architectural monument known at Ed-Dur was the small roughly square fort with round corners (Fort in Area C) excavated by the joint Emirati and Iraqi teams in 1974, located 300 m to the NE of the temple in area M (Boucharlat et al. 1988: 4; Haerinck 2011: 4). This was one of the two Sasanian-period forts at the site, the other excavated by the French team in Area F. The fort is Area C is a roughly square building measuring 22 by 25 m with four round towers and walls 1.5 m thick built of marine sandstone. The interior is empty with the exception of two small structures. Mouton has provisionally dated it to the second or first half of the third century AD, though it could also be somewhat later (Mouton 1992: 91 and note 254). By the third or fourth century the once extensive occupation at Ed-Dur had contracted to limited patches of occupation around the Area F fort (Lecomte 1993: 198) which is a roughly square structure about 25m on each side with three round corner towers and one sub-rectangular corner tower, with three entrances and the main one flanked by two stone eagles (associated with deities Shamash or Nasr). The Area F fort is difficult to interpret. It was built as an elite residence but it soon became a focal point for cultic activity, possibly taking over

from the earlier temple (Kennet 2005: 115). In 1987, detailed excavation procedures by the Belgian team revealed temple/shrine dedicated to a sun god, substantiated in 1988 by the discovering of the Aramaic inscription next to the temple mentioning the Semitic sun god Shamash. The temple is an almost square building, approx. 7.95 x 8.40 x 2.15 m including the protruding plinth. The structure is built directly on the sand, without foundations and was constructed using beach rock with mud used as mortar. The entrance is located on the eastern front-wall (Haerinck 2011: 3-4). Other occupational remains in the vicinity of the temple included ritual fireplaces, stone basin, pyramidal altar, wells etc. (ibid 2011).

At Ed-Dur there is not a concentrated area of buildings. Excavations revealed some houses made of beach-rock and more rarely of mudbricks, although the majority of living quarters probably consisted of *barasti* (palm branch) dwellings (Haerinck 2001). Great attention was paid to the treatment of the deceased by building individual or communal graves, most often interspersed with the remains of residential structures or traces of occupation (Haerinck 2011). A number of contemporary cemeteries have been found in the areas close to the fort together with evidence for small post-hole huts that were possibly occupied by fishermen (Lecomte et al. 1989: 50-56).

2.3 Foreign Pottery and other evidence of trade/contact from Ed-Dur

A quantification of the pottery of the pottery from the Belgian excavations indicated that the Roman fine wares represent only 0.21% of the complete pottery assemblage (17 sherds out of a total of 8,685). As for glazed pottery, Salles (1984) notes that Ed-Dur is the only site in the Gulf that has such a large quantity of glazed pottery on the surface, surmising a link more closely with regions to the northwest, reminiscent of BI ware on Failaka. A Mesopotamian provenance for this Parthian Glazed ware at Ed-Dur (31.75 % of the complete assemblage) was proposed, based on the predominance of Parthian fishplates from Ed-Dur, and as indicated by striking similarities to Iraqi productions at Uruk/Warka and Nippur in southern Mesopotamia (De Paepe et al. 2003). In addition to this Torpedo jars from Mesopotamia are also common (Mouton 1992). South Arabian Wares (three samples 0.03% of the

assemblage) from Ed-Dur indicates an exceptionally coarse but plain looking ware (pinkish orange to reddish brown shallow bowl with plate handles, broad-necked jar with everted rim and a narrow-necked ja) with parallels from Hajar Bind Humeid and Al Guraf in the Hadramawt (De Paepe et al. 2003: 212). Painted pottery, both monochrome and bichrome with motifs in black-on-red or buff or black and red-on-buff or orange are quite common and clearly linked with southeastern Iran (Haerinck et al. 1991: 56). And finally, Indian pottery sherds constitute an important segment of the foreign pottery from Ed-Dur and will be the focal point of this chapter in the thesis.

Besides the evidence of pottery, coins, glass vessels and bronzes denote additional indicators of foreign trade/contact at Ed-Dur. Thirty-two foreign coins have been registered and thus far, four Roman coins have been reported from Ed-Dur (2 gold coins of Tiberius: 14-37 AD; a silver coin of Augustus, and one copper coin of Tiberius) (Haerinck 2008: 77). The presence of Roman coins in the East was a result of trade and a large number, mainly coins of Augustus and Tiberius, occur in India. Five Indian coins are known from the site, including a squarish, punch-marked Sunga dynasty coin (Haerinck 1996: 72). At both sites there is a quite similar picture in terms of origin of the foreign coinage, although there are more Characene, Persis/Parthian and Indian coins from Ed-Dur (Haerinck 2008: 78). Glass was a very cheap product in the west and could be exchanged for much more valuable objects (Haerinck 2003: 203). The 227 vessels from the Belgian and Danish excavations reported on by Whitehouse (2000) form a cohesive group dated to the period between c. 25 BC an AD 75 (Tomber 2008: 111). Commercial ties with South Arabia are evidenced through bell shaped calcite vessels as well as remnants of 20g of myrrh and frankincense (Haerinck 2003: 205). Contacts with India are also evidenced at Ed-Dur. Besides actual coinage, the Belgian team also discovered a lead knob that imitated a Roman coin of Augustus or Tiberius that was produced in India. Finally, mention should be made of etched carnelian beads found at Ed-Dur that are probably imports from India (ibid 2003: 205).

2.4 K. Rutten's Study of the Pottery from Ed-Dur: The Indian assemblage

A very large amount of pottery was found during the nine seasons of excavation and research at Ed-Dur by the Belgian team, and not less than 13,000 sherds were counted (Haerinck 2001, 2003). Only selected registered pottery defined by the Belgian team as Indian could be taken into account for the present study. A careful macroscopic examination of the pottery, undertaken by Rutten, enabled the recognition of 37 distinct wares. On archaeological grounds, it was concluded that 12 wares, accounting for 48.09% of the complete pottery assemblage, could have been made close to the site, or at least somewhere in southeastern Arabia. On the other hand, 20 wares, representative of 49.08% of the collection, were assumed to have been manufactured relatively far away from the site (De Paepe et al. 2003: 208). Katrien Rutten, a PhD candidate from the University of Ghent presented this data as part of her doctoral dissertation on the Ed-Dur pottery. Rutten's thesis submitted in June 2006 and penned in Dutch was titled ' 'The Pottery of Ed-Dur (Umm al Qaiwain, UAE) from the Late 1st century BC to the Early 2nd century AD' (Technological, typological and comparative study with an analysis of the spatial distribution and trade in and beyond the Persian Gulf during the late Pre-Islamic period (3rd century BC- 6th century AD). In her thesis, Rutten had documented the Indian wares from Ed-Dur under the 'Imported pottery' (Geimporteerd Aardewerk) category listing a total of eight types of fabric and 120 forms of vessels.

Prior to detailing the Indian pottery from Ed-Dur in length, it is essential that the methodology adopted by Rutten in documenting the pottery of Ed-Dur en bloc is mentioned to achieve an overall understanding of the cataloguing of data and results from the visual study of the ceramics. The data included the registration of the vessels in a database comprising:

(i) Model number / figure number (Nr.)

(ii) Inventory number from the excavation (Inv. Nr. Context) - reference to the area on the site and, the serial number from the list of ceramics; Archaeological context - excavation unit number, square number and locus number

(iii) Colour - Munsell Colour of the core, internal and external surface. A separation by means of the sign '-' indicates mixed colors, while "/"indicates contrasting colors.

(iv) Inclusions (incl.): Mineral (M) and vegetal (V) and no visible inclusions (‘/’) in the clay - Frequency: little (w), medium (m), plenty; Texture: Fine (f), medium (m), coarse (g) and very coarse (hg)

Inclusions (colour): 1. Transparent 2. White 3. Beige 4. Ochre/orange 5. Red 6. Pink 7. Brown 8. Gray 9. Black 10. Glitter without specific colour.

Inclusions Sorting (s):1.little or no sorting 2. Well-sorted 3. Well to very well sorted

(v) Vessel form (vm) - 1. Globular 2. Plate or bowl
1. Round 2. Slightly angular 3. Angular

(vi) Surface - Appearance and feel - soft (z), medium (m), and hard (h); Fine (f) and Coarse (g); cavities or holes (verschr) and exploding lime particles (expl)

(vii) Finishing (Vessel Form) - Evidence of technical finish influencing the form of the vessels and traces of use: scraped, hard and soft polished, repaired, fingerprint and horizontal, vertical and concentric.

(viii) Finishing (Surface) - Finishing product (glaze, slip, painting, silt, bitumen coating, clay covering) applied to the surface with Munsell Colour notation.

2.5 Indian Vessel Forms from Ed-Dur

The categorisation of the Ed-Dur ceramic assemblage by Rutten (2006) included the designation of vessel 'forms' (*vorm* or vm) as indicated in the methodology. However for the purpose of the present thesis, it would be a useful exercise to regroup the ceramics from subcontinent under known forms or typology categories commonly referred to in the Indian archaeological context. Based on Indian ceramic

terminology, the vessel forms from India in the Ed-Dur assemblage can be classified as follows:

2.5.1 Type 1 - Carinated Vessels

These are generally cooking pots with a wide mouth, sharp ridge or 'carina' at the shoulder and round base, mostly used for preparing food. This vessel type has been described and discussed at length in the documentation of Indian vessels from the contemporary site of Mleiha.

Type 1a - Carinated '*handi*'

The data from Ed-Dur indicating the evidence of the *handi* is available mostly in fabric category of coarse red slipped. The single evidence from a handi body fragment at Ed-Dur indicates a sharp carination at the shoulder with a series of ridge-lines above the point of carination (Fig. 45: 1). The coarse red slipped fabric of these vessels is also typical of the handi variety from the subcontinent with the surface also sometimes burnished.

Type 1b - Vessels with short-neck, everted rim and globular body (handi-type)

Short-necked globular vessels have been attested as belonging to the Red Polished Ware or 'fine red ware' category at Ed-Dur (De Paepe et al. 2003) as well coarse red slipped. This vessel type is best represented by a range of cooking vessels with horizontally or externally everted rim and narrow-necked jars with beaded rim, provided with a globular body and rounded base (ibid 2003: 214), as well as occasional ridge-line or grooves on the flanged neck of the vessel that are typical of *handi*-type vessels. Short-necked globular vessels with everted rim in the Ed-Dur Indian assemblage includes a total of 16 sherds in the coarse red slipped category (Fig. 45: 2-14; Fig. 46: 15-17).

Type 1c - Short-neck globular vessel without *handi* form

A variation of this form is vessels within the short-neck globular vessel category but without evidence of the typical *handi* or carinated form. Moreover unlike the *handi*

vessels, there is no evidence that all of this type (1c) was used for cooking purposes, although some forms bear traces of soot. A total of 18 sherds were recorded in the fine red slipped fabric, coarse red slipped ware and coarse reddish brown ware category (Fig. 46: 18-31; Fig. 47: 32-40).

Type 1d - Ridge Carinated Vessel

Two body sherds of the 'ridge carinated vessel' were recorded in the fine red slipped and coarse brown slipped fabric categories respectively (Fig. 47: 41-42). This form is denoted by the presence of a secondary ridge or ledge protruding from the shoulder of the vessel, at the point of carination.

2.5.2 Type 2 - Cooking vessels without carination

In addition to the carinated vessel forms at Ed-Dur, other cooking vessels without carination were recorded in the coarse vegetal reddish-black category:

Type 2a - includes vessels with smooth and rounded sides without the sharp carination at the shoulder. A total of 5 sherds recorded from Ed-Dur for Type 2a (Fig. 48: 43-47).

Type 2b - Cooking vessels with everted rim straight neck, slightly curved or flaring sides and no carination. Type 2b contains 4 vessel sherds (Fig. 49: 48-51).

2.5.3 Type 3 - Plates or Dishes

At Ed-Dur, the plates or dishes category are mostly vessels with a shallow sagger base, carinated or with smooth rounded shoulders. Three types are observed in this vessel category:

Type 3a - Carinated plate or dish with a ridge-line below the neck, above the point of carination in the coarse brown-slipped fabric (Fig. 50: 52).

Type 3b - Carinated plate or dish with no ridge-lines and smooth slightly flaring sides recorded in the fine reddish brown and grey slipped fabric category (Fig. 50: 53-55).

Type 3c - Shallow plate or dish with smooth round edges or shoulder in the coarse vegetal reddish-black fabric (Fig. 50: 56 -57).

2.5.4 Type 4 - Bowls

Bowls represent the most quantity of Indian vessels at Ed-Dur. A majority of the bowl forms were recorded in the fine ware category indicating their probable use as tableware.

Type 4a - Rimless bowls that are similar to the Indian Black-and-Red wares (in form and fabric). A total of 4 rimless bowl sherds were recorded at Ed-Dur in the fabric category of very fine greyish red slipped wares (Fig. 51: 58-61).

Type 4b - Rimless but with ridges or corrugations on the sides, near the shoulder and a carination. A total of 2 rim sherds were recorded in the fine red slipped category (Fig. 51: 62-63).

Type 4c - Rimless convex-sided bowls with deep bases and curved sides and occasional ‘carina’ at the shoulder recorded in the fine reddish brown and grey slipped category (Fig 51: 64-65; Fig. 52: 66-70).

Type 4d - Bowls with small beaded rims recorded in the fine reddish brown and grey slipped fabric (Fig 52: 71-75).

Type 4e - A total of 4 forms of convex-sided bowls with beaded rims were recorded in the category of coarse red slipped ware (Fig. 53: 76-79).

Type 4f - V-shaped or wide-necked bowls or basins having a sagger base recorded in the fine red slipped fabric (Fig. 53: 80-81). A variation of the same form is also recorded in fine reddish-brown and grey slipped fabric (Fig. 53: 82).

2.5.5 Type 5 - Lids

Typical Indian-style lids or *Dhakan* have been found in Ed-Dur including an incurved rim and sagger base with a small flange and a ledge above it. In some Indian sites, these lids have also been referred to as variations of bowls (e.g. from Nagara, Gujarat where the form is denoted as a deep lid-cum-bowl with broad flange). A total of 3 lids have been recorded at Ed-Dur with slight variations in form (Fig. 54: 83-85).

2.5.6 Type 6 - Bases

Type 6a - Pedestalled or foot-ring bases recorded in fine reddish brown and grey slipped ware (Fig. 54: 86-87).

Type 6b - Flat bases (Fig 54: 88-89).

Type 6c - Pointed or tapering base in fine red slipped ware (Fig. 54: 90).

2.5.7 Type 7 - High-necked vessels with globular body

The form generally comprises an undercut rim with a concave neck probably leading to a globular base. These forms comprise mainly different type of storage jars. The rims have varied features ranging from rounded or squared to beaded or beaked. A total of 20 high-neck globular vessels were recorded from Ed-Dur in fine red slipped ware (Fig. 55: 91-105; Fig. 56: 106-110). Other rim variations of the high-neck vessels from Ed-Dur were recorded in the fine reddish brown and grey slipped fabric totaling 6 forms (Fig. 56: 111-116). Only one form of the high-necked vessel was found in the coarse red slipped category (Fig. 56: 117).

2.5.8 Type 8 - Narrow high-necked vessels or spout/sprinkler type (Fig. 56: 118)

A rare fragment of a typical spout/sprinkler form was recorded at Ed-Dur in the fine reddish brown and grey slipped category. This specialised type of vessel is widely distributed in India. From Amreli (Rao 1966: Fig. 13) for example the sprinker/spout form occurs in RPW fabric. However the so-called sprinkler from Taxila (Ghosh 1948) has a bulbous body and is not of the RPW fabric and is said to be of ’sandy red

clay with a red wash'. The sprinkler fragment from Ed-Dur may be more likened to the Taxila fabric than to genuine RPW.

2.5.9 Miscellaneous

Body fragments in very coarse orangish ware.

2.6 Indian Ceramic Fabric from Ed-Dur

The pottery fabric from Ed-Dur was subject to two types of macroscopic assessment by Katrien Rutten and others (Rutten 2006; De Paepe et al. 2003). The Indian wares were categorised based on visual assessment into eight types of fabric. Secondly, in an attempt to obtain additional evidence for the suggested local provenance or import status of the pottery unearthed at Ed-Dur, 148 sherds, representing 32 wares, were submitted to scientific analysis including 6 samples of Indian Red Polished Ware (De Paepe et al. 2003: 209). Based on Rutten's classification of the Indian pottery fabric in Ed-Dur, it is evident that three types of 'fine wares' and five types of 'coarse wares' occur in the assemblage. For the purpose of the present PhD thesis, the corpus of Indian material (four out of eight types of ware based on availability of samples for study) was carefully re-examined under a microscope to determine the various sub-classes based on the variations in fabric within the categories of wares as defined by Rutten.

2.6.1 Very Fine Greyish Red Slipped

Shapes and Forms: Four Indian vessels of the rimless bowl category (BS5011, N0352, BS6169, AZ0071) were recorded with incurved lip and smooth rounded sides.

Surface Treatment: The Munsell colour noted of the clay core ranges from 10 YR 6/1 and 5 YR 6/6 to 7.5 YR 6/4 and places the fabric in the red ware category. However it is the colour range of the vessel surface or the slip that proves interesting; the external surface is a reddish yellow to yellowish red (5YR 6/6 - 5/6) but the internal surface (also slipped) has a colour notation that ranges from very dark gray to dark

grayish brown or dark gray (10 YR 3/1 or 2.5 YR 4/0). It is possible the black and red surfaces of this ware result due to what is known as 'inverted firing' technique.

Fabric: The particles in the clay, as per Rutten's calculations, were good to very well sorted (3), the inclusions small or medium, fine with mineral content (wfM and mfM) and were glittering with no particular colour (10). This indicates that the inclusions in the clay were probably siliceous material or mica, commonly seen in BRW vessels.

Discussion and Parallels: Rutten's documentation of the fabric and surface technique of these rimless bowls indicates that they could belong to the Indian Black-and-Red ware (BRW) category, a diagnostic ceramic of Early Historic culture in Western India. Based on the above evidence, if this category of vessels is in fact Indian BRW, then this wouldn't be the first reported occurrence of these wares in Arabia. Black-and-Red Ware rimless bowls have been recorded from the earliest levels at Khor Rori in Oman dating from c. 1st cent BC (Pavan & Schenk 2012: 192).

2.6.2 Fine Red Slipped

Description: This hard, compact and fine granular ware appears in several shades of red, pink or brown. The most frequent inclusions are fine sand particles. With a few exceptions, all fragments contain small to large amounts of mica and sand particles in combination with some fine lime. The proportion of this ware within the complete assemblage is limited to 1.7%.

Shapes and Forms: This fabric comprises ceramic forms ranging from v-shaped bowls to carinated dishes and handis as well as globular storage or cooking vessels with horizontally everted rim and narrow neck with beaded rim.

Surface Treatment: About half of the sherds are finished with a red to brown slip, which is thin and rather carelessly applied. It is commonly dull, displaying only occasionally a faint, natural gloss. No clear examples of burnishing were attested (De Paepe et al 2003: 214). The fabric core according to the Munsell colour chart ranged from 2.5 YR 6/6 (light red) to 5 YR 6/6 (reddish yellow) and 7.5 YR 6/4 (reddish

brown). The vessels were slipped externally 2.5 YR 5/4 (reddish brown) to 10 R 4/6 (light red).

Fabric: Rutten's evaluation of the fabric showed that the inclusions in the clay ranged from small and medium with mineral composition (wfM or mfM) and the colour of the particles varied between white (2), grey or black (8, 9) or glittering without any particular colour (10) clearly pointing to a combination of lime particles with mica. Preliminary microscopic observation revealed that the fabric is hard with a smooth fracture and no visible irregularities. The principal inclusions are mica flakes (both muscovite and biotite) with an average size of 0.2 mm - 0.8 mm, calcite nodules up to 1.4 mm across in addition to metamorphic rock fragments at size 0.5 mm - 0.7 mm as well as quartz grains not greater than 0.3mm. Red-brown hornblende, plagioclase, microcline, orthoclase, clinopyroxene, garnet, epidote, rutile and opaques occur in accessory amounts (De Paepe et al. 2003: 222). Voids or cavities include the presence of air holes as well as elongated cavities with striations indicating vegetal or plant phytolith inclusions or temper. The phytolith content was studied in some of the samples of Indian Red Polished Ware and was dominated by one morphotype, typical of *Pooideae* (a sub family of grasses). Additionally it appears that a few samples (BS4365, BS6170 and BS2652) indicate the presence of translucent red and black particles in the sandy fabric. The black shiny inclusions appear to be ferromagnesian minerals as well as be pyroxenes or hornblendes, which are commonly present in Indian fabrics. Shiny black inclusions that seem to be aggregates of more than one grain could also be a volcanic rock. The pinkish inclusions are probably pink-coloured quartz crystals (R. Tomber pers. comm.).

Based on the variations in types of inclusions Fabric FRS-1 is comprised of a sandy texture with voids represented by air holes and vegetal temper. The inclusions are not very distinctive and contain mostly medium sized white and dark mica particles mixed with lime in addition to white quartz grains (Fig. 57). Fabric FRS-2 contains sandy fabric with inclusions of black volcanic rock (ferromagnesian minerals), red/pink quartz crystals and abundant mica grains. Occasionally some vegetal temper and white quartzite inclusions are present (Fig. 58).

Discussion and Parallels: Both fabric and shapes are unequivocally Indian in origin, but a precise provenance is difficult to determine. Although previously defined as typical Indian Red Polished Ware (IRPW), several of the distinctive open forms at Ed-Dur were not represented in the Gujarat Repertory assembled by N. Pinto (Pinto-Orton 1992). (Moreover), the sandy fabric, firing, surface finish and shapes differ from the very fine Indian Red Polished ware, which leads us to believe that the Ed-Dur fragments are most likely imitations of the finer Indian ware (De Paepe et al. 2003: 214). One rim was previously published under the designation of 'fine red ware', without being identified as Indian Red Polished ware (Haerinck et al. 1993: 187, Fig. 4.4). Pottery resembling Indian Red Polished ware is fairly hard, compact and fine-textured. The clays used to make it were typically micaceous. About the same range of inclusions was observed in all samples analysed. However, it appears that there is a lot of variation in their texture. From the mineralogical and petrographical point of view, the non-plastic inclusions in this fabric are not very distinctive, but are consistent with those reported by Méry (2000) relative to pottery from the Indus region covering earlier periods. It is suggested that the Ed-Dur vessels originated to the west of the main production centres in Gujarat, in the Indus valley and/or possibly Pakistani Baluchistan (De Paepe et al. 2003: 224). The occurrence of Pooideae in IRPW (usually in the paste or in voids) from Ed-Dur is thus in agreement with the idea that this ceramic comes from workshops located on the Indian subcontinent, as this part of Asia climatic conditions are suited for the growth of this grass species (de Paepe et al. 2003: 222, 225). Based on the recent observation of the fabric in the present thesis, it is likely that some of the samples (BS4365, BS6170 and BS2652) are comprised of sand derived from a volcanic source.

2.6.3 Fine Reddish-brown and Grey slipped

Description: The fine reddish-brown and grey slipped fabric is a close variation of the fine red slipped ware. This fabric is nearly similar in texture, inclusions and surface finish but for the shades of grey to dark grey/black in the core and slip of the vessel. In some cases the complete vessel fabric is grey or dark grey slipped.

Shapes and Forms: The Indian vessel forms classified under this fabric category range from bowls to bases and high-necked globular vessels as well as the single example of a narrow-necked 'spout/sprinkler' variety.

Surface Treatment: In most cases, the colour notation for the core ranges from 5 YR 6/6 or 7.5 YR 6/4 (reddish yellow) to 2.5 YR 6/6 (light red). The slip or surface finish is a red (2.5 YR 4/6) to yellowish red (5 YR 5/6) with a fine glimmer. However some samples possess a light grey (10 YR 5/1) to 10 YR 5/2 (greyish brown) core with a grey (10 YR 5/1) to very dark grey/black slip (10 YR 4/1-3/1). The slip is often flaky and weathered.

Fabric: The fabric is fairly compact and levigated and smooth with no irregularities. It is similar in texture and inclusions to the Fine red slipped category. According to Rutten (2006), the inclusions are primarily mineral (M) and vegetal (V) and comprise particles/grains in white (2), red (5), grey (8), black (9) and glimmer without any colour (10). The fabric is generally weathered with a fine glimmer of mica on the surface and covered with a slip that often flakes at places. The inclusions are well to very-well sorted (3) and the frequency ranges from little to medium. Closer observation of the fabric in the present research revealed that the majority of the non-plastic inclusions comprise mica particles (muscovite and biotite) often opacified and oxidized as well as white grains of angular quartz/quartzite. Round particles of sediment or sand are often seen in the fabric and core of the samples in addition to hard red quartz grains and sedimentary rocks and black ferromagnesian minerals (volcanic rock). Some cavities in the fabric have a carbonate coating, while the other voids represent air holes and vegetal inclusions. The size of the biotite inclusions is 0.7mm at 51x and the muscovite (white mica) grains measure from 0.3mm at 55x and 0.5mm at 51x. The ferromagnesian or volcanic rock inclusions measure 0.09 - 0.2 at 52x and the hard red grains at 1.1mm at 54x. Quartz and other white inclusions generally measure from 0.1 - 0.2mm at 54x.

Based on the variation in fabric and inclusions, Fabric FRGS-1 comprises a red ware with black ferromagnesian grains and other grey (metasediment) particles, red quartz inclusions and large-sized mica (biotite) grains. FRGS-1 (A) is a variation of the red ware with white mica grains and rounded sand temper/inclusions and occasional

cavities with carbonate coating and Fabric FRGS-2 is the greyish brown to grey ware with a smattering of quartz and other white inclusions as well as voids indicating vegetal temper (Fig. 59).

Discussion and Parallels: One particular form (BB114) of the high-necked 'spout' type ascribed to this fabric at Ed-Dur shares similarities with several sprinkler and spout forms in the RPW and other red wares from sites in India.

2.6.4 Coarse red slipped

Shapes and Forms: At Ed-Dur, carinated vessels (*handis*) dominate this fabric category, followed by bowls with small beaded rims, a few samples of globular 'high-necked vessels' and the typical Indian 'lid' variety.

Surface Treatment: The surface texture ranges from matt and smooth with granular cavities, or rough, friable and slightly weathered. The slip however is nearly always a reddish-brown to red (2.5 YR 5/4-5/6) or dark red (2.5 YR 3/6).

Fabric: The quantity of inclusions ranges from a few to plenty with colour ranging from transparent (1), white (2), red (5), grey (8) and black (9) and sometimes glittering without any specific colour (10). The colour of the core varies from red (2.5 YR 5/6) to reddish yellow or reddish brown (5 YR 6/6 - 6/4) and sometimes light grey (10 YR 7/2) to dark grey (10 YR 4/1). Observation of the fabric revealed that the texture was hard with a rough core and hackly fracture. The mineral inclusions primarily comprise of medium sized transparent angular quartz grains and fine mica particles as well as black ferromagnesian minerals. Elongated voids were present in some samples of the fabric as well as cavities with carbonate coating indicating limestone inclusions. Hard red grains representing pink/red quartz and other rock fragments were also seen as well as iron-rich particles or grog/clay pellets. Sand particles are seen in the core of some samples of fabric. The size of the inclusions range from 0.9mm - 1.4mm at 54x and 0.7mm at 51x for the pink quartz grains; the transparent quartz grains measure from1.5mm to 0.7 and 0.4mm at 53x and the mica particles from 0.2 at 54x to 0.4mm at 52x. The ferromagnesian minerals measure 0.3 - 0.4mm at 49x, 1.5 - 1mm at 52x and 0.7mm at 53x.

Based on the variations noted in the fabric, CRS-1comprises inclusions of translucent quartz and mica particles in a sandy fabric, while CRS-1 (A) is a very coarse reddish brown ware with red and translucent quartz and mica particles and occasional black ferromagnesian minerals and CRS-1 (B) comprises mainly what appears to be iron-rich particles or grog and clay pellets (Fig. 60). Fabric CRS-2 has a light pink surface and elongated voids and CRS-3 with abundant particles of red/pink quartz and black volcanic rock fragments is a variation of fabric 2 (FRS-2) of the fine red slipped ware, but with a coarser fabric and texture (Fig. 61).

Discussion and Parallels: Among the coarse pottery, the red slipped ware is by far the most commonly occurring ceramic fabric in Indian Early Historic sites.

2.6.5 Coarse reddish brown

Description: This ware is classified among the Indian vessels at Ed-Dur that possess a coarse fabric without any surface finish or slip applied. In the Indian context, an equivalent for this fabric would be a generic variation of the Coarse Red Ware (CRW).

Shapes and Forms: Forms belonging to this fabric are mostly globular jars or pots (4 in total) with variations such as out-turned rim, tapering at the lip and others with everted squared rims and short neck.

Surface Treatment: The pots in this variety are plain, devoid of any surface treatment such as slip or burnishing.

Fabric: The colour of the core ranges from red (2.5 YR 5/6) to reddish brown and yellowish red (5 YR 5/4 and 5YR 5/6) or sometimes a dark gray with a pale brown (10 YR 4/1 and 10 YR 6/3). The quantity of inclusions in the core varies from sporadic or little to abundant, fine to coarse particles and mostly of mineral content or tempered with sand. The colour of the inclusions is mostly white (2) or grey (8) and not very well sorted. Only one hand specimen was available for the present study. It is a coarse ill-fired red ware with a sandy temper and a light red wash on the

surface. The principal inclusions comprised of hard red grains, transparent quartz particles and calcite nodules as well as voids or cavities with carbonated coating.

2.6.6 Coarse brown slipped

Shapes and Forms: Two very typical Indian forms, both utilitarian, belong to this category of fabric: carinated dish or plate with everted rounded rim and the ridged carinated vessel varieties.

Surface Treatment: The surface is matt and smooth and colour of the slip varies from 2.5 YR 5/4 (reddish brown) to 2.5 YR 5/6 (red) respectively.

Fabric: Only two examples were reported in this ware with a brown core colour for the carinated dish (10 YR 5/3) and a brown to light reddish brown - reddish brown (7.5 YR 5/4 to 5 YR 6/4-5/4) for the ridged carinated vessel. The mineral inclusions in the clay range from very little (w) to plenty (v), fine (f) or medium (m) and coarse (g) in texture and well-sorted.

2.6.7 Very coarse orangish

Shapes and Forms: This fabric comprises of only two samples of body sherds (BS2617 and BS143).

Surface Treatment: The surface has a matt finish but is coarse and brittle with granular cavities.

Fabric: With regard to the Ed-Dur samples, Rutten (2006) recorded the Munsell colour notation ranging from 5 YR 6/6 (reddish yellow) to 7.5 YR 7/2-6/2 (pinkish grey). The mineral (M) inclusions are well sorted (2) but coarse to very coarse in texture (g or hg) and medium quantity. The particle colours are noted as white (2) and pink (6). One sample (BS2617) was observed for the purpose of the present research using the hand-held microscope. It has a powdery surface feel with a hackly fracture. The principle inclusions are usually sub-rounded particles that are visible white to pink grains with occasional hard red grains that appear to be red quartzite. The white grains are also possibly quartz or quartzite, while the pale pink particles

could be calcite or limestone inclusions (Fig. 62). The size of the pale pink inclusions ranges from 1.9mm to 1.4 and 1mm. The white particles measure from 0.9 - 0.7mm. Based on the grain-size classifications, the class term for the inclusions ranges from coarse to very coarse sand and granules that occur moderately in the fabric (15%).

Discussion and Parallels: Similar fabric or a variation of this fabric has been documented in the Mleiha Indian assemblage (in the present thesis) as coarse orangish or reddish-orange fabric (a variation of Mleiha Fabric 1) and mostly comprises carinated vessel forms.

2.6.8 Coarse vegetal reddish-black

Shapes and Forms: Nearly all of the vessels in this fabric are cooking or storage vessels ranging from dishes/plates to carinated *handis* and other variations of cooking pots as well as typical Indian style lids.

Surface Treatment: The surface has a matt finish and is brittle.

Fabric: The final fabric recorded by Rutten (2006) in the coarse wares category is the vegetal-tempered reddish black ware with the core colour ranging from dark grey (10 YR 4/1-5/1) to black (10 YR 2/1) sometimes in combination with other hues such as yellowish red (5 YR 5/6) and red (2.5 YR 5/6) etc. Such Brick-red or brown cores with intermittent patches of black could suggest firing of this ware under oxidizing conditions possibly in open kilns, in which it is difficult to maintain even temperatures. The inclusions in the fabric are abundant (v), medium textured (m) and are vegetal-tempered (V).

3. Indian Pottery from Dibba: a brief discussion

The site of Dibba al-Hisn, located in the Emirate of Sharjah, north of the eastern coastal plain, is one of the best mooring sites along the Arabian coast of the Gulf of Oman, and has been a central harbour in the region until medieval times (Mouton & Cuny 2012: 181). Few excavations have been carried out including a collective tomb, whose contents provide evidence of far-ranging trade contacts extending from the Mediterranean to India (Jasim 2006), and some domestic remains still unpublished.

Two engraved ivory combs, decorated with incised figurative scenes (Jasim 2006: 224 -225) have an origin in the Indo-Pakistani region. Although precise parallels have not been found, the style of the decoration, the lotus motif and the scenes represented can be compared with pieces of furniture from Begram, dated to the 1st century AD. A cosmetic tube of turned ivory resembles similar objects from Taxila (Ghosh 1948). Etched hemispherical carnelian beads, decorated with diagonal lines, dots etc. were probably produced around the Gulf of Cambay (Jasim 2006: fig. 62 & 63: nos. 17-22).

The pottery kindly shown by S. Jasim includes large quantities of coarse brown sandy or chalky ware comparable to the Indian fabrics found at Mleiha, and a significant amount of Indian coarse reddish-grey ware (tempered with sand, mica and white inclusions) with an ill-fired or blackened core and burnished red slip on the external surface up to the rim and on the internal neck. Shapes include carinated cooking pots or *handis* with everted rim, carina and occasionally ridge-lines on the shoulder above the point of carination.

In the current state of knowledge, the occupation of Dibba appears to date from the beginning of the Christian era (Jasim & Abbas 2008). The Indian pottery from the dwellings and some of the imported glazed vessels found in the collective grave are comparable to the assemblage of period PIR.D at Mleiha, and for that reason the occupation at Dibba must be extended to at least the middle of the 3rd c. AD (Mouton & Cuny 2012: 182). Excavations currently under way may reveal a longer history of occupation.

4. Aftermath of the Early Roman India Trade: Kush (Emirate of Ras al-Khaimah, United Arab Emirates)

The Emirate of Ras al-Khaimah is located in an excellent position from which to study the development of trade in the western Indian Ocean (Kennet 2004: 13). The physical geography of Ras al-Khaimah and the Musandam peninsula is dominated by the mountains of Rus al-Jibal on the east and on the west coast between the

mountains and the sea, a fertile plain with a high water table. This location therefore once provided both agricultural and marine resources as well as trade routes and a focal point of settlement since at least the third millennium BC (Kennet 1994, 1997: 284). With its strategic position at the entrance to the Gulf, Ras al-Khaimah has participated in most of the key cultural developments in Eastern Arabia since the Ubaid period onwards as well close links with southern Iran and with India since the Bronze Age. Ceramic evidence of this Indus connection is demonstrated by examples of a Harappan bottle with simple painted hoops round the shoulder found in tomb 6 at Shimal (de Cardi 1989) as well as diagnostic examples of black-washed, finely levigated, thick micaceous orange ware (which comes from the Indus Valley) found at Asimah in Ra's Al Khaimah (Vogt 1994), amongst other Indus pottery and artefacts found in the Gulf. This section of the chapter however will focus on the Indian pottery documented during the five seasons of excavations at the site of Kush, dating from about the 4/5th century AD to 13th century AD, and studied by the present scholar. In addition to this, Indian ceramics have also been recovered from other localities and sites in Ras al-Khaimah including Khatt (de Cardi et al. 1994: 56), Jazirat Al Hulaylah (Kennet 1994: 190) and al-Mataf (early Julfar) (Kennet 2003; King 1990, 1991, 1992), which will be discussed briefly in this thesis.

4.1 Excavations at Kush and the phased sequence

The archaeological site of Kush is situated in the fertile and well-watered Shimal area of Ras al-Khaimah, approximately seventy kilometres south of the Straits of Hormuz. The site now lies about two and a half kilometres southeast of the modern coast, but was originally close to the edge of a large lagoon that has now silted up and become a *sabkha* (salt-flat) (Kennet 1997: 284). The tell measures 120 metres north to south and 100 metres east to west, with an approximate eight metre stratigraphic sequence (Kennet 2004: 12).

Excavations at the site were carried out between 1994 and 2001, following a survey report by Beatrice de Cardi in 1977, revealing an occupation sequence dating from the 4thto the 13th century AD (ibid 2004).

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Excavations were concentrated in two areas of the site, beginning in the spring of 1994 with a two-metre wide test trench dug over a four-day period. This sondage presented a useful preliminary sequence at Kush of 17 phases of occupational debris including pottery (Phase A to Phase Q) (Kennet 1997: 285). However most of the effort had been concentrated in Trench A that was opened in 1995 during the first full season of excavation (ibid 1997: 289). The trench (10 m width and 26.4 m depth) was cut through the highest part of the tell to reveal a complete sequence through the mound. The stratigraphic contexts were grouped into 43 sub-phases (A-Z & AA-AQ) and the sub-phases grouped into 15 phases: the Eastern sequence represented by E-01 to E-11 and the Western sequence by W-01 to W-04. Both the phases and sub-phases were grouped into 8 periods that represent the historical development of the site (Kennet 2004: 13):

Period I (E-01, W-01, W-02, W-03): Period I constitutes the levels dating to the Sasanian period between $4^{th}/5^{th}$ and $5^{th}/6^{th}$ century AD and represented by phases of mud-brick architecture

Period II (E-02, E-03, W04): Dates to the 7^{th} - 8^{th} century AD and represents the construction and use of the Late Sasanian or Early Islamic mud-brick tower at Kush.

Period III (E-04, E-05): Period represented by the abandonment of the mud-brick tower in the late 8^{th} or 9^{th} century AD, followed by occasional 'squatter' occupation.

Period IV (E-06): Dating from the 9^{th}upto late 11^{th} or early 12^{th} century AD. This period is represented by evidence of fragmentary walls and small structures and a phase of abandonment in the 10^{th} century AD encompassing 300 years of history at Kush.

Period V (E-07, E-08): This period is represented by a large, well preserved mud-brick structure, one of many possible structures revealed by soundings dating to the late 11^{th} or early12^{th}century AD.

Period VI and VII (E-09, E-10): Evidenced by a number of postholes, fragmentary walls and hearths indicating a general decline of the site in the late 13^{th} century AD.

Period VIII (Phase E-11): Period dating in the late 16th or early 17th century AD when the site was re-occupied as a rural settlement.

4.2 Kush Indian Pottery: Forms

According to Kennet (2004: 94), a large amount of pottery from South Asia was found in both the Period I and Period II assemblages (IRPW, IRAB, FIRE, PAINT, INDIA, SBBW). Period II was the high point and the percentage of Indian vessels dropped in Period III and for the reminder of the Kush sequence. The shapes and forms of the Indian vessels at Kush have been described below, under their respective fabric classes (section 4.3). The examples in SBBW and IRAB fabric consist almost entirely of carinated cooking vessels (*handi)*. Some other forms like beaker and shallow plates/dishes are recorded in SBBW, while IRAB comprises some examples of high-necked globular vessels, occasional with a ring-base. FIRE forms are more difficult to estimate because of the fragmentary nature of the samples at Kush. Parallels however can be drawn from similar wares at Khor Rori (Sedov & Benvenuti). Although not originally classified as an Indian fabric, Fine Grey Ware (FGRW) from Kush comprises wheel-made sherds of indefinite form. The ware itself is very similar to the 'Fine Grey Pottery' with a clay source located in northern India (Gogte 2001). Unclassified Indian ware (INDIA) is a coarse ware in both slipped and unslipped categories and is mostly represented in cooking vessel forms. PAINT forms consist mainly of globular vessels with everted or beveled rims and constricted neck, and occasionally some carinated cooking vessels. The unique decorations of these vessels (white astral/flower design, black stripes painted on red slip) can however be closely compared to wares from sites like Akota, Kamrej, Shamalaji, Amreli, Somnath, Vadnagar etc. in Gujarat. Small carinated pots or globular vessels with a high neck and incurved rim mostly represent IRPW forms at Kush. Closed forms of RPW (spout/sprinkler etc.) are not seen in the Kush assemblage. Close typological similarities are seen with the range of RPW forms recorded by Pinto-Orton (1992) and some forms from Nevasa (Sankalia et al. 1960).

All individual samples of vessel forms have been recorded in Appendix 3 of this thesis. Pottery drawings and photographic documentation is also available for a

majority of the Indian vessel samples examined at Kush:

a. SBBW forms (Fig. 63 - 65: 1-14; Fig. 66: 15-20)
b. IRAB forms (Fig. 67 - 68: 24-34; Fig. 69 - 70: 35-38; Fig. 71: 39-44; Fig. 72: 45-50)
c. FIRE forms (Fig. 73: 51-52)
d. FGRW forms (Fig. 73: 53-54)
e. INDIA forms (Fig. 74 - 75: 55- 60)
f. PAINT forms (Fig. 76 - 78: 61-74; Fig. 79: 75-77)
g. IRPW forms (Fig. 80: 78-81)

4.3 Kush Indian Pottery: Fabric

The evidence of Indian pottery at Kush comprises both fine and coarse wares that are mainly functional and utilitarian. Based on preliminary observation of the fabric, these can be classified into two categories: slipped and possibly unslipped, although slipped wares predominate the Indian assemblage at Kush. However as Nanji (2011) has pointed out in her PhD thesis, the nomenclature commonly used in Indian excavation reports tends to classify pottery as generic slipped, burnished or coarse ware (e.g. slipped red ware, burnished black ware, coarse red ware etc.), irrespective of their continued chronological presence in Chalcolithic, Early Historic and Medieval assemblages. Therefore in her classification of the Sanjan indigenous pottery assemblage, Nanji has avoided the generalised usage of these terms and instead has chosen to create distinct classes within the various pottery groups (ibid 2011). Kennet's (2004) classification of Indian pottery at Kush organised the various wares as being slipped red or black, with the recognition of at least five classes bearing a slip - Indian Red-and- Black Ware (IRAB) with red slip on the interior of the vessel and a black or dark grey slip on the exterior, Black Burnished Ware (SBBW), Fine Indian Red Ware (FIRE), Indian Red Polished Ware, Painted Indian Earthenware (PAINT) and Red Slipped Ware (RSLIP) restricted to the late medieval assemblage at Al Mataf. A general class of Indian pottery at Kush called INDIA (Unclassified Indian Ware) consists mainly of cooking pots, but does not mention the

slip or colour (Kennet 2004; Nanji 2011). In addition to this, a category of fine grey ware previously omitted from publications is now accepted as a part of the Indian classes from Kush. Based on the above categories it can be surmised that there are atleast 3 categories of Indian fine wares and 5 categories of Indian coarse wares at Kush.

For the purpose of the present PhD thesis, the corpus of Indian material was carefully re-examined under a hand-held microscope to determine the various sub-classes based on the variations in fabric within the seven categories as defined by Kennet (2004) (excluding RSLIP from Al Mataf). Parallels in terminology of fabric classes are also sought from Nanji's (2011) classification of indigenous ceramics at Sanjan.

4.3.1 Black Burnished Ware (Ware Code: SBBW)

Definition: This ware forms the second largest part of the Indian ceramics from Kush in terms of sherd count. Close parallels in fabric terminology can be derived from the Black Slipped Grey Ware (BSGW) at Sanjan (Nanji 2011: 69). It is a semi-coarse to coarse ware with a large number of inclusions and organic temper, covered by a black slip, burnished to a high lustrous polish, sometimes with a sooty texture. At Kush, SBBW occurs from Phase E-02 onwards, but are more common in Phases E-02, E-03 and E-11, suggesting that they started to circulate in the 7th or 8th century AD (Kennet 2004: 66).

Shapes and Forms: The most common form amongst the coarse Indian pottery at Kush is a cooking pot with a distinctive everted rim (Kennet 2004: 65). This form is typical of both SBBW and IRAB wares and is often carinated at the shoulder. A large number of vessels have constricted necks. From wide-mouthed pots to high-necked vessels, the rim diameter of these sherds ranges from 26 cm to 14 cm and the thickness rarely exceeds 5 - 6 mm. Some additional forms occur in the SBBW assemblage at Kush that include straight-sided rimless beakers (K694) and a shallow bowl or dish (K6814). The rims are mostly rounded, squared, or beaded and externally projecting with a groove on the neck. Ridge-lines are concentrated mainly on the shoulder of the vessel above the point of carination. Grooves are seen on the

upper side of the lip or on the inside of the vessel, or a deep groove is seen running along the middle of the rim. Other decorative features will be discussed in the section on surface treatment below.

Surface Treatment and Decoration: The external surface has a black slip on the exterior of the vessel and interior upto the rim and neck portion. The slip often flakes and erodes and burnishing lines are often visible on the surface. Specks of mica are noticeable on the surface extending through the slip. The surface texture is occasionally sooty. In addition to ridges-lines and grooves, other forms of decoration include triangular puncture marks (K2151) either spaced or joined together and fingernail impressions often above the point of carination (K6784). The decoration is restricted to the shoulder or neck or rim and does not display an imaginative range of designs (Nanji 2011: 69).

Fabric: The fabric of this ware class can be defined based on the three preliminary categories of description of fabric: 1. Hardness range is hard- sherd can be scratched with penknife 2. Surface texture is rough where irregularities can be felt and 3. Fresh Fracture is hackly with more widely spaced irregularities.

The second step is the visual identification of principal inclusions. Samples of SBBW pottery was observed under a microscope at 51-55x and 75x to identify and distinguish between natural inclusions and temper. Preliminary observation revealed that the inclusions in the SBBW fabric are homogenous i.e. the grains appear to be composed of one type of mineral and do not react with acid. In addition to this, voids were detected on the surface and core of the fabric, which included elongated cavities with striations down the length indicating grass or straw inclusions and air holes. The paste itself appears to be composed of coarse sedimentary clays, probably tempered with a silty paste in addition to vegetal temper. Except for the mica particles, the other inclusions were visible only through the microscope lens. The inclusions comprise of both light and dark coloured particles. Based on the current observation of the fabric, it is very difficult to draw a distinction between the naturally occurring and non-plastic inclusions (temper) present in the clay. The light-coloured inclusions comprise of white mica (muscovite) and clear/white glassy

grains of quartz/quartzite, irregular lumps of rounded and angular lime or limestone particles as well as rectangular or sub-rectangular crystals of feldspar and basalt. In addition to this, dull black inclusions are visible in the fabric consisting of hard flat laminated grains of metasediment, slate or shale as well as soft, rectangular and laminated inclusions of organic or carbonaceous material. Dark mica flakes (biotite) are noted in the fabric.

The other aspects of the fabric based on observation include the sorting parameters where the SBBW ranges between poorly to moderately sorted based on the variations in the fabric. Inclusion roundness classes vary from sub-rounded particles which include poorly developed flat faces with corners well rounded to rounded particles with flat faces nearly absent corners all gently rounded.

The size of the grains was measured at various magnification levels. The quartz particles measured from 0.13mm to 0.29mm (up to 0.30mm) at 52x, the rectangular and sub-rectangular feldspar (?) 1-2mm at 53x and, the black inclusions (metasediment/shale) measured 0.19mm to 0.74mm at 50x. The particles denote class terms that range from fine sand (0.12mm) to granules (2mm) (on basis of size in mm). The frequency of the inclusions varies from moderate (15%) to common (20%).

Discussion: A previous assessment of the SBBW fabric by Kennet (2004) reported a lack of vegetal temper and visible mica particles. Nanji (2011) states that mica in some proportion is an essential component of Indian Black Burnished Ware fabric. Conversely, detailed study of the SBBW fabric as part of the present research has identified both vegetal temper (impressions of vegetal inclusions can be seen very clearly) and prominent mica particles in the fabric. The presence of charcoal embedded in the surface as reported by Kennet (2004) has also been confirmed by evidence of carbonaceous fragments detectable by the microscope. In addition to this, aplastic inclusions like quartz, slate/shale, possibly feldspar/basalt and occasional limestone particles are seen to occur in the SBBW fabric samples.

Based on the presence of these inclusions, variations in the fabric are noted: SBBW-1 is semi-coarse to coarse fabric with a large number of light inclusions and vegetal

temper, in addition to carbonaceous material. It appears mostly tempered with sand and other siliceous particles. The fabric is grey to black (the latter as a result of ill-firing) (Fig. 81). The surface is burnished with a black slip with evidence of streaking. Forms are restricted to cooking vessels/plates. SBBW-2 is a smooth to semi-coarse fabric with dark (dull black) inclusions predominant among the white inclusions. There is less sand and mica in the fabric. The dark grey slip on the surface often flakes and erodes and is less burnished. It is more evenly fired with a light grey fabric (Fig. 82). Bowls are predominant in this fabric.

Parallels: In the Arabian Gulf, generic black ware found at sites like Mleiha and Ed-Dur in the Late Pre-Islamic period has been the subject of study and debate regarding its origin (Salles 1984, De Paepe et al. 2003). However specific varieties like Black Burnished Ware (BBW) has a more definite Indian or South Asian source, with early evidence available from Khor Rori (Dhofar, Oman) dating to the early centuries of the Christian Era (see Chapter 3). The forms at Khor Rori included cooking vessels (*handi*) with everted rim and rimless bowls. The presence of Indian black burnished wares continues into the medieval period at Al-Hamra Al-Sharqiya, a medieval trade entrepôt at Khor Rori with evidence of two fragments of coarse grey paste with polished black slip, and decoration of impressed commas over carination dating from the 10th - 11th century AD (Rougeulle 2008: US 9,14 ex. & US17, 15 ex.). At Suhar (Oman), Kevran reports the occurrence of BBW increasing greatly in Islamic Levels V and VI respectively with evidence primarily of cooking pots with coarse black fabric, sometimes dark grey and particles of mica (Kevran 2004: Fig. 21: 21-23; Fig. 23: 25; Fig. 30: 10). Black or grey wares with mica, black slip and burnishing are also seen in the preceding levels at Suhar with evidence from Levels 0-IV (Kevran 2004: Fig. 8:11, Fig. 9: 9-10; Fig. 10: 20; Fig. 14: 7,11). In Level V at Suhar, the Indian ceramic much of it in black ware, represents about 18% to 20% of the total ceramic finds (Kevran 1996: 40-42).

The closest form and fabric parallels can be ascribed to sites in Western India (particularly Gujarat and Maharashtra) (Fig. 83) up to the Sind region. However in the course of her study of the Sanjan Medieval assemblage from Gujarat, Nanji (2011) comments that it is difficult to tell the Early Historical assemblage from the

Medieval, more so because the medieval period has been treated with some disdain in archaeological studies in India, with no sub-division of chronology attempted. At Baroda (Akota and Medical College area), Subbarao mentions the occurrence of BBW beginning from Period II (up to the 6th century AD) as a dark grey ware occasionally burnished (Subbarao 1953:36). It occurs in small quantities but predominates the medieval period in Periods III-V where it is referred to as burnished grey and black ware (Subbarao 1953: Fig. 17: Types 40-47; Fig. 18: Types 76-90, 92-99). At Nagara, Mehta and Shah have classified Black Burnished Ware as occurring mainly in the deposits of Period III (8th - 9th century AD) and Period IV (14th - 18th century AD) (Mehta & Shah 1968), with no description of the fabric or chronological demarcation. Some of the forms however have close parallels with the Kush SBBW including pots (ibid 1968: fig. 20: 27-45) and plates (ibid 1968: fig. 23: 63-64). At Kamrej, some of the wares categorised as burnished buff wares are similar in form and fabric to the Kush black burnished wares. These include the cooking vessels with everted rim (Gupta 2004: Fig. 8: VIII, IX, XI; Fig.9: I-III, VI-VIII, Fig. X: VII-VIII, XI, XVII) and decorated sherds with triangular puncture marks (Gupta 2004: Fig. 8: XVI-XIX; Fig. 9: X-Xa). From Maharashtra, SBBW or black slipped wares are seen at sites like Nevasa (Sankalia et al. 1960: Fig. 140: T.104 & 104a) and Nasik (Sankalia et al. 1955: Fig. 39: T120 - 121) etc. In her 1998-99 campaign in the site of Sehwan Sharif in Sind (Pakistan), Kevran (1999) reports the presence of mostly painted wares from the medieval levels of the sondage (layers D, E, F &G) but which are found in association with some black burnished sherds (Kervran 1999: Fig. 12: pl 220; Fig. 13: pl. 190; Fig. 14: pl 194; Fig. 15: pl. 218).

4.3.2 Indian Red and Black Ware (Ware Code: IRAB)

Definition: This ware forms the majority of the Indian ceramics from Kush in terms of sherd count. Closest parallels in fabric terminology can be derived from the Red Slipped Red Ware (RSRW) at Sanjan (Nanji 2011: 72), although the clay is partly grey-black as a result of firing. It contains an abundance of badly sorted, sub-rounded, quartz grains and visible mica particles (Kennet 2004: 90), in addition to some samples with organic inclusions (rice?) as well as possible shell and

microfossils recently detected in the re-examination of the IRAB fabric as part of the present research. The outer surface is slipped and heavily burnished. At Kush IRAB comes from Phase W-01 dating from the 5th-6th century AD with a few residual sherds in the later phases (ibid 2004).

Shapes and Forms: Cooking vessels with everted rims (often with a notch on the outside) continue to represent the predominant forms of IRAB in the Kush assemblage. A large number of vessels have constricted necks, while a few samples are of high-necked vessels with a globular body (as suggested by the curve of the shoulder). They range from large storage vessels (Rim diameter: 30 cm) to smaller vessel forms (10 cm). The rims forms are generally rounded or squared and occasionally beaked and beveled. One example of the vessel base (K5044) indicates a contiguous rounded or ring base.

Surface Treatment and Decoration: The exterior of the vessel has a dark grey slip (10YR3/1), while the burnished slip on the interior and over the rim varies between red (2.5YR 5/6) and a reddish yellow (7.5YR 7/6) (Kennet 2004: 90). However some variations include an application of red slip both on the interior and exterior with no actual evidence of grey slip; instead the dark areas on the fabric surface are a result of the blackening of the vessel caused by soot-stains (resulting from continued usage over fire) or from un-controlled firing conditions (in these cases the core is also ill-fired). Therefore in terms of surface treatment, several of the IRAB sherds closely resemble generic Indian red-slipped or red burnished wares. With regard to decoration, in addition to the presence of grooves and ridge-lines on the rim and vessel surface, only one sherd (K4423) revealed decorative elements in two bands of triangular puncture marks inscribed below the shoulder of a carinated vessel.

Fabric: The fabric has a rough fracture that was occasionally finely irregular with small closely spaced irregularities. The vessel is soft-fired, and is very weak and friable, with a powdery surface feel.

The principal inclusions in the fabric were detected under a microscope with

magnification levels ranging from 45 to 56x. The fabric itself appears to be homogeneous with several inclusions. In addition to the mineral inclusions like quartz, quartzite, feldspar and white mica, organic particles were identified in some samples. These light (white) particles have a curved structure with scalloped edges based on which they could be identified as rice temper (Lippi et al. 2011; Tomber et al. 2011a). However rice-tempered ware tend to be packed with rice inclusions, rather than the odd stray grain that can get in to any number of different fabric types since rice was so ubiquitous in the Indian context (Tomber pers. comm.). On the other hand, shell inclusions and other microfossils can sometimes also have similar scalloped edges as well as plate-like laminated features. Therefore a more careful approach will have to be undertaken in future through detailed petrographic analysis of the sherds to determine the overall composition of this clay.

The dark inclusions in the IRAB fabric comprise mainly of hard red grains and earthy red grains. The hard grains include slightly magnetic, sometimes bright ocherous inclusions that could indicate red iron ore/oxides or more likely haematite stained clots. Voids in the form of air holes and elongated cavities with striations indicating vegetal temper are also present in the fabric. The inclusions are badly or poorly sorted and consist mainly of sub-rounded forms.

The sizes of the grains were measured at various magnification levels. The organic curved white inclusions measure between 0.423mm and 0.877mm at 55x. The quartz particles measured from 0.106mm to 0.590mm at 52x,and the haematite clots range from between 0.357 to 0.437mm at 56x. Based on the grain-size, the inclusions denote medium to coarse sand sediments. The frequency of the inclusions varies from common (25%) to very common (30%).

Discussion: Several variations in fabric could be determined based on both inclusions and surface treatment of the IRAB vessels at Kush. Based on the study of the latter, a distinction in fabric can be drawn between: a) deliberately created Indian Red & Black ware vessels with grey slip and grey fabric in addition to red slip/fabric and, b) fabric with a black surface caused by usage over fire or as a result of firing. A majority of the vessels (estimated 20 out of 25 IRAB rim sherds) however appeared

to fall into the latter category of vessels with a black surface caused by fire and were more akin to Indian red slipped wares (those with a red slip and red fabric).

Based on the variety, size and frequency of the inclusions, two broad categories of IRAB fabric types are established: IRAB-1 is fabric with organic inclusions and IRAB-2 is fabric with mineral inclusions. IRAB-1 is a semi-coarse to coarse clay with a large number of white inclusions that appear to be either particles of rice or shell and other microfossils, based on the curved structure and scalloped edges noticed in several of the inclusions (Fig. 84). Although it may be inaccurate to refer to the inclusions as rice-temper, even the odd stray rice inclusions in pottery from Kush are a positive indicator of a tentative South Asian origin of these wares. Shell is sometimes noticeable in pottery from the Indian coasts, but these are usually naturally occurring inclusions and are not intentionally added to the clay. The clay itself is red ware with a porous texture resulting from the air voids. Mica and quartz grains although present are negligible. The slip is burnished red. IRAB-2 with the mineral inclusions has several fabric sub-classes (Fig. 85): IRAB-2 (A) is a semi-coarse grey fabric with visible impressions of vegetal temper. The surface has a light/dull red slip with streaks of blackening. With the exception of large grains of mica, quartz and other mineral inclusions are less. IRAB-2 (B) has a better levigated fabric with red clay that has been partially fired grey. The fabric is slipped red on the interior and grey on the exterior. Large grains of quartz are seen in the fabric and mica is less. Fabric-2 (C) is a semi-coarse red fabric with predominantly hard red inclusions of haematite stained clots in addition to thin flakes of quartz and other white inclusions. The surface is burnished red with streaks. Fabric-2 (D) is a dull semi-coarse red ware with plenty of sub-rounded particles of quartz and limestone and only occasional haematite stained clots. The clay is partially fired grey. The surface is applied with a smooth dull red slip.

Parallels: The generic use of the term 'red slipped ware' in the excavation reports in India with no description of the fabric and the lack of identification of deliberately created coarse red-and-black wares makes it difficult to find fabric parallels for the IRAB sherds from Kush. Further, excavation reports rarely document early medieval pottery in greater detail, making it difficult to identify typological markers (Nanji

2011: 74). Nevertheless, some sites in Gujarat (e.g. Nagara, Shamalaji, Dhatva and Devnimori) mention a category of coarse pottery from the historic levels referred to as 'Crude Red and Black Ware'. The crude red and black ware is a well-known ware in central and southern Gujarat in the early historic to medieval periods. At Nagara this ware described as '…similar to crude red ware with the inner side and often parts of the rim black, with a gritty smoky core...'' (Mehta & Shah 1968: 70). In certain cases its upper part also shows black colour, as noted in the vessels from Shamalaji (Mehta & Patel 1967: 33). For the first time at Dhatva, these vessels were mentioned having a red slip (Mehta & Chowdhary 1975: 39) akin to the IRAB from Kush. The forms parallel with the Kush examples including globular pots and basins as evidenced from Dhatva (Mehta & Chowdhary 1975: Fig. 14: 90-94 and Fig. 16: 95-96). At Shamalaji in Periods II and IIA (50 - 400 AD and 400 - 1000 AD) the vessel shapes are restricted to handis to dishes from Period II to IIA (400 - 1000 AD) (Mehta & Patel 1967: Fig. 16: 114-117) as with Devnimori where only two sherds of globular pots or handis were recorded (Mehta & Chowdhary 1966: Fig. 36: 104-105). At Nagara in Periods II & III (3rd cent BC - 1st cent. AD and 1st cent AD - 8th/9th century AD) they display a greater range of forms from bowls with flared rims, pots with globular body, dish-cum-bowls to lids (Mehta & Shah 1968: Figs. 39-41: 383-413). In Maharashtra, only a few sites document coarse black and red wares with examples evidenced from Nevasa, where basins, carinated vessels, short-necked vessels and dishes have been reported (Sankalia et al. 1960: Fig. 16: T.63, Fig. 127: T.64-6g, Fig. 128: T.67-68) from period V (1st cent BC - 3rd cent AD). A long gap of almost 800 years is reported from sites in Maharashtra including Nevasa and Nasik (Sankalia et al. 1955) between the Early Historic and Early Muslim-Mughal Maratha periods (c. 1400-1800 AD) and this poses a problem in finding form-fabric parallels for the Kush Indian assemblage.

4.3.3 Fine Indian Red Ware (Ware Code: FIRE)

Definition: Kennet (2004) reports this ware from Kush as material similar to IRPW rather than a clearly defined class. This variation is seen in the quality of the slip and fabric which is much coarser and represents a number of different classes from South

Asia and possibly elsewhere (Kennet 2004: 90). At Khor Rori, a class of similar wares has been identified as different from Indian Red Polished Wares (RPW) owing to the weak treatment of the surfaces and poor firing, and is instead called Indian-style table jars (Sedov & Benvenuti 2002: 187). The FIRE from Kush is however well fired with abundant mica and deep red slip on the exterior.

Shapes and Forms: No diagnostic forms were recorded from among the forty-five body sherds occurring at Kush (based on the most recent sherd count). In general the material is thin-walled (2.5 - 4mm). Based on the curve of the neck in sherd K2233 it probably resembles a vessel with a beaded out-turned rim. Similar vessels forms have been recorded in the Khor Rori assemblage (Sedov & Benvenuti 2002: Pl. 12: 1).

Surface Treatment and Decoration: The surface is applied with a thin coat of deep red slip (2.5YR 5/8) on the exterior and up to the rim of the vessel on the interior. Mica is abundant and clearly visible on the surface through the slip. Unlike the typical RPW the FIRE slip is weak and erodes and often flakes at places. The surface treatment is therefore more akin to the burnished red ware tradition common in South Asia in Early Historic and Medieval (Kennet 2004: 90). No decorative elements are observed on the surface of the FIRE vessels at Kush.

Fabric: The FIRE fabric from Kush is well fired, hard and smooth with no visible irregularities. In the visual identification of principal inclusions, preliminary observation under a microscope with magnification levels 50-56x displays two types of fabric: a) no inclusions with the exception of mica and b) with homogeneous inclusions. The fabric with irregular voids could denote particles of limestone. In addition to the mica particles, transparent inclusions of quartz (clear glassy grains), quartzite (white glassy grains), particles of limestone (irregular lumps - angular or rounded), and occasional tiny particles of red quartzite are visible in some variations of the fabric.

The inclusions are well sorted and consist mainly of rounded forms. The sizes of the grains range from 0.150mm - 200mm and large grains at 0.700mm (55x) for quartz/quartzite/limestone particles and mica particles are generally between 0.040 and 0.060mm (54x). Based on the grain-size, the inclusions denote coarse silt to medium sand sediments. The frequency of the inclusions is rare (2%).

Discussion: Although no visible particles are seen in the fabric, closer microscopic observation has revealed some variations of the fabric (Fig. 86). FIRE-1 is a well-levigated fabric with no mineral inclusions except mica and with a sandy temper. Fire-2 (A) has small-sized inclusions of white quartz, quartzite and occasional tiny particles red quartz/quartzite and haematite stained clots. Fire-2 (B) includes medium particles of transparent/translucent quartz/quartzite and limestone.

Parallels: As in the case of most excavation reports in India, the use of generic terminology in describing fabric and the want for distinct classes based on fabric variations, FIRE sherds from Kush lack genuine parallels from Early Historic-Medieval Indian sites. It is possible that they many represent low quality products from South Asia or local imitations from the Gulf (Kennet 2004). A careful re-examination of RPW from sites in the Indian context could help identify fabric parallels for Kush FIRE from within the Red Polished pottery repertoire. Fine Red Ware as a manufacture technique surely is as much widespread in Indian as others and some may be mistaken for the actual RPW due to the shiny surface (Sedov & Benvenuti 2002: 193).

4.3.4 Indian Red Polished Ware (Ware Code: IRPW)

Definition: The vessels of this class have an extremely well levigated fabric with a pale-pink to brick red body covered by a thin orange-red (2.5YR 4/8) to deep red slip (2.5YR 5/8) which is burnished or polished to a high gloss. The firing is even and mica is visible on the surface. It is generally accepted that this ware belongs to the early centuries of the Christian era, although at Kush the occurrence of this class is most abundant in the 7th or 8th centuries, when it is thought to have ceased

circulating in India. A total of thirty-nine sherds were found, the earliest in Phase E-01 and Phase W-04 whilst 28 sherds occurred in Phases E-03 and E-04 (Kennet 2004: 89).

Shapes and Forms: Out of a total of thirty-nine sherds recorded, four sherds displayed diagnostic features (two rims and two carinated vessel mid-sections respectively). The most common form is a carinated pot with an almost horizontal out-turned rim that is notched on its outer face (e.g. Whitehouse & Williamson 1973: fig. 5 d e). Closed forms like spouts and sprinklers are not reported from the Kush IRPW assemblage. The rims include sharply incurved beaked/collared (K3462) and everted grooved or notched features (K5079). Based on the shape of the neck, these rims can be ascribed to globular vessel forms. The body fragments include slightly carinated forms with prominent notch or groove line in the mid-section (K3466) and vessel with series of groove lines at the point of carination (K5069).

Surface Treatment and Decoration: The sherds have a dark red slip applied evenly on the external surface. Slipped surfaces are notable for their highly burnished quality. The slip is well bonded to the body and, for the most part, has not flaked with age (Pinto Orton 1992: 48). Decorations are rare on RPW and at Kush these are generally incised lines/grooves or notches on the outer surface of the vessel.

Fabric: IRPW fabric is hard with a smooth fracture that is flat or slightly curved, and no visible irregularities. Although Kennet (2004) reports no visible inclusions in the fabric, microscopic observation reveals the presence of principal homogenous inclusions. Further, voids are noticed in the fabric including elongated cavities with striations down length indicating grass or straw particles. The mineral inclusions include quartz, quartzite grains and red haematite stained clots as well as an abundance of mica particles. The inclusions are well sorted and the size of the quartz/quartzite grains ranges from 0.190 - 0.600 mm at 55x and mica particles from 0.066, 0.250 - 0.500 mm. Based on size, the sediments can be termed from very fine sand to medium sand. The inclusions are rounded to well rounded and their frequency is sparse (3%).

Discussion: At Kush the IRPW fabric has been compared with FIRE, stating the latter fabric much coarser. However closer microscopic observation of Kush IRPW has revealed that although the fabric is better levigated and thin-walled (1 - 2mm), the size and range of inclusions is greater than in FIRE. Further the presence of voids in the fabric denoting grass/straw or vegetal particles is unusual. IRPW-1 denotes an evenly fired pale reddish-orange fabric with quartz-like inclusions and abundance of mica, in addition to vegetal/grass inclusions (Fig. 87). The fabric is quite compact and does not have many air holes. The IRPW clay appears to belong to the same petrofabric as FIRE-2 (B).

Parallels: It is accepted that IRPW probably originated in Gujarat, the region around Amreli, the site where the greatest number of vessel shapes were reported and the colours of the fabric ranged from pink to dark red (Pinto Orton 1992: 46). Form parallels for the Kush fabric can be alluded to sites selected by Pinto Orton (1992) in the catalogue of RPW for Gujarat. Although absolute parallels remain to be found, close typological similarities for the Kush IRPW rims can be seen from Una (Fig. 4.22, no. 2; Fig. 4.24, no. 2) and Chhara (Fig. 4.11, no.1), whilst the body fragments from Kush resemble forms from Bhoji-Kadwar (Fig. 4.6, no.1) and Una (Fig. 4.26, no. 4) amongst other examples. In Maharashtra, RPW was first mentioned at Nevasa (Sankalia et al. 1960: 279) occurring between periods IV and V (Early Historic - Early Medieval periods) beginning from the 1st century AD (Fig. 88). Vessel shapes including globular vessels show similarities with the Kush forms (e.g. Sankalia et al. 1960: fig. 14: 9).

There is evidence of IRPW imported into the Gulf evidenced at Suhar from Level 0 to Level IV. Beginning with four fragments of 'best quality RPW' in Level 0, the quantity of RPW amounts to almost 10% of the whole ceramic collected in the level II of the city-centre sounding (Kevran 1996: 40). A decrease in RPW (3% of the whole ceramic collection) is evident in Levels III and IV respectively (Kevran 1996, 2004). In Level I and II, the principal form in the RPW consisted of a *handi*, a neck-less pot with a wide opening, an everted grooved rim and globular body (Kevran 1996: fig. 3 - 2,4,5). The earliest evidence of RPW in the Gulf is noted from Ed-Dur

in the 1st cent AD levels identified from 'fine red-slipped ware' category proposed by Rutten (2006). However as mentioned earlier, the absence of the distinctive RPW forms from Ed-Dur in the Gujarat repertory by Pinto Orton (1992) as well as the treatment of the fabric could suggest that these wares are most likely imitations (De Paepe et al. 2003: 214). At Qana, a few fragments of find red slipped pottery, which show similarities with RPW first appeared in the strata of the lower period (early 1st cent AD to first half of 2nd cent AD), but mostly from the strata of the middle period (2nd - early 7th cent AD) (Sedov 1996: fig. 4: 19; fig.6: 8,9). At Khor Rori, there is also presence of definite RPW pottery in the form of small table jars made from light red well-levigated paste of Area A13 (Sedov & Benvenuti 2002: Type II.3.4; Pls. 21: 3, pl. 25: 8).

4.3.5 Painted Indian Earthenware (Ware Code: PAINT)

Definition: A class of wheel-made jars of reddish yellow clay (5YR 7/8) with dark red paint or wash covering the surface, which is decorated with bands of thin black or dark brown paint (Kennet 2004: 91). Alternatively, it is decorated with unique ‘astral or flower’ designs in white paint. Four sherds occur in the earlier phase E-03 (7th/8th century AD), but most of the sherds (fifteen in number) occur in later phase E-11 (late 16th or early 17th century AD) (ibid 2004).

Shapes and Forms: Indian painted wares from Kush consist mainly of vessels that are thin in section (5 - 8mm), with beaded everted rims (K2218 and K5078) or sloping bevelled lip (K4036). Two fragments also belong to painted vessels with a beaked projection or ledge along the middle (no visible rims) (K5081 and K5083). However the identity of painted ware is more likely based on the surface treatment of the vessels (white and dark brown/black painting over red slip) and decorative elements (striped bands and unique designs).

Surface Treatment and Decoration: The fabric has a red slip (2.5 YR 5/8), burnished, over which painting was done. The interior is unpainted. White-on-red, black-on-red slip paintings have been made with different designs, ranging from dots and flowers or ‘astral’ symbols between horizontal lines to plain thin/broad parallel horizontal

lines (Gupta 2004: 49). Several design elements on painted wares are recorded from Kush that include thin or thick horizontal black bands or stripes (hatched), white astral or flower symbol, and unique decorations in labelled as triangular wavy lines and hatched 'ladder-like' design. The paintings from Kush were most likely created post-firing. According to Gupta (2004), in the case of post-fired paintings, vegetable dyes or colours were often used. The black colour is derived from levigated ochre or indigo while white is derived from calcium carbonate (known in India as *kankar*). The red slip or paint is probably produced from haematite or by heating yellow ochre.

Fabric: The PAINT fabric is hard and brittle but breaks easily giving an angular fracture (Kennet 2004: 91). The principal inclusions comprise white grains of quartz, quartzite and mica in addition to voids seen in the fabric that indicates both air holes and some elongated cavities with striations that denotes grass or straw inclusions. The inclusions are moderately sorted and the size of the grains for white inclusions ranges from 0.300mm to 0.500mm for the medium sized quartz/quartzite particles (54x), and 0.090 mm to 0.250 mm (54x) for small-sized white inclusions. The particles are generally rounded to sub-rounded with a moderate frequency average rate (10%).

Discussion: Fabric PAINT-1 consists of fabric with a small number of white inclusions and elongated voids indicating grass or straw particles. PAINT-2 (A) comprises fabric with visible air holes in addition to angular medium-sized particles of quartz/quartzite grains with an ill-fired core. PAINT-2 (B) is a variation of the fabric with a well-fired core and abundant small-sized white inclusions (Fig. 89).

Parallels: Although Kennet (2004) suggests that similar PAINT sherds have been found the early Medieval site of Sehwan Sharif in Sind (Kervran 1999: Figs. 10-17), detailed visual study of the fabric undertaken as part of this research thesis indicate that the parallels are presumably from sites in Western India of the later Early Historic and Medieval periods as stated by Mehta (1979:48). More precisely, each of the decorative elements on PAINT from Kush (in black/dark brown and/or white

paint over red slip) is identical to painted wares from sites in Gujarat (Figs. 90-91). Kush PAINT Type 1a is a series of horizontal black bands or stripes, Type 1b is a variation with alternate bands in white paint, or black lines over a white band, occasionally with diagonal or slanting lines. Type 2 is an astral or flower motif painted in white, usually in association with painted bands or lines in black and white and Type 3 are unique decorations in black comprising triangular peaks and hatched 'ladder-like decorations.

Precise comparisons are seen from Devnimori (Mehta & Chowdhary 1966: Fig. 37: Type 121, 122 & 126), Vadnagar (Subbarao & Mehta 1954: Fig. 11: 5-6, 8-11; Fig. 12: 14, 18, 20, 22, 28, Fig. 13: 34& 39), Shamalaji (Mehta & Patel 1967: Fig. 10: 140, 143-144), Kamrej (Gupta 2004: Fig. 13a: I - XVI), Baroda (Subbarao 1953: Fig. 22: 31) and Amreli (Rao 1966: Fig. 22: 5, 8, 9). Parallels in form for the Kush PAINT (K4306, K2218, K5078) can be seen from sites like Vadnagar (Fig. 11: 1 - 4) and Baroda (Fig. 22: 3, 6). The derivation of parallels from Gujarat sites however does not eliminate the possibility of finding additional comparisons with painted wares from Sind and other sites in western India. In the Arabian Gulf sites like Suhar, Kevran mentions (1996: 38) mentions a 'fine painted ware' dated between 8th and 12th cent. AD. Based on her more recent report on the archaeological research at Suhar, Indian pottery with red slip and black designs as well as red painting have been reported on body fragments, lids and spouts from Level II onwards (Kevran 2004: Fig. 10: 22 - 27). These occur again in Levels V and VI (Kevran 2004 Level V: Fig. 22: 8; Level VI Fig. 30: 9; Fig. 33: 6,7; Fig. 36: 17-18).

4.3.6 Unclassified Indian Ware (Ware Code: INDIA)

Definition: Kennet (2004: 91) classifies this ware as being quite distinct from other classes at Kush. It is a low-fired fabric, easily breakable and with visible mica inclusions. There are eight such sherds recorded from Kush but with no chronological pattern.

Shapes and Forms: The forms generally belong to carinated vessels (*handi*) with out-turned or flared rims (triangular or beaded). A majority of the carinated forms have a

secondary ridge on the shoulder of the vessel are usually decorated with incised lines just above the point of carination (K6677 and K6397). Additionally other forms include globular storage vessels and basins with flared (K6895), beveled (K6385) and triangular rims (K1677).

Surface Treatment and Decoration: The surface of INDIA wares has a thin red slip although a majority of these wares have a red wash on the exterior (2.5YR 6/8-5/8). As mentioned earlier, the decoration of incised lines is typical of carinated vessels that are included in the INDIA forms.

Fabric: The INDIA fabric is brittle with a powdery texture. The principal inclusions, in addition to white particles of quartz, quartzite and mica include red particles, occasionally with black veins that resemble inclusions of clay pellets or mudstone. The larger red inclusions measure from 0.493mm to nearly 2mm in size at 54x. In comparison, the quartz/quartzite particles and dull black grains range between 0.140mm to 0.250mm at 56x, with occasional elongated inclusions at nearly 1mm at 50x. Based on their size classification, the inclusions denote sediments of coarse - very coarse sand and granules. The inclusions are moderately sorted and are primarily sub-rounded and rounded and their frequency rate is rare (2%).

Discussion: The INDIA fabric can be broadly classified into slipped and un-slipped categories. The latter also includes vessels with a red wash. INDIA-1 belongs to the slipped category comprising several red particles including clay pellets or mudstone in addition to sparse inclusions of white quartzite and mica. INDIA-2 is a coarse fabric that does not contain any slip on the surface. The clay particles of this fabric are gritty comprising of several white and dull black grains (Fig. 92).

Parallels: In the absence of a documented class of INDIA-type vessels in excavation reports, it is very difficult to find parallels from Indian Early Historic - Medieval sites. It may be that this class of wares had been previously identified and grouped under the generic ‘coarse red ware’ or red-slipped ware category, without acknowledging the variation in fabric. The forms however are certainly Indian or South Asian in origin. Parallels for the Kush INDIA carinated vessel forms can be

noted from Dhatva (Mehta & Chowdhary 1975: fig. 14: 92), Kamrej (Gupta 2004: fig. 8 IX), Nagara (Mehta & Shah 1968: Fig. 21: 32, 35), Baroda (Subbarao 1953: Fog. 20: 85) etc. in Gujarat and Bhokardan (Deo & Gupte 1974: fig. 8 type 36A), Paunar (Deo & Dhavalikar 1968: fig. 18 type 118) in Maharashtra amongst other sites. The globular vessels with flared rim (K6895) as well as the sloping bevelled rim (K6385) share similarities with coarse sandy wares from Nagara (Fig. 33: 204; Fig. 37: 350).

4.3.7 Fine Grey Ware (Ware Code: FGRW)

Definition: Fine Grey ware from Kush is made up of fine, very well levigated compact clay with bluish steel grey colour slip on the surface. This class of wares of possible Indian origin has not been recorded by Kennet (2004) in his original classification of pottery from Kush.

Shapes and Forms: In the absence of diagnostic forms of FGW from Kush, it is difficult to determine the shapes of these vessels. Evidence of a broken rim sherd however denotes a vessel with an everted lip (K4251). An unusual rim (?) form has also been recorded in this ware (K2221). The sherds are thin-walled (1-2mm).

Surface Treatment and Decoration: These vessels have been applied with a thin coat of grey slip evenly fired and burnished to produce a grey to sometimes bluish-grey colour (2.5Y 5/1 - 2.5Y 4/2). Striations are visible on the surface indicating that these wares were wheel-made. A majority of the sherds also have thin flat ribs or panels on the interior. Decoration in the form of fine incised lines is occasionally seen on the exterior of some sherds (K2226).

Fabric: It is a hard fabric with a smooth fracture with no visible irregularities. The surface has a smooth almost soapy texture. The fabric was observed under a microscope at magnification levels ranging from 54x-55x. Aplastic inclusions (quartz, quartzite, feldspar etc.) were not visible in the fabric. Mica flakes on the other hand were abundant and some voids (air holes) were visible. Some of the fragments contained black grains (soft rectangular with a laminated structure) that

could indicate the presence of charcoal and other organic/carbonaceous material. The clay appears to be sand tempered. The inclusions are well sorted and their frequency is rare (1%).

Discussion: Fabric FGW-1 is denoted by the presence of mica and other inclusions described above (Fig. 93).

Parallels: At Sanjan, Nanji recorded grey wares (GW) in the assemblage including 'an exceptionally fine fabric which has been seen in only a few examples.' (Nanji 2011: 71). However at present it is not possible to ascertain if these are similar to the Fine Grey Ware from Kush. An earlier study has identified a source for the clay used in **'**Fine Grey Pottery**'** located in northern India, the author hypothesising a site on the Ganga Plain (Gogte 2001: 199).

4.4 Indian Ceramics and other finds from Ras al-Khaimah: Khatt, Jazirat al-Hulayla (Early Julfar), al-Mataf, al-Nudud

By Phase 6 (c. 9th century AD) Indian imports appear to have stopped at Kush. The few sherds in the phases above this are almost certainly residual (Kennet 1999: 21). The imported Indian pottery consists of Indian Red Polished ware plus a large number of coarse wares that seem likely to have originated on the western coast of India. Besides their presence at Kush, RPW dated to the first five centuries AD has been found at the site of Khatt, situated at the foot of the Hajar Mountains on the eastern side of the Jiri plain in interior Ras al-Khaimah (De Cardi et al. 1994: 56). Labeled as 'Ware 15', the fabric is a very fine, well-levigated brick red body covered by a thin orange-red slip, which is often burnished. RPW vessel forms at Khatt were not identified. No Indian vessels were reported from the succeeding periods at Khatt (8th - 18th century AD). Again at Jazirat al-Hulaya (Early Julfar), the earliest wares in Period 1 (Sasanian to Early Islamic - 1st/3rd AD to 8th AD), without doubt was the Indian Red polished ware (ware 15), which based on the form, is datable to the first centuries AD (Kennet 1994: 167). The RPW at Khatt appears to occur in areas where there is no evidence of ninth century or later occupation (de Cardi et al. 1994), while in Period I at Hulayla the settlement was abandoned for a period of time during

the 8th century, and was re-occupied in the 9th century in an entirely new location (Kennet 1994: 172-173). By the 9th century, occupation at the sites of Hulayla, Kush and Khatt seems to have ended or altered significantly and between the 11th - 13th centuries the Gulf experienced an economic 'dark age', with almost no occupation known from the Arabian Littoral (Kennet 2002: 160). The decline soon made way for the period of economic boom in the 'al-Mataf period' from the 14th - 17th century AD. At the beginning of this period Kush was finally abandoned and the site of al-Mataf was founded three kilometres away (ibid 2002: 161). Indian pottery re-appeared at this site from Phase III onwards (late 15th/16th century) where thirteen sherds of coarse red-slipped ware (RSLIP) were found. This class of ware has a fine buff fabric with small inclusions, visible mica particles, small air holes and a smooth fracture. It is a small and thin-bodied class (5mm) covered with a red slip, which tends to comes off in places (Kennet 2004: 91). According to Kennet (2002: 161), during the 14th and 15th centuries, al-Mataf was developing into a wealthy trading emporium on the coast stimulated by the economic boom of Hormuz Island, which was a link between India and the markets of Central Asia. Trade along these routes reached a peak in the late 15th century, the same period RSLIP is dated at al-Mataf.

Besides ceramics, numerous fragments of glass bangles were recovered from the surface deposits during the archaeological survey of al-Mataf (Hansman 1985: 80). External parallels for the source or manufacture of a majority of these bangles (with applied knobs or punts on the dorsal surface) were sought from Nevasa, Bombay (Mumbai) and Brahmapuri in Western India. The fragments come from various contexts and areas at al-Mataf; Area G dating from the 14th - 18th century (Hansman 1985: Fig. 19a) and Area C dating to c. 16th - 17th century (Fig. 19 e& f). Other fragments illustrated by Hansman (1985) include Fig. 19 g that shares similarities with the Nevasa material and Fig. 19 d & h compared with bangle fragments dated between 1435 and 1700 AD at Brahmapuri. As early as the mid 1st century AD, the Periplus mentions that pearls were exported in large amounts to Barygaza (modern Baroach) in Gujarat. This is the first mention of pearls being exported from the Gulf to India, albeit ones of low quality (Carter 2012a). The evidence of six small seed-pearls recovered during the Iraqi excavations at al-Nudud in 1973 (Hansman 1985: 94) points towards the importance of the pearl-fisheries in the Gulf to the economy

of Julfar and subsequently to Ras al-Khaimah. The Portuguese traveller, Duarte Barbose in 1517 says that the Moors of Hormuz Island bought pearls from Julfar to sell in India and other countries. Following the occupation of Hormuz by Persian forces in 1622, Hindu and other Indian merchants acquired pearls directly at the coastal ports where some of them also settled. Seed-pearls, in particular, were much in demand for use at Hindu wedding ceremonies and these were sold at the ports in bulk lots. Many pearl oyster shells also sold profitably in India where mother-of-pearl was used as a decorative inlay on furniture and carved wooden boxes. The Hormuzi victories of the early 14th century brought the pearl fisheries of both the lower and central Gulf under the control of a single political and trading entity, with Julfar acting as an entrepôt for goods passing through the Gulf, as well as an outlet for the inland regions of south-eastern Arabia and continued to maintain its importance under the Portuguese rule (Carter 2012a). The Kush and al-Mataf sequences have provided a detailed quantified picture of the trade in fine and coarse Indian pottery from the 4th/5th century onwards and have allowed us to trace its development as late as the 16th century (Kennet 2004: 88). Based the archaeological evidence of Indian pottery and other finds from Ras al-Khaimah, a wider picture of trade relations between India and the Arabian Gulf emerges, corroborated by historical sources in Chapter 8.

CHAPTER 3

SOUTH ARABIA, OMAN AND INDIA CONNECTIONS IN THE EARLY ROMAN PERIOD AND BEYOND

This chapter discusses the connections between South Arabia, Oman and India beginning with the Early Roman period in light of the ancient incense trade. An attempt has been made to amalgamate existing and new data pertaining to Indian or South Asian ceramics for an assessment of the trade networks and cultural contacts between India and Southern Arabia.

The chapter begins with a historical background to the aromatics trade (section 1). Next, the chapter is divided into three main sections: The section on Khor Rori (section 2) includes a background to the site (section 2.1). This is followed by an introduction to the Khor Rori Indian assemblage (section 2.2) and desk-based study of South Asian pottery from the American (AFSM) and Italian (IMTO) excavations (sections 2.3 - 2.5). Subsequently, the detailed documentation of the Indian pottery from the IMTO excavations is presented with the classification of Indian pottery into different morphological classes in relation to the intra-site distribution (sections 2.6.1 - 2.6.4). This is followed by the primary data results from the study of five types of Indian pottery fabric from Khor Rori (section 2.6). The next main section of the chapter focuses on the site of Qana (section 3) with an introduction to the site (section 3.1), the excavations and stratigraphy (section 3.2), followed by a desk-based study of the Indian pottery from Qana (section 3.3). Evidence of Qana's contacts with India are summarised at the end of the section (3.4). The final section of this chapter is devoted to the site of Suhar (section 4) with an introduction (section 4.2), stratigraphy and chronology (section 4.2-4.3) and a detailed compilation of Indian pottery from Suhar (4.4). The section on Suhar concludes with comparisons of Indian pottery from Kush (section 4.5).

Chapter 3

1. Historical background to the 'aromatics trade': the role of Southern Arabia and India

Southern Arabia, the Arabia Felix of the Romans and Eudaimon Arabia of the Greeks had already been involved in trade with the Mediterranean before the time of the Periplus (Fig. 94). Ever since a market for perfumes and incense had begun to exist in the Near East and Egypt from at least the 1st millennium BC, caravan kingdoms including Ma'in (capital Qarnaw), Saba (capital Marib), Qataban (capital Timna) and Hadramawt (capital Shabwa) were established in South Arabia (Seland 2010:17; Avanzini 2002b: 19). The two most valuable commodities that the South Arabians carried to the cities of the north came from the genera of balsam trees belonging to the *Burseraceae* family, known as *Boswellia* (frankincense) and *Commiphora* (myrrh). Together with their supplies of these aromatics, South Arabian merchants purchased exotic and highly prized goods that arrived in trading ships from India, Sri Lanka and southeast Asia and loaded them onto their camels to sell them in the distant markets of the Mediterranean, passing them off as their own produce (Singer 2007).

The geography of the South Arabia made it possible to control the trade. Desert areas, wells, mountain passes and fortresses narrowed the choice of routes so that the aromatics had to pass through a chain of kingdoms and cities on their way to the Mediterranean (Bowen 1958: 36). From the beginning of the 2nd century BC, the Romans began to use frankincense and myrrh in ever-greater quantities and the four hundred year period from the 2nd century BC to the 2nd century AD can be regarded as the zenith of aromatics trade (Singer 2007: 6). With the incorporation of Egypt in the Roman Empire in 30 BC, the Arabian trade in aromatics was drawn into the monsoon system and diminished the importance of the old caravan routes, as remarked upon by the Greek geographer Strabo that "…as many as one hundred and twenty vessels were sailing from Myos Hormos to India, whereas formerly under the Ptolemies, only a few (around 20) ventured to undertake the voyage and to carry on traffic in Indian merchandise." (Seland 2010: 18). By the time of the Periplus in the mid 1st century AD, direct trade between Roman Egypt and India had developed. Control over coastal areas allowed the South Arabian states to take advantage of this

long-distance maritime trade based on the monsoon winds. These blow steadily from the south-west in the summer and from the north-east in the winter, thus facilitating swift and relatively safe passage from all coasts of the western Indian Ocean and back again the course of less than a year (Seland 2005: 271).

From the 1st century AD, Qana (in present-day Yemen) was one of the key points for the ancient aromatics trade, both on the overland and maritime routes. However its main export frankincense did not grow in significant numbers in Qana nor in the vicinity of the capital of Shabwa. On the other hand, frankincense trees grew abundantly along the limestone ridge beyond the mountains in the Dhofar region, which lay 400 mile to the south-east of Shabwa (Singer 2007: 23). The site of Khor Rori (Sumhuram) a well-guarded city with its remarkable natural harbor was established by the Hadramites in the core frankincense producing area, near Salalah on the coast of modern Oman with its foundation levels dating back to the 3rd century BC (Avanzini ed. 2002a). From Sumhuram, the frankincense was sold to passing ships of the Greeks and Egyptians who docked here on their way back from India. From the 1st century BC, Qana was an important port and shipyard of the Hadramite kingdom, and by the 1st century AD an important depot for the Dhofari frankincense harvest, and one of the major stops on the Egypt-India maritime trade route (Singer 2007).

With the establishment of the direct trade-link between Roman Egypt and India it would be too easy to ascribe the decline of Eudaimon Arabia to these changing patterns. However as Seland (2010: 20) states that Arabia had plenty of products to offer to visiting traders and was quite able to carry on a profitable trade in aromatics with both India and Egypt even without acting as an intermediary between the two. Frankincense from South Arabia found a ready market in India, for example, and Indian merchants who dealt with Chinese traders travelling down through Bactria could trade East African ivories and South Arabian aromatics for Chinese silks and pelts, which they sold on to the Egyptians and Romans (Singer 2007: 20).

Chapter 3

2. Khor Rori (Sumhuram)

The walled ancient city of Sumhuram, known from the South Arabian inscriptions, is situated about 45 km east of Salalah on the coast of Dhofar. By the end of the 19th century, the site has been identified as possibly the Moscha Limen of the Periplus (Casson 1989: 69). Its ancient south Arabian name 'Sumhuram' was identified by Beeston (1976) as linguistically resembling a personal name associated with Hadrami royalty. The site was explored and excavated for three seasons between the 1950s and 60s by the expedition from the American Foundation for the Study of Man, conducted by F.P Albright and directed by W. Phillips (Cleveland 1960; Albright 1982). Since 1996, the site has been excavated by the Italian Mission to Oman (IMTO) headed by Alessandra Avanzini with Alexander V. Sedov as chief archaeologist. Previously the American team dated the history of Sumhuram from the 1st to the 3rd century AD. These dates proposed for Sumhuram seemed to be linked to the increase in maritime trade between the Mediterranean and India in Roman times. The new excavations presented a whole new chronology and interpretation of the city with evidence of its foundation levels dating back to the 3rd century BC and then abandoned in the 5th century AD. (Avanzini & Sedov 2005: 9; Avanzini 2007: 23), proving that the city's foundation is to be backdated by at least four centuries earlier than the heyday of Roman trade (Pavan 2011: 100).

The choice of the place for the foundation of Khor Rori, the ancient Sumhuram, was determined by numerous factors the most important of which was closeness to the main source of income at that time: the highest quality incense, the *Boswellia sacra*, was produced just behind the city, in the Najd's arid plateau (Zarins 1997: 624). Other factors that influenced the choice of the settlement are related to the characteristics of the surrounding territory: Wadi Darbat and the peculiar position of its estuary that made this site into a remarkable natural harbour. Ships/boats could find shelter in the wide lagoon, formed by the estuary of the Wadi at the point where it flows into the Arabian Sea (Orazi 2002: 211). The old colonisers, who arrived around the 3rd century BC, must have realized that this particular *khor*, on account of its morphology, was an ideal natural port (Raffaelli et al. 2011). From June to September, Dhofar also experiences the south-west monsoon (*Khareef*) that causes

particularly favourable climatic and ecological conditions in this part of southern Oman. The monsoon winds between East Africa and China cause about 300mm of annual precipitation. The wind, obstructed by the Dhofar Mountains, rises causing a heavy volume of rainfall during the summer half year (Scholz 1980: 18). Albright (1982: 3) reports that the coastal plain has numerous springs of drinkable water and high quality building material. The city itself was built on the top of a limestone outcrop with a general downward slope from east to west (Avanzini & Pavan 2011: 44). This was an ideal defensive barrier against attacks since its eastern, southern and western flanks were protected by the presence of an extremely steep natural inclination of the ground (Orazi 2002: 213). Nonetheless, a massive system of fortification was put in place in Sumhuram with thick walls and with defence towers along the wall guarding the single entrance of a monumental gate, ensuring that the inhabitants and their possessions were well guarded (Seland 2010: 29; Avanzini & Pavan 2011: 44). On the other hand, the port city of Qana long considered to be a centralised trading post, has no city wall.

It is therefore clear that Sumhuram was certainly no small trading or military outpost but a city with temples, palaces, residential areas and strong walls of defence as indicated from the results of several seasons of excavations: The most striking feature constructed at the site is undoubtedly the fortification system with its perimeter marked by a series of offset walls and a couple of towers set into the north-eastern and north-western corners; a tower guards access to the monumental gate and a couple of isolated towers, to protect the city (Avanzini & Pavan 2011). With regard to the other excavated areas/structures, it has to be noted that the Italian excavations revealed the existence of quarters intended for specific vocations: Warehouse or storage quarter, Residential quarter and the worship/religious area with the city temple.

(i) The Residential Quarter (Area A)

This part of the ancient city of Sumhuram is located immediately south of the Gate Complex where several buildings that may have been interpreted as private dwellings were investigated (Buffa & Sedov 2008). The domestic architecture consisted of

square sandstone or limestone ashlars based on the wealth of the owner, built against the city wall (Avanzini & Pavan 2011). The city wall was erected directly on the bedrock as the soundings made at the foundations revealed. One of the earliest buildings excavated in this part of the city is Building BA1 in the north-western corner of the square A8 (the earliest habitation level in this part of the city), Building BA2/BA3 was constructed next to the southern city gate (Avanzini & Sedov 2005: 14), Building BA4 occupied the corner formed by the northern city wall and Building BA5 was excavated against the south-eastern wall (Buffa & Sedov 2008: 22-27). The houses appeared to be very crowded although lower-floor windows could indicate small open courtyards between buildings. Evidence of a second floor is seen by the remains of stairways as well as regularly placed holes to house wooden poles (Avanzini & Pavan 2011: 46). Different structures belonged to different constructional phases and were stratigraphically set at different levels of occupation. Several of the excavated structures and features were associated with four construction/chronological phases at Area A. The structures in Area A also included a 'Monumental Building' interpreted as a temple (Albright 1982: 19) as well as features associated with activities like kilns of different types for food preparation and blacksmithing. In the case of an attack, a series of facilities including water was made available from a rectangular well 25.6 metres deep (Avanzini & Pavan 2011).

(ii) Warehouse or Storage quarter (Area B)

The Area B is located in the SE corner of the city where the so-called 'storage quarter' is situated. It consists of long rectangular rooms (bins), seven built towards the north and four towards the south, on both sides of a large rectangular area (8 x 3.2m), identified as a marketplace (Sedov 2008c: 173; Avanzini & Pavan 2011). Albright (1982: 32-33) suggested that these 'bins' were probably used to store frankincense, while the 'mint-rooms' indicating a city mint stood in premises by the storehouses indicating possible coin manufacture at the site. A small doorway in one part of the city towards the east of the market place led to the port area located downhill. A wall with a narrow opening (70 cm wide) ran along on its western side during the earlier periods for possible protection of merchandise stored within, and to ensure the security of the commercial transactions. It was consequently walled up

leaving only the small doorway leading to the port. Excavations have also revealed that in the course of time the storerooms were accessed from the roof (Avanzini & Pavan 2011: 45). In addition to pottery, very few objects were recorded during the excavations of Area B including stone tools (pestle, handstone, whetstone etc.) as well as spindle-whorls and a bead made from marine shells (Sedov 2008c). The storehouses at Sumhuram were identical in architecture to those from Qana (Avanzini 2007: 24).

(iii) The Cultural Quarter (Area F)

Area F is located at the north-western corner of Sumhuram, along its north-western defence wall which comprises several excavated structures. These include a large open square (A20) with two side-streets (A29 & A48), monumental staircase (M91) leading to the top of the defence wall, buildings BF1 and BF2 and a large building BF3 (intra muros temple) and the north-western corner of monumental building BF5 were discovered during the excavations (Sedov 2008d: 183). Four constructional phases (1- 4) were determined, corresponding to the major periods of building activity of the inhabitants of the ancient town (ibid 2008d: 183 - 202).

(iv) The Religious Area (City temple)

No fewer than three buildings of religious nature have been found despite the smallness of the city of Sumhuram. These include the *extra muros* temple and the temple *intra muros* (including the great temple of the moon god Sin) and one small sanctuary (Avanzini & Pavan 2011: 47). The ruins of the temple *extra muros* are located approximately 300m north-west of Sumhuram, only a few metres above the water level of Wadi Darbat and was probably destroyed by a flood (Avanzini & Sedov 2005: 10). It was comprised of four rooms (Rooms A1-A4) with Room A1 (6.6x8m) where the sanctuary was located and the cults and rituals in honour of the deity are presumed to have been performed (Pavan & Sedov 2008: 262). The main temple of the city *intra muros* is located against the city wall close to the north-western corner of the ancient city and was constructed on the ruins of a house and dedicated to the moon god Sin (Avanzini & Sedov 2005: 12). It is a complex structure that underwent several alterations and at least two constructional phases

were identified (1st phase: mid/late 2nd cent BC - mid third cent AD; 2nd phase: mid 3rd - late 4th/early 5th cent AD). The temple interior consisted of several compartments of different sizes with low stone benches against the walls. The core of the ancient temple was a rectangular sanctuary (5 x7 m) with four wooden pillars and stone bases preserved in situ. The south-western part of the temple contained two adjacent rooms identified as the temple kitchen (ibid 2005). An additional building identified as a small sanctuary revealed a great variety and quality of goods including seashells used as oil lamps, stone vessels, bronze bowl with dedicatory inscription mentioning god Sin, bronze coins, stone-incense burners etc.

(v) Chronology

As a result of the excavations in 2003 and 2004 concentrated in two areas inside the city walls; Area A near the city gate and Area F (Cultural quarter) in the north-western sector, the new revised dating for the harbour came to light (Avanzini & Sedov 2005). Deep soundings revealed a foundation filling stratum (30-40cm) composed of rock chips mixed with earth and stone between the bed rock and the city's earliest inhabited levels probably dating from the third and late first centuries BC (Avanzini & Pavan 2011; Avanzini & Sedov 2005). In addition to the C14 dates, diagnostic pottery forms including Mediterranean amphorae (Dressel 2-4 type) and Indian imports such Indian Rouletted Ware, are associated with the layers of this phase. On the other hand, there is no so-called early material at Qana. Sumhuram appears to have been abandoned in the late 1st century BC in the time when Qana was founded and also perhaps as a result of repeated damage by floods in the Wadi Darbat. It was later re-built in the second phase dated between the early first century AD and the third century AD and achieved new wealth and development. And finally, the dating of the third phase is between the very late third and late fourth or early fifth centuries AD (Avanzini 2007: 26; Avanzini & Sedov 2005: 15-16).

2.2 Khor Rori Indian pottery: Introduction

The South Asian pottery found in the most ancient layers at the site of Khor Rori (Sumhuram) consists of two main groups: fine tableware and vessels of ordinary ware intended for household use (Pavan & Schenk 2012: 197). The relations between

Sumhuram and India points to a continuity from the 3rd century BC until the abandonment of the site as indicated by the presence of Indian pottery that can be dated indisputably to the early centuries BC. Fragments of true Rouletted ware (RW) and of the handmade 'paddle impressed' ware of definite Indian or South Asian origin found in the strata when the city was first inhabited confirm the early dating of Sumhuram and its participation in the international trade of the 'Pre-Periplus' era. Sumhuram is the only site in all the Arabian Peninsula where both RW and paddle impressed ware have been discovered (Pavan 2011: 102). Both wares are not attested in western India, except for the recent discovery of RW sherds at the site of Pattanam in the Malabar Coast (Shajan et al. 2008; Cherian et al. 2011). Beyond Sumhuram, both RW and 'paddle-impressed ware' have been attested on the Red Sea in Berenike and Myos Hormos establishing a link among the three ports of Arikamedu, Sumhuram and Berenike.

From the 1st century AD onwards, a new scenario unfolds in the Indian Ocean trade network with an increase in utilitarian vessels from north and northwestern coast of India at Sumhuram. These include several samples of carinated pots, lids, oil lamps and containers of transport and storage (see Avanzini ed. 2008). These vessels are mostly thick coarse red and some black wares against a fewer pieces of fine wares. Other evidence indicating the proposed source of these wares to the western and northwestern coast of India are coins of King Kanishka I of the Kushana empire and Abhiraka, Satrap of Barygaza (in Gujarat) (Pavan 2011: 103).

2.3 Desk-Based Study of South Asian Pottery Form and Fabric from Sumhuram

The Indian or South Asian discovered at Khor Rori (Sumhuram) has already formed the subject of investigation through the study of numerous sherds and vessels unearthed during the expeditions in the 1950s and 60s by the American Foundation for the Study of Man (AFSM) (Cleveland 1960; Albright 1982) and then from 1996 onwards by the Italian Mission to Oman (IMTO). The unpublished sherds including some Indian pottery from the American expedition were studied and consequently published by Yule and Kevran (1993: 69-106). Following this, the American Archaeological Mission headed by J. Zarins published a comprehensive study of the

pottery and lithic material from a bulk of pre-Islamic sites in Dhofar region including those contemporaneous to Sumhuram (Zarins 1997; Zarins 2001). Detailed study and documentation of the ceramics from Khor Rori (Sumhuram), and in this particular case concerning the Indian/South Asian assemblage, was published by the IMTO in two excavation reports, the Khor Rori Report 1 (Avanzini ed. 2002a) and Khor Rori Report 2 (Avanzini ed. 2008) respectively. Part of chapter 3 of this thesis will be to collate the available published data concerning the Indian (or South Asian) assemblage from Dhofar with particular emphasis on the site of Khor Rori in order to infer evidence of trade or contact with the Indian subcontinent from the Arabian perspective.

2.4 Indian pottery data from the AFSM excavations and American Archaeological Mission

Most of the ceramic material (except for 17 sherds) resulting from the AFSM excavations by Albright and others at Khor Rori was not kept or studied (Zarins 2001: 96). Roman pottery including Dressel 2-4 types and East Mediterranean imports were recorded leading to an erroneous assumption that the site was founded around the middle of the 1st century AD (see Albright 1982: 48). Following this, Yule and Kevran undertook a revision of the unpublished but apparently collected ceramics from Khor Rori and documented a total of 21 sherds of vital interest, including a number of red slipped vessels labeled as being imported and described as Indian Red Polished Ware (RPW) (e.g. Yule & Kervran 1993: Fig. 3 nos. 1-5 & Fig. 5). In addition to the RPW, the archaeological material included a small bronze Salabhanjika, tree goddess figurine datable to the 3rd century AD and a bronze Kushana coin of Kanishka I dated to the early centuries AD (Albright 1982 nos. 137 & 39 respectively). With the discovery of Shisr in 1991 and the key site of Ayn Humran on the Salalah plain, survey and soundings were undertaken by the American Archaeological Mission to gauge the nature and extent of finds from these two sites. The primary period at Shisr is from the 1st century BC to 4th century AD with ceramic evidence indicated by the presence of Indian RPW (now identified as Indian-style table jars or cooking vessels), identified with complex incised rim and upper body and numerous examples that occur in lower levels throughout the site

(Zarins 2001: Figs. 42 & 43). At Ayn Humran, a number of parallels to Shisr were found in the Indian material, the so-called RPW and polished black wares although not as abundant (ibid 2001: 122).

Furthermore mention should be made of the nomenclature adopted by the American Archaeological Mission with reference to the chronology of the finds from Dhofar including the Indian wares. The term 'Iron Age', defined by the actual use of iron begins with the Seleucid period in northern Oman (Potts 1990). Iron Age B (IAB) (325 BC - 650 AD) is the period related to the incense trade and had consequently been used by Zarins to date the finds including Indian pottery from Khor Rori and other sites in Dhofar (Zarins 2001: 93 - 133).

Following these discoveries, Sedov and Benvenuti (2002) undertook a reassessment of these 'Indian' cooking pots from Sumhuram, which earlier had been inserted among the RPW based on the knowledge at the time by Yule and Kevran (1993) and Zarins (2001). Their study indicated that a majority of the cooking or kitchen vessels are not Indian Red Polished Ware as previously ascribed (Sedov & Benvenuti 2002: 189).

2.5 Indian pottery data from the IMTO excavations

The pottery from the site of Sumhuram has been the focus of comprehensive study by the Italian Mission to Oman, following the AFSM activities in Dhofar, which contained practically no information on ceramic material. Although subject to several articles, the detailed documentation of pottery (including Indian/ South Asian forms) has been presented in the Khor Rori reports 1 & 2 (Avanzini ed. 2002, 2008). In the first report, Sedov and Benvenuti (2002) undertook the study of the general pottery typology from Sumhuram based on the material from the excavations at Area A7 located outside the city-wall to the southeast of the gate complex located in the dumps from AFSM excavations; another trench dug in Area E6 at the foot of the northern city wall and in the Area A13 located outside the city-wall. A more comprehensive inventory of Indian material was published in the second report where South Asian or Indian pottery was recorded from the several excavated structures and cultural deposits in the residential quarter or Area A (Buffa & Sedov

2008), trench A13, the storage quarter or Area B and the cultural quarter or Area F (Sedov 2008d). However the Indian or South Asian ceramics were not specifically labeled or categorised as such in the Khor Rori report 2 inventories. A vast majority of the Indian vessels from report 2 have therefore been identified separately in the various 'Areas' of the site by the present author and sorted into form categories as discussed below:

2.5.1 Indian Pottery from Area A

The Residential Quarter or Area A of the ancient town of Sumhuram is located immediately south of the Gate Complex. The general dimension of the area excavated in the 2000 - 2004 season by IMTO was 25x22 m. Several constructional phases corresponding with major building activities and structures were discovered during the excavations (Buffa & Sedov 2008: 15) (Fig. 95). The Indian or South Asian pottery from Area A has been identified from several such buildings/structures and phases: Building BA1, Building BA2, Building BA4, Building BA5 and Square A8 (streets A44 & A45).

2.5.1.1 Cooking vessels from Area A: Indian or South Asian cooking vessels (often resembling the carinated *handi*-type) have been identified right from the 1st constructional phase in Building BA2. Three rim fragments of cooking vessels were found in Room A27a (square room 3.5x3.7m) of Building BA2 from the US99 and US100 floors (SUM02A; room A27a; US99, 7, SUM02A; room A27a; US99, 9 and SUM02A; room A27a; US100, 7) (Fig.96: 1-3). The fabric is reddish brown fine compact, reddish brown medium fine compact and dark reddish brown medium compact with inclusions and mica and slip/burnishing on both sides. The external and internal surfaces are dark reddish brown, red and reddish brown (2.5YR3/4; 2.5YR4/6; 2.5YR4/4). The rim diameters include 17.0 and 20 cm with thickness of 0.5-0.6 cm (Sedov 2008a: 65, pl. 2 nos. 9 -11).

A total of five cooking vessels of Indian origin were found in the various constructional phases of Building BA4. A single fragment of upper part of a cooking pot was identified in the 1st phase of BA4 in Room A32, stratum US113floor (SUM02A; room A32, floor; US113, 11) (Fig.96: 4) with a light brown compact

fabric and remains of slip and soot on the exterior, with a horizontal incised line on the interior. The external surface is a light grey (GLEY 1 7/1) and the interior light brown (7.5YR6/3) with a rim diameter of 17.0 cm. Two fragments of Indian cooking vessels were found in the 3rd constructional phase of Building BA4 in stratum US108floor (SUM02A; room A32; US108, 16 and SUM02A; room A32; US108, 17), both with a reddish medium compact fabric with inclusions and mica and external/internal surfaces ranging from dark grey to reddish brown (2.5YR3/4; 2.5YR4/4). The diameters of the vessels are 14.0cm and 18.0 cm respectively. In the following 4th constructional phase in Room A36/A40, two fragment of cooking vessels were identified in stratum US115floor and M60 respectively (SUM03A; room A36-A40; US115, 1 and SUM03A; room A36-A40; M60, 1) (Fig. 96: 5-8). The fabric is reddish medium fine and brownish medium compact with inclusions, black to dark core and internal and external surfaces slipped and burnished in red and reddish brown (2.5YR5/8; 5YR4/3-4). The diameters of the vessels are 29.0 cm and 26.0 cm respectively (Sedov 2008a: 69, 119, pl. 4 no. 12, pl. 29 nos. 1 - 4).

A single cooking pot fragment was found in the 1st constructional phase of building BA5 in room A35 in stratum US110floor (SUM02A; room A34; US110, 2) (Fig. 96: 9) with a red medium fine compact fabric and slipped red surfaces (10R5/6) and a rim diameter of 21.0 cm (Sedov 2008a: 71, pl. 5 no. 9).

A total of eight cooking vessels were found dating to the 2nd constructional phase of Building BA1 from the various Rooms A14, A18, A19, A17 and A14 and contexts US29bis, US48 and US50 (SUM00A; room A14; US29bis, 10, SUM01A; room A18; US48, 10, SUM00B; room A19; US48, 2, SUM00B; room A17; US50, 16, SUM00B; room A19; US48, 3, SUM00B; room A17; US50, 18, SUM01A; room A18; US48, 15 and SUM00A; room A14; US29bis, 7) (Fig. 97: 10-17). The complete vessel in this assemblage (SUM00A; room A14; US29bis) was previously erroneously identified as RPW (e.g. see Avanzini et al. 2000, fig. 30, 31). The fabric ranges from red and reddish brown medium coarse to fine compact and black coarse with inclusions and grit temper. Slip and burnishing and remains of soot are seen on the exterior and top of interior of most vessels. The external and internal surfaces are red (2.5YR4/6; 10R5/6) to brown and reddish brown (5YR3/4) and diameters range

from 16.0 - 22.0 cm with thickness from 0.6 - 1.2 cm (Sedov 2008a: 79, pl. 9 nos. 1 - 8).

The majority of Indian cooking vessels from Area A (n=17) have been recorded from Square A8, Streets A44 and A45. The cooking pots here were recorded beginning from the 3rd constructional phase mainly from the contexts of US22floor and US38floor (n=14) (SUM03A; US22, 83, SUM03A; US22, 82, SUM03A; US22, 62, SUM04A; US112, 3, SUM03A; US22, 76, SUM03A; US22, 60, SUM00A; US22, 6, SUM03A; US22, 61, SUM01A; US22, 28, SUM01A; US38, 4, SUM03A; US22, 69, SUM03A; US22, 48, SUM03A; US22, 94.UM00A; US22, 5, SUM03A; US22, 63 and SUM03A; US22, 55) (Fig. 98: 18-31) and from the 4th constructional phase from the US111 pit associated with the new US29floor (constructed over the US22 floor) (n=3) (SUM04A; US111, 13, SUM03A; US111, 3 and SUM03A; US111, SUM04A; US111, 13) (Fig. 98: 32-34). The cooking vessels in the 3rd & 4th phase of Square A8 (streets A44 and A45) comprise fragments of rim and upper part composed of a red to reddish and brown medium compact or medium coarse fabric with inclusions and mica. The external and internal surfaces range from reddish brown (5YR5/3; 2.5YR4/4) to red (2.5YR5/6; 10R5/6) and reddish grey (5YR4/2). The diameters of the vessels are between 16.0 cm - 22.0 cm with thickness from 0.5 - 1.1 cm. (Sedov 2008a: 95, 97, 103, pl. 17 nos. 10-17, pl. 18 nos. 1-7, pl. 21 nos. 4, 6, 7).

2.5.1.2 Lids from Area A: Indian lids were identified from the 2nd constructional phase onwards in Building BA1 where two fragments of domical and flat-topped lids with projected edges and fitted base (SUM00B; room A17; US50, 29 and SUM00B; room A17; US50, 30) (Fig. 99: 1-2) were recorded in the US50 stratum. The fabric is red compact with red slip (10R4/6) and wet-smoothing (2.5YR5/6) respectively. The diameters of the vessel are 18.0 cm and 20.0 cm with thickness of 0.7 cm (Sedov 2008a: 83, pl. 11 nos. 1-2).

A single fragment of lower part of a lid (projected roof edge) from building BA4 have been recorded from the 4th constructional phase in foundation stratum US139 from new constructed Room A37 (SUM03A; room A37, under floor; US139, 2) (Fig.

99: 3). The fabric is reddish medium compact with red slip on both sides (10R5/6) and diameter 21.0 cm (Sedov 2008a: 69,pl. 4 no. 17).

Three lid fragments (including one complete form) were also recorded in Square A8, streets A44 and A45 dating to the 4th constructional phase from stratum US111 (SUM04A; US111, 11, SUM04A; US111, 8 and SUM03A; US111, 4) (Fig. 99: 4-6) composed of red compact to medium compact fabric with inclusions and mica and surfaces slipped on both sides with occasional soot on the exterior. The external/internal surfaces are reddish brown (2.5YR5/4) to light red (2.5YR6/6) and red (10R5/6) and diameters of the vessels 13.0 cm. 15.0 and 12.0 cm respectively with thickness at 1.3 and 0.5 cm (Sedov 2008a: 105, pl. 22 nos. 1-3).

2.5.1.3 Oil lamps from Area A: Another category of lids of possible Indian or South Asian origin referred to as 'oil lamps' in the Sumhuram assemblage include wide flaring rims with a circular reservoir in the centre. A total of 4 examples were recorded in Area A from the context of Building BA1 and Square A8 (streets A44 and A45). The two oil lamp fragments (central reservoir) from Building BA1 were discovered in the 2nd constructional phase from stratum US50 in Room A17 (SUM00B; room A17; US50, 31 and SUM00B; room A17; US50, 32) (Fig. 100: 1-2). The fabric is coarse red with inclusions, mica and straw and grit temper with wet smoothing and slip respectively. The surfaces range from red (2.5YR5/6) to reddish yellow (7.5YR6/6; 5YR6/6) with diameter of 9.0 cm and 12.0 cm and thickness 0.9 cm and 1.6 cm (Sedov 2008a: 83, pl. 11 nos. 3-4).

From Area A8 (streets A44 and A45), a fragment of rim and base as well as one fragment of lower part were identified from stratum US22floor from the 3rd constructional phase (SUM01A; US22, 21 and SUM03A; US22, 67) (Fig. 100: 3-4). The fabric is light red medium and light reddish brown compact fabric with light reddish brown and red external/internal surfaces (2.5YR6/4; 5YR6/4). The diameter of the vessels is 15.0 cm with thickness of 1.1 cm (Sedov 2008a: 95, pl. 17 nos. 8-9).

2.5.1.4 Storage jars from Area A: The Indian storage jars from Area A were recorded from Area A8 (streets A44 and A45) from stratum US22floor in the 3rd

constructional phase. Three fragments of storage jars were identified (SUM03A; US22, 30, SUM04A; US22, 100 and SUM03A; US22, 89) (Fig. 101: 1-3). These belong to the category of very typical jars with out-turned bulbous rims and a "collar" under it (Type I.2.2) (Sedov & Benvenuti 2002: 181, pls. 3 nos. 2-3; pl. 23 no. 6). The fabric is red compact to reddish brown medium compact with traces of slip and burnishing. The surfaces range from light red (2.5YR6/6; 10R6/8) to reddish yellow (5YR6/6) and light reddish brown (5YR6/4). The diameters of the vessels are 22.0 cm, 24.0 cm and 23.0 cm respectively with thickness of 1.5 - 1.6 cm (Sedov 2008a: 87, pl. 13 nos. 1-3).

2.5.1.5 Table jars from Area A: Table jars from Area A (n=6) consist of vessels with outturned rounded or beaked and beaded rims similar to Type II.3.3 (Sedov & Benvenuti 2002: 187, pl. 12 nos. 1-7). Two fragments (rim and ring-base) were recorded from the 1st constructional phase of Building BA2 from stratum US100 and US99 in Room A27a (SUM02A; room A27a; US100, 4 and SUM02A; room A27a; US99, 3) (Fig. 101: 4-5). The two fragments comprise a reddish yellow find compact and light red very fine contact fabric with light and pale red surfaces (2.5YR6/6 and 10YR6/4) with slip and burnishing. The diameters of the vessel are 14.0 cm and 20.0 cm and thickness 0.7 and 0.5 cm respectively (Sedov 2008a: 65,pl. 2 nos. 3-4).
Two rim fragments of table jars were recorded in rooms A37 andA32 from stratum US139 andUS113 respectively of Building BA4 from the 1st constructional phase (SUM03A; room A37, under floor; US139, 1 and SUM02A; room A32, floor; US113, 1) (Fig. 101: 6-7). The fabric is a very pale brown medium compact with inclusions and mica with slip and polishing on both sides. The external and internal surfaces are pink (7.5YR7/3) to red (10R5/6). The diameters of the vessels are 16.0 cm and 12.0 cm respectively (Sedov 2008a: 69, pl. 4 nos. 1,3,4).

A single table jar fragment was recorded from Building BA5 in the context of US151 of Room A54 from the 1st constructional phase (SUM04A; room A54; US151, 3) (Fig. 101: 8) with a red medium compact fabric with inclusions and mica with red surface (10R5/6) and flaked slip and burnishing. The diameter of the vessel is 13.0 cm and the thickness is 0.7 cm (Sedov 2008a: 71, pl. 5 no. 5).

2.5.1.6 Table bowls from Area A: Two fragments of table bowls of probable Indian or South Asian origin were recorded from the various structures/phases in Area A. These include vessels which have oval or pointed, slightly beaked rims with the profile of the upper part recalls the characteristic Rouletted Ware (RW), while the colours and treatment of the surfaces recalls the Black-and-Red Ware (BRW) (Type II.2.1b) (Sedov & Benvenuti 2002: 186, pl. 10 no. 3, pl. 22 no. 4). An example of this variety has been identified from Building BA2 from the earliest levels or 1st constructional phase (SUM02A; room A27a; US100, 6) (Fig. 102: 1) in a reddish brown fine compact fabric with external surface red (2.5YR4/6) and internal surface black (GREY 12.5/N) with slip and burnishing on both sides. The diameter of the vessel is 23.0 cm with thickness of 0.6 cm. ((Sedov 2008a: 65,pl. 2 no. 5)

Another similar variety of table bowl but without the BRW firing technique was recorded from Building BA4 in room A36/A40 from stratum US124 also in the 1st constructional phase (SUM03A; roomA36, A40; US124, 14) (Fig. 102: 2). The fabric is fine reddish compact with dark red surface (10R4/6) with slip and polishing on both sides. The diameter of the vessel is 19.0 cm and thickness 0.4 cm (Sedov 2008a: 69, pl. 4 no. 2).

2.5.1.7 Table plates from Area A: Plate vessels from Area A comprise of both table plates and cooking plates. A fragment of flat-pedestalled base was recorded from Building BA2 in room A27a from stratum US99 dating to the 2nd constructional phase (SUM02A; room A27a; US99, 8) (Fig. 102: 3) in a reddish brown fine compact fabric with abundance of mica temper, red surface (2.5YR5/6) with slip and burnishing on both sides. The diameter is 7.0 cm and the thickness 0.6 cm ((Sedov 2008a: 65, pl. 2 no. 7)

Another fragment of a table plate base was recorded from Building BA4 from the 1st constructional phase of room A33 and stratum US129 (SUM03A; US129) (Fig. 102: 4). The fabric is very fine compact light red (10R5/8) with slip and polishing on both sides and diameter of 5.0cm with thickness 0.3 cm. This includes the fragment of a ring or pedestalled base is similar to Wheeler Type 18 from Arikamedu (Sedov 2008a: 69, pl. 4 no. 4)

Two examples of cooking plates that comprise shallow dishes with thick flared rim were identified from Square A8 (streets A44 and A45) from the 3rd constructional phase (SUM03A; US22, 63 and SUM03A; US22, 55) (Fig. 102:5-6). These include fragment of upper part and rim with brown medium compact fabric with mica and grit temper with slip and burnishing on both sides. The external surfaces are brown (7.5YR5/3-4/2) and the internal surfaces are reddish brown (5YR4/3) and dark greyish brown (10R4/2). The diameters of the vessels are 19.0 cm and 22.0 cm with thickness of 1.3 cm and 0.9 cm respectively (Sedov 2008a: 97, pl. 18 nos. 9-10).

2.5.2 Indian Pottery from Trench A13

The trench A13 was dug outside the limits of the ancient town, in the corner between city wall M15 and wall M8 constituting the gate complex in order to investigate the undisturbed sequence of cultural deposits accumulated outside the defence walls of the ancient town. The four constructional phases of the site were identified in association with a sequence of cultural deposits in the south-western part of the trench, where a dozen separate layers with surfaces resembling floors were discovered (Fig. 103). Indian pottery forms from Trench 13 were identified and recorded belonging to each constructional phase (1 - 4) and its corresponding layer/stratum: 1st phase - US125, US133; 2nd phase - US59=123; 3rd phase - US94=58 and 4th phase: US93, US92 & US84.

2.5.2.1 Cooking vessels from Trench A13: Cooking vessels from the 1st phase of Trench A13 have been recorded from two contexts: US125, the deepest layer (0.8 - 1.3 m) in the trench covering the bedrock, and US133, the deepest layer in the north-eastern part of the trench (0.45 - 0.8 m). Nine cooking vessels have been recorded from these two layers comprising rims (everted thick/thin sometimes with a shallow groove on the top) and fragments of the upper portion (handi-type or rounded sides). Seven vessels come from US125 context (SUM03A; US125, 50, SUM03A; US125, 28, SUM03A; US125, 23, SUM03A; US125, 25, SUM03A; US125, 24, SUM03A; US125, 35 and SUM03A; US125, 38) (Fig. 104: 1-7), and two vessels from US133 (SUM03A; US133, 9 and SUM03A; US133, 21) (Fig. 104: 8-9). These are

composed of a reddish medium compact fabric with inclusions and/or grit temper and mica and occasionally reddish or brownish medium coarse wares. Slip and burnishing is seen on both sides of the vessels with a red (2.5YR4/8, 10R4/8)or dark brown (7.5YR3/2) or black exterior (5YR2.5/1) and red to reddish brown to dark grey (10YR4/1) interior. The diameter of the cooking vessels from 1st phase ranges from 16.0 cm - 26.0 cm (Sedov 2008b: 141, 143, pl. 4 nos. 9 - 14, pl. 5 nos. 1 - 3).

There is a general decline in the number of cooking vessels in the 2nd and 3rd constructional phases with a total of five (SUM03A; US123, 10, SUM03A; US123+125, 46, SUM03A; US59, 3, SUM03A; US123, 5, and SUM03A; US123, 11) (Fig. 105: 10-14) in the 2nd phase and three vessels in the 3rd phase respectively (SUM01A; US94, 11, SUM03A; US58, 30 and SUM03A; US58, 32) (Fig. 105: 15-17). The vessels from the 2nd phase come from the US59=123 context with a thickness of 0.3 - 0.5 m and those from the 3rd phase from US94=US58 at 0.35 - 1.0 m. The fabric of cooking vessels from the 2nd phase varies from reddish to brownish and dark red medium compact with dark grey - black core, slipped and burnished on both sides (exterior red to reddish black and grey) (10R4/8; 7.5YR2.5/1; 5YR5/1) and interior (red to brown and dark grey) (GLEY/4) and diameter ranging from 12.0 to 18.0 and 22.0 cm and thickness 0.5 - 0.8 cm. A similar variety of cooking vessels although limited in quantity were recorded from phase 3 with reddish to brownish medium compact fabric with diameters ranging from 16.0 - 18.0 cm (Sedov 2008b: 147, 153, pl. 7 nos. 6 - 10, pl. 10 nos. 11-13).

The 4th constructional phase is marked by a rise in the number of Indian cooking vessels from the previous phase. These occur in two different contexts: context US92 with a total of five vessels (SUM03B; US92, 17, SUM03B; US92, 20, SUM03B; US92, 18, SUM01A; US92, 12, SUM01A; US92, 2)(Fig. 106: 18-22) and context US84 consisting of two vessels (SUM03B; US84, 54 and SUM01A; US84, 11) (Fig. 106: 23-24). The fabric is reddish medium compact with inclusions and mica with the external surfaces ranging from red or weak red to reddish grey and reddish brown (10R4/6 and 10R4/4 to 5YR4/4 and 4/2) and interior mostly red and dark grey (5YR3/1). The diameter is from 16.0 - 19.0 cm and 22.0 - 28.0 cm (Sedov 2008b: 165, 171, pl. 16 nos. 7 - 11, pl. 19 nos. 14 - 15).

2.5.2.2 Lids from Trench A13: Only one fragment of a lid (lower part) with a projected flat-topped roof edge from recorded in the US133 context from the 1st constructional phase (SUM03A; US133,8). The fabric is reddish medium compact with red surface (1.5YR5/6) and thin wash on the exterior with diameter of 10.0 cm and thickness of 0.6 cm (Sedov 2008b: 141, pl. 4 no. 7).

2.5.2.3 Table bowls from Trench A13: A total of 4 table bowls of possible Indian origin have been recorded from the 1st constructional phases at Trench A13 from Sumhuram in US133 and US125 contexts. It appears that by the 2nd - 4th constructional phases, South Arabian and Roman table bowls completely replaced the Indian ones. The Indian table bowls from the 1st phase in Trench A13 comprise mainly of red slipped ware and black ware vessels with incurved rims (SUM03A; US133, 4 and SUM03A; US125, 40) (Fig. 107: 1-2) in a brownish and reddish medium compact fabric, and two bases (SUM03A; US125, 21 and SUM03A; US125, 30) (Fig. 107: 3-4) with pinkish coarse porous and reddish medium compact fabric respectively. The diameters of the vessels are 20.0 and 30.0 cm and 10.0 - 11.0 cm (Sedov 2008b: 139, pl. 3 12 - 15).

2.5.2.4 Table and cooking plates from Trench A13: Two varieties of plates of possible Indian or South Asian origin were recorded from Trench A13. Table plates from the US133 context in the 1st constructional phase comprising of shallow carinated form with a deep groove on the rim (SUM03A; US133, 22) as well as a complete v-shaped plate with flat base also called an oil lamp (SUM03A; US125, 7), in addition to a pedestalled base similar to Wheeler type 18 (SUM03A; US133, 2) (Fig. 107: 5-7). Cooking plates have been identified from the 3rd constructional phase of Trench A13 with shallow base and everted rims (SUM03A; US58, 34 and SUM01A; US94, 3) (Fig. 107: 8-9). The table plates have reddish fine to very fine compact fabric as well as pinkish medium compact fabric with occasional straw temper (oil lamp) and mica. The surfaces are red (10R5/8 and 2.5YR5/6) and are mostly slipped or wet smoothed. The diameter ranges from 6.0 cm - 17.0 cm with varying thickness 0.3 - 0.4 cm (Sedov 2008b: 141, pl. 4 nos. 1, 3, 6). The cooking

plates have a reddish medium compact fabric with inclusions and mica with slip and burnishing on both sides of a reddish brown (2.5YR4/4) to red or weak red surface (5YR4/6; 2.5YR4/2). The diameters of the vessels are 26.0 and 34.0 cm with a thickness of 1.2 cm (Sedov 2008b: 171, pl. 10 nos. 14 - 15).

2.5.2.5 Table jars from Trench A13: This category of tableware from Sumhuram comprises both small beakers that include small cup-like vessels with everted pointed rims and jars, often with high-necks (or sometimes constricted necks) with outturned rounded or beaked and beaded rims. In the 1st constructional phase of Trench A13, a single table jar fragment in the form of a beaker was recorded (SUM03A; US133, 3) (Fig. 108: 1) identified as Tissa Form I (Schenk 2001: 122, fig. 104). Its bell shape is reminiscent of an earlier version linked to Tissa Phases a and b that at the time was exclusively made of BRW, but the piece from Sumhuram is red fired and slipped (2.5YR5/6) (Sedov 2008b: pl. 4 no. 2).

Table jars with beaked or beaded out-turned rims (Sedov & Benvenuti 2002: 187, Type II.3.3, pl. 12 nos. 1 - 7) are recorded in Trench A13 from the 3rd and 4th phases. Type II.3.3 from the 3rd constructional phase includes two rim fragments (SUM03A; US58, 22 and SUM03A; US58, 37) (Fig. 108: 3-4) and one base (SUM03A; US58, 23) (Fig. 108: 2) (Sedov 2008b: 151,pl. 9 nos. 10 - 12). This variety continues into the fourth or final phase of Trench A13 with a total of four rim fragments (SUM01A; US93, 3, SUM03B; US93, 43, SUM03B; US93, 42, SUM03B and US93, 37) (Fig. 108: 5-8) from US93 context, one beaker or goblet as well as a grey-ware jar from US84 (SUM01A; US84, 21 and SUM03B; US84, 69) (Fig. 108: 9-10). The fabric ranges from reddish fine to medium compact with external and internal surfaces at light reddish brown and reddish yellow (5YR6/4) or red and dusky red (10R4/8; 7.5R3/8). The diameter of the vessels range from 13.0 cm - 19.0 cm and varied thickness (0.7 - 0.9 cm) (Sedov 2008b: 159, 169, 171, pl. 13 nos. 1 - 3 & 5, pl. 18 no. 9, pl. 19 no. 2).

2.5.3 Indian Pottery from Area B

The pottery from the storage quarter of Khor Rori was noted primarily in the context

of US106. This comprises the filling outside the city walls with its top made up of material dumped by the American excavation and its lower part consisting of loam mixed with large stone blocks fallen from the tops of city walls (Sedov 2008c: 174) (Fig. 109). The Indian pottery comprises kitchen vessels that constitute only 6% of all pottery shards from US106 (total pottery 107 fragments). There are two types of cooking pots: thin-walled (about 0.5 cm thick) with no neck and a rounded out-turned rim (type III.1.1; pl. 2: 7) and other thick-walled (0.7-0.9 cm thick) vessels with pointed out-turned rims (type III.1.3; pl. 2: 5, 6) (Sedov &Benvenuti 2002: 189-190). Both types were made from reddish medium fine compact fabric with black and white (lime?) bits inclusions, mica and, sometimes, grit temper. Their surfaces were slipped and burnished, and sometimes had traces of soot on the exterior (Munsell hue 5YR4/3 and 10YR4/6). The diameter of the vessel rim is between 16.0 and 24.0 cm (Sedov 2008c: 180, Pl. 2 nos. 5-7) (Fig. 110: 1-3). In general it has good parallels in the stratified pottery assemblages of the late 1st – 3rd or even 4th centuries AD from other areas of the site.

2.5.4 Indian Pottery from Area F (Building BF3 and Square A20, streets A29 & A48)

The Indian pottery from the Cultural Quarter of Khor Rori was recorded from two different structural contexts: Building BF3 (later incorporated into the *intra muros* temple) and from two streets (A29 & A48) in square A20 (Fig. 111). The Indian or South Asian pottery from Building BF3 published in Khor Rori report 2 were recorded mainly from rooms A25, A39, A41, A41b and A42. These sorted into corresponding forms within various structural contexts by the present author:

2.5.4.1 Cooking vessels from Area F BF3: The cooking pots from BF3 comprise mainly of vessels with pointed everted, rounded or squared out-turned rims occasionally with a shallow groove on top of the lip and a series of incised horizontal lines on the rim and/or body. Many of the pots seemed to have a carination on the shoulder (*handi*-type), while other forms comprise rounded or convex sides. A total of 15 vessels were noted from building BF3. Six cooking vessels were found in the context of room A39 (SUM01A; US86, 21, US86, 19, US86, 22, US86, 15, US86,

17& US86, 18). These comprise of a red medium compact fabric with white and/or dark (black) inclusions and mica with occasionally black core and evidence of soot on the exterior. The external surfaces have a red to weak red hue (Munsell 10R3/2-5/6) with slip and burnish on both sides. Special decorations include three carelessly incised South Arabian letters (+m±; f = *fhm*) on the exterior on shoulders of one of the vessels (SUM01A; US86, 15). The diameter of the vessel rims ranges from 15.0 and 22.0 and 25.0 and 24.0 cm (Sedov 2008d, pl. 4 nos. 5 - 10) (Fig. 112: 1-6).

One cooking vessel was found in the context of room A42 (SUM04A; US127, 10) (Fig. 113: 7) (fragment of upper part) and five (rims) in the context of A41b (SUM03A; US140, 6, US138, 8, US140, 5+7, US138, 4 & US138, 3) (Fig. 113: 8-12) respectively. The fabric ranges from brownish medium to reddish and dark red compact fabric with white and/or dark inclusions and mica. The core is occasionally grey or black. The external surface is reddish brown (2.5YR5/4) and red to weak red (10R4/4-5/8) and sometimes black (5YR2.5/1), while the internal surfaces range from red to dark reddish brown (5YR3/3) very dark grey (7.5YR3/1) and black, with slip and burnishing on both sides. The diameter of the vessel rims range from 18.0 to 26.0 cm (Sedov 2008d, pl. 8 nos. 4 - 9).

Only one cooking pot (Fig. 113: 13) was found in room A41 of Building BF3 (SUM03A; US126, 8) (upper part) and another one (rim) (Fig 113: 14) in room A25 (SUM03A; US80, 18). Both comprise a brownish compact fabric with white and dark inclusions respectively and mica. The external and internal surfaces differ: vessel in Fig. 113: 13 has a weak red external surface (10R5/4) with soot and reddish brown interior (5YR5/3) while the other cooking pot Fig. 113: 14 is dark greyish brown (2.5YR4/2) with internal surface dark grey (5YR4/1). These are slipped and burnished on both sides. Vessel diameter is 22.0 cm with thickness at 0.4 and 0.9 cm respectively (Sedov 2008d: pl. 18 nos. 8-9).

2.5.4.2 Storage jars from Area F BF3: Indian storage jars from Khor Rori typically comprise of out-turned bulbous rims with a ‘collar’ under it and an incised horizontal line below the rim. These have also been identified in Area A (A7) and published in Khor Rori report 1 (Sedov & Benvenuti 2002 pl. 3 nos. 2 - 3; pl. 23 no. 6). A total of

3 fragments of storage jars (two upper part fragments and one rim) were recorded in room A41 (SUM03A; US132, 1, US132, 3) (Fig. 114: 1-2) and room A39 (SUM031; US121, 1) (Fig. 114: 3). The fabric is reddish medium compact with white (lime) and dark inclusions and mica. The external and internal surfaces are light red (2.5YR6/6) to red (10R5/8) applied with a thin wash and sometimes with slip and burnished. The diameter of the rim is between 22.0 and 24.0 cm (upto 32 cm) and thickness 1.0 - 1.5 cm (Sedov 2008d: pl. 14 nos. 1-3).

2.5.4.3 Table bowls from Area F BF3: Two bowls were recorded from room A41b and A42 of building BF3 (SUM03a; US138, 10 & SUM04A; US146, 1) (Fig. 115: 1-2), recalling the shapes of typical BRW with oval or pointed, slightly beaked rims and convex sides. These have also been recorded in Areas A7, E6 and A13 of Khor Rori report 1 (Sedov & Benvenuti 2002: pl. 10 no. 3, pl. 22 no. 4). The bowls in Building BF3 were made from brownish and reddish medium compact fabric with white (limestone), dark inclusions (grit) and mica. Both surfaces were slipped and burnished; the external surface of the vessels is brown (7.5YR5/4) to red (2.5YR5/6) and the internal surface black (10YR2/1). The diameter of the rim is between 18.0 and 24.0 cm and thickness 0.7 cm (ibid 2008: 229, pl. 7 nos. 13 & 14). An additional beaked rim convex-sided vessel was recorded from room A41 made with a dark grey compact fabric with white and black inclusions and mica with a black slip (7.5 YR2.5/1) and burnish on both sides. The diameter is 24.0 cm (ibid 2008: 249, pl. 17 no. 5) (Fig. 115: 3). The grey fabric and black slip indicate that this vessel belongs to Indian black burnished (polished) ware.

2.5.4.4 Table plate from Area F BF3: A fragment of shallow carinated plate with a horizontal ridge at the point of carination was recorded in room A41 of building BF3 (SUM03A; US126, 6). The fabric is fine compact with external and internal surfaces red (10R5/8) and slipped on the exterior. The diameter of the vessel is 19.0 cm and thickness 0.4 cm (Sedov 2008d: 249, pl. 17 no. 1) (Fig. 115: 4).

2.5.4.5 Table jars from Area F BF3: Table jars with everted rim and occasional narrow neck were separated from storage jars and have also been recorded in report 1

as a special type (Sedov & Benvenuti 2002: pl. 12 nos. 1 - 4). Two fragments of a rim (SUM03A; US127, 5) from roomA42 and a square flat base (SUM03A; US138, 12) from room A41b were identified from report 2 (Sedov 2008d: 229, pl. 7 nos. 5 & 12) (Fig. 115: 5-6). The fabric ranges from reddish medium to reddish fine compact with white and dark inclusions and mica, external surfaces red (10R4/8 and 2.5YR4/8) and slip on both sides. The rim diameter is 11.0 cm with thickness 1.1 cm and the base is 4.0 cm with thickness 0.7 cm.

The core of Area F was square A20 surrounded by buildings (BF1, BF2, BF3 and BF5) on all four sides (Fig. 111), with BF1 and BF2 on the north-east, BF3 on the northwest, BF5 on the south-west and some un-excavated structures on the south-east. Two side streets ran from the corners of square A20: street A29 (7.5/8.5 x 3.5 m) to the north perpendicular to the north-eastern defence wall and street A48 (7 x 2 m) to the south-east between buildings BF3 and BF5. The Indian pottery was found in the various contexts of US98, US54, US56, US80 and US103 (Sedov 2008d: 185, 190 - 191).

2.5.4.6 Cooking vessels from Area F Square A20, street A29 & A48: A total of 29 kitchen vessels (cooking pots and/or *handis*) were identified from A20 streets A29 and A48 in Khor Rori report 2. Out of these three were recorded from the context of US98 floor (SUM01A; US98, 7, SUM03A; US98, 12 & SUM01A; US98, 8) (Fig. 116: 1-3) and one from US103 (SUM01A; US103, 2) (Fig. 116: 4). The fabric was reddish medium compact with white and dark inclusions and mica, with the external and internal surfaces were red (7.5R4/6 and 10R5/6) and pale red (7.5R6/4), with slip and burnishing on the exterior up to the rim. The diameter of the vessel is between 23.0 to 26.0 cm and 31.0 cm and thickness from 0.4 - 0.6 cm (Sedov 2008d: 217, pl. 1 nos. 9, 11 - 13).

Fourteen kitchen or cooking vessels were recorded from context US54 (SUM04A; US54, 51, US54, 52, US54, 74, SUM00B; US54, 7, SUM03A; US54, 28, SUM00B; US54, 1, SUM04A; US54, 54, SUM03A; US54, 29, SUM03A; US54, 31, SUM03A; US54, 20, SUM04A; US54, 53, SUM03A; US54, 33, SUM00B; US54, 15 & SUM04A; US54, 50). The fabric of these vessels ranges from reddish medium compact to reddish compact and occasionally greyish medium compact with white

and dark inclusions or grit temper and mica. The external and internal surfaces range from dark reddish brown (2.5YR3/3)to red (10R4/6) and dark grey (5YR4/1) to black (10YR2/1) and are slipped and burnished on both sides or on the exterior up to the rim. Both red slipped and black slipped/burnished wares are evident. The diameter of the vessels are between 14.0 cm and 19.0 cm and 22.0 cm to 25.0 cm with thickness between 0.4 to 0.7 cm and 1.0 to 1.2 cm (Sedov 2008d: 235, 241, pl. 10 no. 5 & pl. 13 nos. 1 - 13) (Fig. 116: 5-18).

Six vessels from the US 56 context comprise of kitchen or cooking vessels (SUM03A; US56, 26, US56, 14, SUM04A; US56, 32, SUM03A; US56, 11, US56, 12 & US56, 13) (Fig. 117: 19-24). These consist of fragments of rim and the upper part of the vessel composed of reddish to brownish medium compact with white and dark inclusions and mica and occasional soot on the exterior or both sides. External and internal surfaces are reddish brown (2.5YR5/4) to red (10R5/6) and weak red (10R5/3). The diameter of the rims range from 11.0 to 16.0 cm and 18.0 to 21.) com and are relatively thick from 0.4 to 0.6 cm and 1.1 to 1.4 cm (ibid 2008d: 225, pl. 20 nos. 13 - 18).

Context US80 of streets A29 & A48 consists of five kitchen or cooking vessels of Indian origin (SUM04A; US80, 60, US80, 53, US80, 55, US80, 47& SUM03A; US80, 39) (Fig. 117: 25-29). The fabric is brownish to reddish medium compact with white and dark inclusions and mica and black to grey core. The external and internal hues range from pink (7.5YR7/3) to light red (10R6/8) and reddish brown (5YR5/4) to red (7.5R4/6). These vessels are comparatively larger among the cooking vessels with rim diameter from 10.0 - 15.0 cm, 19.0 - 22.0 cm and 30.0 cm (ibid 2008d: 259, pl. 22 nos. 7 - 11).

2.5.4.7 Oil Lamps from Area F Square A20, street A29 & A48: Two fragments of oil lamps including a portion of the shallow reservoir (SUM01A; US98, 9) (Fig. 118: 1) and part of the rim (SUM01A; US56, 9) (Fig. 118: 2) were recorded from Area F (square A20 - street A29 & A48). The fabric from Khor Rori is reddish brown to brownish medium compact with white and dark inclusions as well as mica. Internal surfaces have slip or wet smoothing with hues ranging from reddish black (10R2.5/1)

to reddish brown (2.5YR5/4) and traces of soot. The diameter of the reservoir is 2.8 cm and the rim 18.0 cm (Sedov 2008d: 217, 255, pl. 1 no. 6, pl. 20 no. 2). These have also been recorded from other contexts in Arabia namely the site of Mleiha as well as in the Red Sea region. The origin of these oil lamps is much disputed as they are widely available from the Red Sea region to India and South East Asia (see Chapter 7 of this thesis).

2.5.4.8 Lids from Area F Square A20, street A29 & A48: Two fragments of Indian-style lids with a projected roof-edge both domical (SUM04A; US54, 490) and slightly flat-topped (SUM01A; US56, 10) were recorded. The fabric is reddish compact to medium compact with reddish brown (2.5YR5/4) to red (10R5/6) external and internal surface and wet-smoothing on both sides. The diameter of vessel is 16.0 cm and 20.0 cm and thickness 0.7 cm (Sedov 2008d: 239, 255, pl. 12 no. 7, pl. 20 no. 1) (Fig. 118: 3-4).

2.5.4.9 Table bowls from Area F Square A20, street A29 & A48: Table bowls from street A29 & A48 are typically convex-sided vessels comprising an incurved pointed rim and variations with a deep horizontal groove line on the neck (SUM01A; US98, 6) (Fig 119: 1), or with two horizontal corrugations (SUM04A; US54, 7) (Fig. 119: 3) or rounded incurved rim (SUM04A; US54, 36) (Fig. 119: 4). Other variations include slightly out-turned beaded rim bowls with horizontal incised line on the lip (SUM03A; US54, 30 & SUM03A; US56, 23) (Fig. 119: 2, 5). These five vessels comprise of fragments from both upper and lower portions and are composed of red compact fabric with mica and/or white and dark inclusions. The external and internal surfaces are red (10R5/6, 2.5YR5/6) and occasionally black 7.5YR2.5/1) on the exterior with slip and burnishing on both sides. The diameter of the vessels are from 13.0 to 14.0 cm and 22.0 to 26.0 cm (Sedov 2008d: 216, 237, 255, pl. 1 no. 7, pl. 11 nos. 13, 14 & 16, pl. 20 no. 8).

2.5.4.10 Table jars from Area F Square A20, street A29 & A48: Three fragments of table jars were recorded: A table goblet with reddish fine compact fabric with light reddish brown exterior (5YR6/4) and light red interior (2.5YR6/6) with traces of slip

on both sides (diam. 12.0 cm) (Sedov 2008d: 237, pl. 11 no. 11) (Fig. 120: 1), a table jar with a outward flaring tapering rim with a horizontal incised line and constricted neck (SUM04A; US80, 46) (Fig. 120: 2) and composed of a brownish compact fabric with white and black inclusions and mica, with a red (7.5R5/8) exterior slipped and light reddish brown interior (5YR6/4) and finally the third is a fragment of upper part of a table jar with everted rim and four incised lines at the shoulder (SUM03A; US80, 41) (Fig. 120:3) with reddish compact fabric and red exterior (10R4/8) and reddish brown interior (2.5YR5/4), slipped and burnished on the exterior. The diameter of the vesselsare 15.0 cm and 10.0 cm and thickness 0.8 cm (Sedov 2008d: 259, pl. 22 no. 1-2).

2.5.4.11 Table plates from Area F Square A20, street A29 & A48: Three fragments of table plates were recorded: Flaring wide v-shaped plate with a squared base (SUM03A; US54, 34) (Fig. 120: 4), the base fragment of a similar vessel (SUM04A; US54, 38) (Fig. 120: 5) as well as a shallow convex-sided cooking plate with a rounded everted rim with a groove on top (SUM04A; US80, 59) (Fig. 120: 6). The fabric ranges from brownish medium compact to fine compact for the v-shaped plates and reddish medium compact for the cooking plate with red and light reddish brown slip on exterior or sometimes both sides (2.5YR5/4-5/8 and 10R4/8-5/6). The diameter of the v-shaped plate is between 7.0 - 13.0 cm and the convex-sided plate is 33.0 cm (Sedov 2008d: 237, 239, 259, pl. 11 no. 12, pl. 12 no. 2, pl. 22 no. 12).

2.6 Primary study of the Indian pottery fabric from Sumhuram

A visual examination of samples of Indian pottery fabric was undertaken as part of the present thesis in order to establish a detailed identification and interpretation of the categories of Indian pottery documented from previous research at Khor Rori (Sumhuram) (Yule and Kervran 1993; Sedov & Benvenuti 2002; Avanzini ed. 2008; Pavan 2011; Pavan & Schenk 2012). These particular samples are not inclusive of all the Indian or South Asian fabric classes represented at Sumhuram, but comprise a selection of wares that are significant for the assessment of trade relations and contact between India and Sumhuram as well as for cross-referencing with similar

material from other sites within Arabia and in India to determine source/provenance. They include samples from a total of five wares or fabrics including 3 varieties of coarse wares and 2 types of fine wares. The samples examined include:

2.6.1 Rice-tempered Ware (Sample nos. SUM 10C; US174, 194& SUM 10C; US174, 192)
2.6.2 Black Burnished Ware (BBW) (Sample nos. SUM 10C; US174, 163& SUM 10C; US174, 189)
2.6.3 Shell-tempered ware (Sample no. SUM 10C; US470, 16)
2.6.4 Black-and-Red Ware (BRW) (Sample no. SUM 10C; US174, 78)
2.6.5 Fine Indian Ware (FIRE) (Sample nos. SUM 11A; US174, 295 & SUM05B; US174, 77=63).

2.6.1 Rice-tempered Ware

Description: Rice-tempered ware is a distinctive class of handmade pottery with slightly uneven thick walls (c. 10mm) but light in weight resulting from rice and other organic additives used to produce vessels. These wares have also been referred to as the so-called "light ware" or "spongy ware" (Tomber et al. 2011a; Lippi et al. 2011). At Khor Rori these wares may be chronologically attributed to the 1st - 4th century AD (Lippi et al. 2011: 1174).

Shapes and Forms: This ware is usually represented by a type of Indian cooking pot today known as the *handi* (Tomber et al. 2011a: 360). In addition to this, the main pottery shapes of rice husk tempered pottery originally discovered from the Red Sea ports of Quseir al-Qadim (Myos Hormos) and Berenike comprise of restricted forms including carinated plates and other cooking vessels. The samples of rice-tempered ware examined in the present research belonged to a typical form of a shallow plate with everted rim and thick ridge below the neck with a carination at the shoulder (SUM 10C; US174, 194), a *handi* with a squared externally projecting rim with a series of ridges on the shoulder above the point of carination (SUM 10C; US174, 192) (Fig. 121).

Surface Treatment: At Khor Rori, the rice-tempered wares originally recorded by Sedov and Benvenuti (2002: 189-190) consists of reddish brown or brown wares with slip and burnishing on both sides or, slip on both sides and burnishing restricted to the exterior and top of the rim. Evidence of soot was visible on the exterior indicating their use as cooking vessels.

Fabric: The macroscopic appearance of the surface of this ceramic consists of a red matrix with white, earth-like, elongated inclusions that are generally iso-oriented (Lippi et al 2011: 1175). Tomber et al. (2011a: 360) have noted that these wares are characteristically black, although sometimes with red or buff surfaces or margins. The core is sometimes grey or black due to the ill-firing. The most distinctive aspect of this ware is the identification of the organic inclusions as rice husk and stem. With regard to the two samples studied in the present research, these were examined under a portable microscope (dino-lite AM4113ZT) at magnification levels varying from 52-75x). The presence of rice husk has been noted by the occurrence of white inclusions, the size and shape of which vary. These include typically documented features including a) linear or curved particles of rice chaff with scalloped edges and b) elongated features characterized by longitudinal ridges and furrows that represent detrital crop residues or food processing waste (see Tomber et al. 2011a: Fig. 5 D-F). Voids were also visible in the fabric indicating plant material that may have burned out during the firing process. It has been previously noted that plant fragments of the *Poaceae* family will often start to burn out at 600^{o}C-800^{o} cleaving characteristically shaped voids. However the presence of silica within the plant cells increases the capacity of the organic inclusions to survive the higher firing temperatures and repeated use as cooking vessels (Tomber et al. 2011a: 363). On the whole, the plant temper still visible forms 12-26% of the total surface and, if the voids resulting from complete or near complete oxidation are to be considered then it is hypothesized that the total plant temper could have amounted to 34% of the surface (Lipp et al. 2011: 1175). The mineralogical composition of these samples comprises of visible glassy grains of quartz, rectangular or subrectangular crystals of feldspar in addition to small amounts of white mica. Carbonaceous material is also noted in the fabric. Additionally ferromagnesian minerals (pyroxene and hornblende), plagioclase and clay pellets have been noted (Tomber et al. 2011a).

Discussion: Analysis of the rice-tempered wares from Khor Rori has revealed that the absence of stem or leaf fragments suggests the use of by-products of the last stage of rice processing. The use of plant by-products implies abundance in the territory and the diffusion of the cultivation of a special cereal, providing useful information regarding geographical provenance, particularly when the worldwide distribution of that cereal (in this case of rice) is restricted (Lippi et al. 2011: 1177-1178). On the other hand, although using crop or food processing residues of rice for tempering pottery might simply be an economic measure in regions where rice is readily available, the technological significance of using this particular type of temper should not be underestimated. As an organic component within the clay matrix it serves to open up the pottery, particularly for cooking pots. This helps to reduce thermal shock within the vessel during firing and in subsequent re-uses of the pottery over cooking fires. Furthermore, the frequent presence of silica within the rice husks contributes to the technological properties of the fabric. The range of variability in the matrix and quantity of rice husk temper suggests that these fabrics were made on a small scale, possibly even in the home as a seasonal activity. The common occurrence of clay pellets indicates that the clay was not carefully prepared; alongside this are the somewhat uneven colours that could result from a bon-fire (Tomber et al. 2011a: 363 - 364).

Parallels: The analysis of temper deliberately added is crucial for the identification of the area of provenance (Lippt et al. 2011). Although India (particularly Gujarat) was verified as the most likely source, the tracking of this ware began from a westward direction, where this organic-tempered ware is found throughout the sequence at Quseir and Berenike in the Red Sea region and the combined sequence at these two sites indicates an Early Roman date for the ware in Egypt, i.e., between the late first century BC/early first century AD and the third century AD (Tomber et al. 2011a). Parallels for this vessel beyond the Red Sea were identified based on publications from Ras Hafun (Somalia, ancient Opone) (Smith & Wright 1988, nos. 8h - j), Qana (Yemen) (Davidde et al. 2004, Fig. 9, no. 3, 8) and Khor Rori (Oman, ancient Sumhuram) (Sedov & Benvenuti, 2002, e.g. Pl. 16, nos. 1- 4). Rice-tempered ware from India belongs to a longer tradition of black-burnished pottery and the mention of husk as tempering has been recognized at Baroda (Subbarao 1953, 36, near Fig.

14, nos. 2, 5, 5a; Fig. 15, no. 12) and Kamrej (Gupta 2004, 47, e.g. Fig. 6, no. XXIX, Fig.11, nos III, X), Prabhas-Somnath (Nanavati et al. 1971), Hathab (Pramanik 2004), Nagara (Mehta 1968, near Fig. 21, no. 36) and Dhatva (Chowdhary 1975, Fig.15, nos. 103 - 105).

2.6.2 Black Burnished Ware (Ware Code: BBW)

Description: Black Burnished vessels at Khor Rori (Sumhuram) consist of rare pieces of fine black ware (Pavan & Schenk 2012: 196) and a semi-coarse to coarse black ware with a burnished black slip.

Shapes and Forms: Fine black Ware, rare at all times, is always restricted to table-ware with shapes corresponding to the contemporary main imported wares at Khor Rori (Pavan & Schenk 2012: Fig. 1 nos. 8-9). Some of these forms correspond to the Black-and-Red Ware tradition of rimless bowls with squared incurved lip. This form of incurved wall rimless bowls also occur in the coarse BBW fabric (Sample no. SUM 10C; US174, 163) (Fig. 122). However the most common form amongst the coarse Indian pottery at Khor Rori is a cooking pot with a distinctive everted rim reminiscent of a similar tradition of BBW forms in early medieval period at Kush in the 7th/8th century AD (see Kennet 2004: 65-66). The sample from Khor Rori comprises of a rounded externally projecting rim with a groove running along the middle of the lip and a constricted neck with ridge-lines on the interior of the vessel (SUM 10C; US174, 189) (Fig. 122).

Surface Treatment: In the case of the black burnished fine ware, the slipped surface is remarkably well preserved due to a hard firing. The external surface has a black slip on the exterior of the vessel and interior upto the rim and neck portion. The slip often flakes and erodes and burnishing lines are often visible on the surface.

Fabric: As mentioned earlier, two samples of BBW from Khor Rori were examined under a microscope at 52-56x to identify and distinguish between natural inclusions and intentionally added temper. Preliminary observation in sample SUM 10C; US174, 163 include voids detected on the surface and core of the fabric. These voids comprise elongated cavities with striations down the length indicating grass or straw inclusions and air holes. The mineral inclusions in the sample consist of white mica

(muscovite) and clear/white grains of quartz/quartzite. Other white inclusions could also indicate siliceous plant material that remained in the fabric. In addition to this, dull black inclusions were visible in the fabric consisting soft, rectangular and laminated inclusions of organic or carbonaceous material. BBW sample SUM 10C; US174, 189 is part of the tradition of burnished wares tempered with inclusions of rice husk. These are mostly seen as curved particles with scalloped edges as well as cellular inclusions with longitudinal ridges or furrows. Other varieties of plant-based temper also complement the rice inclusions in the fabric. Mica and other mineral particles are present in the fabric.

Discussion: The presence rice husk inclusions in BBW from Khor Rori also indicate that these vessels belong to a tradition of black burnished wares from India and more precisely from the area in and around Gujarat (Tomber et al. 2011a). On the other hand, the sample of BBW from Khor Rori without the inclusions of rice temper is likely to have a wider geographic source within the Indian subcontinent and beyond.

Parallels: Kevran reports the occurrence of Black or grey wares with mica, black slip and burnishing from Suhar (Kevran 2004: Fig. 8:11, Fig. 9: 9-10; Fig. 10: 20; Fig. 14: 7,11), although their quantity increases in the later levels (18% - 24%) (Kevran 2004: 40-42). Fabric and form parallels can be ascribed to sites in southwestern and western India particularly Kerala, Gujarat (for the rice-tempered black burnished ware) and Maharashtra up to the Sind region. Other generic forms of BBW including *handi*-type cooking vessels, bowls with incurved walls and lids have been noted in publications from Maharashtra including Ter (Chapekar 1969: Fig. 17, 22: Type 40 - 45) from Period II levels (1st -3rd cent AD) and black-slipped globular pots from Nevasa (Sankalia et al. 1960: Fig. 140: T.104 & 104a) in Period V levels (50 BC - 200 AD).

2.6.3 Shell-tempered Ware

Description: This ware designated as part of the Dhofari tradition of wares is characterised by pottery with reddish/buff fabrics which usually employs, as temper, crushed shells or calcareous microfossils, with upto 2-3mm in diameter, never wheel-

made (Pallecchi & Pavan 2011: 85).

Shapes and forms: Sedov and Benvenuti (2002:15 nos. 4-6) noted a category of cooking vessels with out-turned beaked rims, an elongated body and carination in the lower part, with white inclusions of lime bits or crushed shells. These vessels resemble a variation of the Indian *handi* or cooking vessel. Also a single fragment of a handmade jar with out-turned pointed rim, spherical body and round bottom with 'a large amount of white (shell temper?)' was discovered in Area 7 (Sedov & Benvenuti 2002: Pl. 18 no. 1).

Surface treatment: The surface of the vessels were slipped and burnished with shells or pebbles by rubbing the surface when it is still wet. The exterior was incised with particular decorations (dot-in-circle, rosettes, chevrons, slashes, wavy lines etc.) made after the burnishing of these vessels. These decorations were made with sharpened tools or with a rouletting technique (Pallecchi & Pavan 2011: 86). A few examples of these wares were also present without any slip, decoration or burnishing.

Fabric: Visual examination of sample no. SUM 10C; US470, 19 indicated that the principle inclusions in the fabric comprise of shell indicated by plate-like laminated or curved features as well as with structures at right angles to the surface. In some examples the temper appears to be a combination of ground shell and mineral grits. Additional inclusions, in smaller quantities, visible under a microscope include transparent and translucent quartz/quartzite, brown flint? and limestone. The shell temper is present throughout the exterior and interior of the vessel including the rim portion. The average size of the shell inclusions ranges from 2-3mm. These are well-sorted and their frequency is abundant (40%) (Fig. 123).

Discussion and parallels: In the Dhofar region in terms of ceramics, associated material appears to be primarily either grit or shell-tempered (Zarins 2001: 87). Such vessels were found at Ayn Humran and at several other coastal and inland sites in Dhofar including the boat-shaped burial sites that were identified by Zarins as 'Iron Age Local Wares" (Zarins 1997: 664-666). The subsequent layers at Shisr in the Nejd dating to the post-fourth century AD revealed evidence of local buff wares with 'crushed shell temper' and applied punctuate design (Zarins 1997). In the Islamic

period at the site of al-Baleed, the pottery assemblage comprises of local coarse wares 1 and 2 made from 'mineral grit and ground shell visible on the interior and exterior of the pottery (Yule & Mohammed 2000). Moving to southeast Arabia, the site of Mleiha has the only documented collection of shell-tempered vessels in the Arabian Peninsula outside of the Dhofar region. Smith and Wright (1988: 122, Fig. 5l) had previously reported the presence of a small carinated vessel (with everted rim reinforced by scalloping) at Ras Hafun (Somalia) in a shell-tempered dark grey fabric. These vessels comprising abundant shell inclusions that seem to be intentionally added to the temper. *Hand*i-type cooking vessels as well as a few examples of storage jars predominantly represent the main forms for the shell-tempered ware at Mleiha. The evidence of this typical Indian vessel form (*handi*) produced in the shell-tempered fabric will be discussed in more detail in Chapter 7.

2.6.4 Fine Indian Ware (Ware Code: FIRE)

Description: At Khor Rori, FIRE represents a class of wares nearly identical to vessels often identified as "Indian Red Polished Wares (RPW), but the quality of the pieces, especially the rather weak treatment of the surfaces and the sometime poor firing, makes this identification rather dubious. Instead they are referred to as Indian-style table jars (Sedov & Benvenuti 2002: 187).

Shapes and Forms: Sedov and Benvenuti (2002: Pl. 12: 1-7) have noted that the shapes and dimensions of this fabric are nearly similar to RPW. Vessels usually consist of table jars and bowls with a beaked or beaded out-turned rim varying from 11-16 cm to 23-26 cm diameter.

Surface Treatment and Decoration: The surfaces are slipped and burnished. Mica is abundant and clearly visible on the surface through the slip. Unlike the typical RPW the Fine Indian Ware has a weak slip that erodes and often flakes at places. Burnish streaks are visible on the surface of some samples. The fabrication of this pottery never achieved the glossy criterion of RPW.

Fabric: The clay used was medium compact, sometimes even coarse, with a considerable amount of vegetal and mica temper together with white (lime bits) and black (grit) inclusions (Sedov & Benvenuti 2002: 189). Two samples of Fine Indian

Ware from Khor Rori were examined under a microscope at magnification levels varying from 40x - 55x. Variations in fabric were noted ranging from red to reddish-brown fine compact paste (SUM05B; US174, 77=63) to a sandy/silty fabric (SUM11A; US174, 295) (Fig. 124). The dark grey core in the section of some fragments clearly testifies to the poor firing. In addition to the mica particles in the fabric, both samples appeared to consist of abundant white inclusions. Additional mineral particles identified are quartzite (white glassy grains) and particles of lime/limestone (irregular lumps). Both samples comprise reddish-orange clay-like, rounded, soft inclusions indicating grog or clay pellets in the core.

The sizes of the white inclusions range from 0.150mm - 0.230mm and 0.260mm - 500mm for the medium grains (53x), 0.046mm - 0.099mm for the lime bits (53x) and mica particles at 0.080mm - 0.240mm (40x). The red inclusions, grog or clay pellets measure from 0.500mm - 0.800mm (53x). Based on the grain-size, the inclusions denote coarse silt to medium sand sediments. The frequency of the inclusions is moderate (15%).

Discussion: Based on preliminary study of the fabric, it is evident that some variations are present between RPW and FIRE wares. More detailed study including a re-examination of the RPW from Indian sites is now required to identify these fine wares (of probable South Asian origin) and to classify them as a separate category of wares (for a more detailed assessment see chapter 7).

Parallels: Fragments of similar wares have been found in the strata of “middle” (BA-II) period at Qana, at Ras Hafun Main site (Smith & Wright 1988: figs. 6e, 8e), Quseir al-Qadim (Whitcomb & Johnson 1982: pl. 13e), Suhar (Kervran & Hiebert 1991: fig. 4 nos. 17-18) and Kush (Kennet 2004: 90). Parallels from India were sought in the material from Arikamedu (Wheeler et al. 1946: fig. 28; type 69), in the collection of coarse red wares from early and middle levels of Period II at Amreli (Rao 1966, pp. 65-68, fig. 15: 1,2,9,18,24; fig. 16: 28,29) and the early historic period at Ahar (Sankalia et al. 1969, p. 159; figs. 94: T271, T272).

2.6.5 Black-and-Red Ware (Ware Code: BRW) and Rouletted Ware (Ware Code: RW)

Definition: Black-and-Red Ware (BRW) is the diagnostic Early Iron Age pottery of Southern India and Sri Lanka from the beginning of the Iron Age or even earlier (Begley 1983; Gupta 1995: 51; Schenk 2001: 126-136). The BRW technique was widely used in Sri Lanka and southern India during the second half of the first millennium BC. BRW were made using a firing technique that was employed in pottery workshops all over the southern region of South Asia at this time. The clays, when fired under reduced, inverted conditions turn black on the inside (with the black colour overlapping rim) and red on the outside over the remaining part of the body and may be considered an imitation of RW pottery (Pavan & Schenk 2012: 192, 195). Identified at Arikamedu as Wheeler Type 1, Rouletted Ware (RW) is primarily a grey ware and the only shape in it is a dish (Wheeler et al. 1946; Begley 1992: 176). A simple featureless rim also occurs at Tissamaharama (Sri Lanka) (Schenk 2006: 129).

Shapes and Forms: At Khor Rori, forms include a bowl/dish with an oval or pointed, slightly beaked rim recalling 'the profile of the characteristic Rouletted Ware (RW), while its colour and treatment must be linked to BRW (Sedov & Benvenuti 2002: p. 186; Type II.2.1; Type II.2.1b).

Surface Treatment and Decoration: Traditional BRW technique involves the application of the slip in a single layer. The surface is remarkably well preserved due to hard firing and usually has a brilliant gloss. RW is usually slipped and often has a lustrous surface, which are either brown or black or red and gray in colour, with a predominantly gray core. Based on these surface colours, the ware is akin to the firing technique of BRW (Begley 1992). The base fragments of true Rouletted ware (RW) fired in the BRW technique were often decorated. The most distinctive feature of RW is its decoration that was believed earlier to have been made with a roulette, but the study of contemporary village techniques in India has indicated that the tool used was not a roulette but a sharp pointed implement which, when held against the wall of the vessel and allowed to jump or chatter as the vessel rotated on the wheel, would have produced the desired indentations (Begley 1988: 434-438)

Fabric: BRW technique is often used on pottery forms (including true RW, Wheeler types 10 & 18 etc.) that is made from a fine grey paste and have been grouped under the term 'Fine Grey Pottery of North Indian Origin' (Schenk 2001: 71-73). Falling into a different category are rim fragments that are of a shape identical to RW but have coarsely textured clay, sometimes with a partly blackened core. Both qualities were made using the firing technique of Black-and Red Ware (BRW) (Pavan & Schenk 2012: 194). The sample examined in the present thesis (SUM 10C, US174, 78) appears to belong to the latter category of coarse fabric. The sample belongs to a typical convex-sided bowl incurved pointed rim that is fired partially black and red. The fabric is tempered with sand and mica and large quantities of plant/vegetal temper, indicated by elongated white inclusions. Some organic yellow inclusions were also noted, but could not presently be identified. The surface has a light slip that is well burnished (Fig. 125).

Discussion: The single sample examined in the present research indicates that it probably belongs to a category of imitation RW that was often of similarly high quality as the true RW, but a cross-sectional examination of the fragment has revealed the differences both in colour and the high temper content. Moreover, the base fragments of coarser quality are never decorated. This indicates the emergence of the two varieties: decorated true RW and the coarser imitation, the latter which is a less refined, local production from all over southern Indian and Sri Lanka where BRW tradition existed. Alternatively, however, the examined sample could also indicate imitation BRW from the subcontinent and not RW. The manufacture of RW is restricted from the 3rd century to the 1st century B.C. at the latest. Imitations in local BRW emerge in the 1st century B.C. as evidenced in many contexts at Tissamaharama (Schenk 2006: 140-141).

Parallels: The origin of RW is still disputed, probably due to the failure in the past to differentiate between imported ‘true’ RW and the coarser imitations (Schenk 2006: 127). Imitation RW was certainly produced in many places and belongs to the southern South Asian variety of forms. On the other hand, a study by V. Gogte (1997, 2001) revealed that the very fine gray clay of the true RW (that is also typical of NBP) is certainly not of South Indian provenance, as demonstrated in the XRD

analysis of RW fragments from several South Indian sites as well as from Chandraketugarh and Mahasthangarh near Bay of Bengal. For parallels, Gogte compared these with BRW samples from Tissamaharama. The study identified a source for the clay used in the fine grey pottery as located in northern India, a site on the Ganga Plain (Gogte 2001: 199). In the light of different material analyses, one indeed must accept that "Fine Grey Pottery" doubtless was not produced in southern India and Sri Lanka. Alternatively, P. Magee undertook a re-evaluation of geochemical data wherein Group A comprising of RW from Arikamedu and Greyware from Anuradhapura was most likely produced somewhere in south-eastern India and Group B consisting of RW from Anuradhapura was produced somewhere in Sri Lanka, probably in the northern part of the Island (Magee 2010: 1048-1050). A more detailed discussion of Black-and-Red Ware/ Rouletted ware is provided in Chapter 7 (section 2.3)

3. Qana' (modern Bi'r Ali)

3.1 Introduction

The ruins of a settlement identified as the ancient Hadrami city-port of Qana is situated on the southern coast of the Arabian Peninsula near the modern village of Bi'r Ali on the opposite side of a beautiful bay, at the foot-hill of the black volcanic rock called Husn al-Ghurab, probably one of the best landing places on the southern coast of Yemen (Sedov 2007: 71). The ancient site covers 500 m in length and a maximum width of 300 m. The water supply was provided by several wells, supplemented by four cisterns dug at the top of Husn al-Ghurab. Several factors that indicate Qana as a commercial and port site include the presence of a lighthouse on top of Husn al-Ghurab, the stone anchors found in the port, warehouses that dot the lower city, as well as imported pottery (Schiettecatte 2008). The coast of Qana sees the summer monsoons but derives almost no benefit from them; the average rainfall is 64.3 mm at Mukalla, about 100 km north-east of the site (Mouton et al. 2008: 197). Sedov (1997: 368-369) comments that the location of Qana is rather surprising owing to the presence of sand, black stones, salted water even in the wells and very

little vegetation and the fact that there were more pleasant and suitable harbours for ships and settlement further east. The explanation therefore for the location of Qana were good caravan roads connecting this site to the other south Arabian towns (the capital Shabwa along wadi Hajar full of sweet water and Mayfaat, the chief town of the region of al-Mashriq) as well as the bay of Qana being a favourable place for coming ships as it was impossible to miss (ibid 1997: 369).

Qana was first seen by the Europeans in 1834 and mentioned for the first time by Lt. J.R. Wellsted in his book published in London describing a vast settlement at the at the foothill, a fortress on top of Husn al-Gharub, and the find spot of the famous South Arabian inscriptions now known as CIH 621 and CIH 728, which identify Mawiyat Bi'r Ali and Husn al-Ghurab as the ancient names of Qana (Wellsted 1838 quoted by Mouton et al. 2008: 197). According to some scholars, the earliest mention of Qana occurs in the Bible (*Ezekiel* xxvii, 13) and can be dated to the first quarter of the 6th century BC (Doe 1961: 182). The site was also known to Pliny (Natural History, 6, 36, 104) and Claudius Ptolemy (Geography 6.7).

3.2 Excavations and stratigraphy at Qana

Following the discovery of Qana in 1834 by British naval officers, in 1961 the first sketch-plans and detailed description of the ruins was published (Doe 1961: 191-198). The archaeological investigations started in 1972 by Soviet archaeologist S.S. Shirinskij, when the architectural remains of a large building partly excavated at the highest point of Husn al-Ghurab were identified as a temple of a local deity and suggested a first century BC for its foundation (Shirinskij 1977: 202-205 quoted by Sedov 1997: 369). Since 1985, systematic excavations at Bi'r Ali settlement have been carried out by the Russian Archaeological Mission to the Republic of Yemen, which until the end of 1991 was called the Soviet-Yemeni Joint Complex Expedition (Sedov 1992, 1996, 1997, 2007; Salles & Sedov 2010). For three seasons from 1995 to 1997, the French archaeological expedition to the Jawf-Hadramawt was directed by M. Mouton (CNRS) as a joint programme with the Russian Archaeological Expedition to the Yemen to facilitate a geomorphological study as well as topographic and archaeological mapping of the site (Mouton et al. 2008). Under

water surveys of the harbour were carried out from October-November 1996 and January - February 1998 by the Italian Institute for Africa and the Orient (Davidde & Petriaggi 1998; Davidde et al. 2004). Through several field seasons of the Russian Archaeological Mission it has been possible to identify Qana's structures as well as the chronological and territorial limits and stratigraphy of the cultural deposits: the *Lower City* including separate structures outside the city limits; the *Citadel* on the summit of Husn al-Ghurab; and the Necropolis on the north-western edge of the city (Sedov 1992, 2007) (Fig. 126) However, the most comprehensive publication available on the archaeology of Qana is the results of the Russian-Yemeni excavations conducted from 1972 to 1994 which discusses the archaeological work on the different areas of the ancient city including complete architectural and stratigraphic study of more than 2000 artefacts (Salles & Sedov 2010).

(i) Lower City

Fieldwork by the Russian Archaeological expedition in the Lower City was concentrated on the tell in the form of a rectangle (300 x 500 m) that constitutes the main part of the city and consisting of two parts: the north-western and south-eastern. The ruins of numerous houses can be seen in this part of the settlement. Ordinary dwellings consisted of several (2-3) small cells connected by passages with separate entrances. The larger buildings of the elite were formed of adjacent cells and separated from each other by small, narrow streets or side streets, and concentrated on the northern and north-eastern parts of the settlement. The number of houses is estimated to more than one hundred (made of black basalt blocks and porous limestone slabs and roofs with wooden poles, palms). The structures in the northeastern and southeastern parts of the site were different and comprised large multi-roomed buildings with enormous enclosed courtyards. There was no regular system of town planning. No traces of city walls were identified and only some parts of the ancient town were fortified. One of the well-fortified areas was situated at the foot of Husn al-Ghurab leading to the fortress on the summit. Three structures lie outside the city limits: The western structure (44 x 64 m), suggests that it was a temple dedicated to Syn, the principal God of Hadramawt dated to the 1st century AD. Northwest of the Lower City, a building was excavated which also appears to

have had a religious function by both the plan and nature of the finds (frankincense, marble sacrificial table, stone receptacle for ablutions, Hadrami coins etc.) in addition to a Greek inscription suggesting that it was a synagogue (Sedov 1992: 112, 2007: 74). The largest of the buildings in this sector was the fortified warehouse, its use confirmed by the very large quantity of incense deposited in wicker baskets. The warehouse was positioned at the foot of the slope and defended by the fortress built on the summit of the promontory (Mouton et al. 2008: 201; Salles & Sedov 2010).

(ii) Citadel

The citadel comprises the remains of the fortress 'Urr Mawaiyat located to the northwestern part of the summit of Husn al-Ghurab, in addition to a lighthouse for incoming ships (partly excavated in 1972), as well as four huge water-tanks, rectangular or square in shape (Sedov 2007: 74).

(iii) Necropolis

A large cemetery was founded to the west of the settlement and northwest of the Lower City with 15 burial structures indicated by oval-shaped underground crypts used for collective burials, most of them completely ruined. On the surface the crypts were marked by rectangular stone structures about one metre high and excavations suggest they were family tombs (Sedov 1996: 18, 2007: 74).

(iv) Stratigraphy

Excavations and soundings in the various parts of the settlement revealed three main phases of Qana/ Bi'r Ali's occupation: the 'lower' (BA-I), 'middle' (BA-II) and 'upper' (BA-III) periods (see Sedov 1992, 1996, 2007).

The lower period comprised the earliest structures of the site at the foot of Husn al-Ghurab (Area VI) including the building remains with adjoining large rooms (90 sq. m) near the path leading to the fortress, the lighthouse on the summit as well as the possibility of some houses on the northern slope (Fig. 127). Based on the preliminary analysis of mostly Mediterranean material, the lower (BA-I) period of Bi'r Ali can be placed between the second half of the 1st century BC and middle or late 1st century AD (Sedov 1992: 116; Sedov 2007: 79).

The middle (BA-II) period comprised the big multi-roomed dwellings with enclosed courtyards (Areas II and VI), shops (Areas IV and VI) and the two religious buildings: the synagogue and the temple of Syn (Areas III and VII) as well as the necropolis. It appears that the fortress 'Urr Mawiyat and lighthouse were still functioning and some of the structures were built on the ruins of previous structures (i.e. Area VI) (Fig. 128). The dating of the BA-II period can be placed between the 2nd and 5th centuries AD (Sedov 1992: 114; Sedov 2007: 86).

In the 'upper' (BA-III) period, Qana occupied the southwestern and central part of the settlement characterised by the elite multi-roomed houses separated by narrow streets (Sedov 2007: 86). In all probability the settlement in the Lower City was abandoned around the early 7th century AD (Sedov 1997: 376). The occupation of the upper periods of Bi'r Ali should be placed between the 6th and early 7th centuries AD (Sedov 2007: 89). Yet according to Power (2010: 81) the chronology of Sedov's Upper or Late Period, either between the fifth or sixth century and the early seventh century, seems rather high and in need of revision. He instead proposes a late fourth century date as much more likely for the lower limits of Sedov's Late Period, based on the ceramic evidence from the chronology of the Aila Amphorae.

3.3 Desk-based study of Indian pottery from Qana (Bi'r Ali)

Imported pottery at Qana was dominant in all strata from the settlement and added up to 75% of all pottery finds. The assemblage is rich and diverse with sources from the Roman world, East Africa, India and Mesopotamia all well represented (Sedov 1996; Sedov 2007: 76-90). The dating of the various phases of occupation at Qana was based on this preliminary analysis of the pottery assemblage. The presence of Indian pottery at Qana is attributed to a limited quantity in the earliest period (BA-I), leading to a steady rise in the number of vessels of Indian origin in the middle (BA-II) period, followed by a complete absence of Indian wares in the final 'upper' (BA-III) period. For the purpose of a desk-based collation of Indian pottery, several published articles (Sedov 1992, 1996, 1997, 2007; Davidde et al. 2004; Mouton et al. 2008) and a recent report on Qana (Salles & Sedov 2010) have been referred to in this research thesis:

3.3.1 Indian pottery from the 'Lower' (BA-I) period

During the 'lower' period, storage vessels were dominant in the pottery corpus. These include both imported amphorae like Koan-type or Eastern Aegean (Dressel 2-4), Egyptian and Campanian types (58% of the assemblage) as well as locally-produced handmade vessels 'zirs' (25% of the finds). Additionally fragments of thick-walled storage jars of the Gulf-type or Ed-Dur type of 'black and grey ware' were found in this strata. Fine ware or tableware was represented by Roman eastern sigillata as well as rare Nabatean painted wares (Sedov 1992: 116; Sedov 2007: 76-77).

With regard to Indian pottery, a few pieces of fine slipped pottery, which show similarities with Indian Red Polished Ware (RPW), Rouletted Ware (RW) and Black-and-Red Ware (BRW) occur in the stata of the 'lower' (BA-I) period (Sedov 2007: Fig. 4.11 nos. 3-9; idem Sedov 1996: Fig. 4 no. 19) (Fig. 129: 1-7). Two fragments of upper part of the bowl or lid, made with red paste with dark and white inclusions (diam. 15-16 cm) recorded in Area VI, room 5a (Salles & Sedov 2010: 199; fig. 86 nos. 832-833) (Fig. 129: 8-9). The form is similar to the typical Indian-style lid from the Middle (BA-II) period, but the occurrence of these two fragments in the BA-I period could indicate a local product or Egyptian source. Similarly a group of cooking jars or pots in a dark red medium fabric with red slip and burnishing on the exterior and top of the rim as well as thee horizontal incised lines were recorded from the same BA-I context (Area VI room 1a and 5a) (Salles & Sedov 2010: 215, fig. 92 nos. 902-907) (Fig. 130: 10-15). Although these vessels are recorded as Indian cooking pots in this thesis, it is also likely that they represent Egyptian red slipped wares.

The assemblages resulting from the underwater surveys from Qana supplement this corpus of Early Roman pottery types with additional Indian vessels identified (Davidde & Petriaggi 1998; Davidde et al. 2004). Several of these coarse red ware vessels were judged as Indian productions based on archaeological parallels. Some samples of coarse wares were also subjected to thin sectioning and study under a petrographic microscope which showed evidence of a common fabric, suggesting a

common source or at least in the same region (Davidde et al. 2004: 88, 94). The pottery of possible Indian production from the 'lower period' of Qana recorded during the underwater surveys has been documented in Table 4; Fig. 131: 1-8 of this chapter.

3.3.2 Indian pottery from the 'Middle' (BA-II) period

Numerous changes occur in the Qana pottery assemblage by 'middle' (BA-II) period of Qana's occupation; Dressel 2-4 and other early Mediterranean amphorae, terra sigillata and Nabatean pottery have completely disappeared at this time, and replaced by vessels/amphorae of North African origin including Tripolitanian types, North-Afrian Gallic, Egyptian 'bitronconique' as well as handle-less amphorae of possible Palestinian(?) origin. Tablewares are mostly represented by Fine Orange Painted Ware fragments from southern Iran as well as glazed wares of Mesopotamian origin (Sedov 2007: 80).

The percentage of the so-called Indian RPW, known from the previous strata in very few numbers, increases in the layers of the 'middle' (BA-II) period (Sedov 1996: Fig. 6 nos. 8, 9, 10; Sedov 2007: Fig. 4.18 nos. 1, 3,4) (Fig. 132: 1-6). Another form noted in period BA-II, is the Indian-style lid (lower fragment) (Sedov 2007: Fig. 4.18 no. 2) (Fig. 132: 7).

Another form from Qana of possible Indian origin is diagnostic of the vessels of the BA-II period. It is a handless amphora-like vessel with collar-stepped rim. These have been compared to Indian pottery from Amreli (Davidde et al. 2004: 94-97; Sedov 2007: Fig. 4.17 nos. 1-6) (Fig. 133: 1-6). These forms have also been referred to previously as storage jars (Sedov 1996: Fig. 5 nos. 10-12).

One more diagnostic form for the 'middle' (BA-II) period is a very specific type of oil lamp in the shape of a plate with a round bottom and small reservoir inside (Fig. 134: 1-6). The edge of the reservoir is usually slightly burnt (Sedov 1996: Fig. 6 nos. 11-13; Sedov 2007: Fig. 4.18 nos. 12-15). Both vessel types (storage jars and oil lamps) were also recorded in the 'lower' BA-I period pottery assemblage during the underwater surveys of Qana (Davidde & Petriaggi 1998; Davidde et al. 2004) (refer to Table 4 in this chapter).

Cooking vessels (fragments of rim, upper part and base) in the typical carinated *handi* form were recorded from Area VI (rooms 1, 10 and 12) in the middle BA-II period. The fabric is made from a medium compact red paste, with a dark red slip and burnishing on the exterior or both sides as well as occasional horizontal incised lines on the exterior. The diameter of these vessels ranges from 10-15 cm (Salles & Sedov 2010: 267, fig. 114 nos. 1170-1174) (Fig. 135: 1-6)

3.3.3 Imported pottery from 'Upper' (BA-III) period

By the upper horizon at Qana, the Roman finds shift from western to Eastern Mediterranean sources especially Levantine (Tomber 2008: 104). The imported wares include Gaza and Aqaba amphorae from Aila, Torpedo jars (LR4) and glazed wares from Mesopotamia as well as a sizable presence of Aksumite pottery reflecting connections with East Africa (Sedov 2007: 87-89). Contact with India was 'reduced drastically' during this period and the only evidence of a very early contact with the Far East was a fragment of inscribed Chinese celadon ware (*van* - king) (Sedov 2007: 105).

3.4 Qana and contact with India

At the time of the Periplus, Qana like Moscha Limen (Sumhuram) was not only a port of call for Roman merchants, but also the node of an Arabian network (Seland 2010: 27) trading with Barygaza and Skythia (in India), Omana (Ed-Dur? or Dibba? in south eastern Arabia) and the kingdom of Persis (the Parthian Empire) (Periplus 27). Ships sailing between the Red Sea and India often stopped at Qana and epigraphic evidence indicate the presence of a royal Hadrami shipyard there (Beeston 2005: 58, 62 no. 11). Similarly as was the case with Moscha, the Periplus also detailed the lists of imports and exports at Qana. Frankincense, an imperial monopoly and the port's major export, was bought to Qana from the island of Soqotra, which was also under Hadramawt control, for storage in a warehouse there. The other local product aloe was also exported and was probably transshipped to Qana from Soqotra (Potts 2012: 1055). On the other hand, Qana imported wheat from Egypt as well as wine, fine clothing, copper, tin, coral, embossed silverware, large quantities of money (coins), horses and statuary (Casson 1989 Periplus 28). In

this early period however, the scantiness of eastern imports in comparison with the large number of western artifacts is evident. At Qana, in its early levels (lower period), there is very little number of sherds that can be considered as Indian Red Polished Ware (RPW). It may be surmised that goods from India, Mesopotamia and the Arabian Gulf did not leave any material traces that might be found during excavations. Alternatively this lack of eastern imports may indicate less intensive contacts between Qana and the east in the early period owing to a greater demand for frankincense in the Mediterranean world than in India and Mesopotamia, although incense was present in its markets (Casson 1989 Periplus 36, 39). At the same time, in the 1st century AD, the Periplus describes Qana as the departure point for vessels on their way to India (Periplus 57) but does not indicate whether they stopped at the same site on their way back to Egypt when some Indian goods could be dropped off (Sedov 1997: 371-372).

Nevertheless, the period between the late 2nd and 5th centuries AD was the heyday of Qana, as well as for South Arabian maritime commerce in general. During this 'Middle Period' of Qana, the trade connections with the Mediterranean region, which were reduced in the late 1st century AD, were no doubt reactivated with, increased material evidence of imports from Arabian Gulf, Mesopotamia and India as well as the reduction in Mediterranean objects. With regard to ceramic evidence, Roman pottery decreased and mirrored changes in Roman trade in general. Indian storage jars and cooking pots and Mesopotamian sources were more common, and Hadrami types decreased (Tomber 2008: 104). Sedov sees this as a shift in function from a small port serving boats between Qana and Egypt to a major Hadrami port for Indian Ocean commerce (Sedov 2007: 104-105). In later times (Upper Period), Qana had little or no contact with India (Sedov 1996; Mango 1996: 154-155). The focus of this section of the chapter in this way, has been to highlight the evidence of Qana's role in the Indian Ocean trade particularly its connections eastwards to India by presenting the Indian pottery data recorded from the various excavated strata.

Chapter 3

4. Suhar

4.1 Introduction

The site of Suhar on the Gulf of Oman is situated between the outlets (*khor)* of two *wadis*, perpendicular to the coast. The settlement took place on the beach, less than two metres above the present high-tide level of the sea. Although not particularly suitable as a harbour, the site provides several advantages: (1) The location of Wadi al-Jizi, two kilometres north of Suhar provides the principal pass through the Hajar al-Gharbi mountain barrier, linking the Gulf of Oman with the Arabian Gulf hinterland, (2) The same wadi system also provided groundwater for the site, drawn from wells (*jizar*) and aquifers/water canals (*aflaj*), (3) The *khor* between the two wadis together with a moat (topped by a wall), encloses the settlement with natural defences, (4) copper mining industry with the main copper deposits of Oman (Lasail) located 30 km west of Suhar (Kervran 2004: 296-297). With regard to long distance sea-trade, its unsuitability for use as a harbour is reflected in the flat sandy beach that offers no shelter for boasts and its exposure to the *shimal*, northerly wind during the winter. However in antiquity it is possible that the two wadis enclosing Suhar and linked to the sea offered shelter to medium-sized ships coming to Suhar (ibid 2004: 298). With reference to sailing schedules particularly to and from India, although Suhar lies some 500 km off the monsoon path, the monsoon nevertheless formed a major part of the calculations of Suhari ship captains. While it was possible to sail from Suhar to North India and the reverse nearly all year-long, sailing to South India was possible only from February to April, and return voyages only from October to February.

4.2 Excavations at Suhar

The port town of Suhar was undeniably very active during the whole Islamic period, with the Palestinian Geographer al-Muqaddasi of the 10th century AD describing it as '… the gateway of China and the emporium of the East…" (al-Muqaddasi 1897). The results however of the test-pit excavation at Suhar by P. Farries in 1975 concluded 'the discovery of a sizeable deposit of pre-Islamic occupation' (Kervran 2004: Fig. 4; Appendix 2: pls. 37-39) (Fig. 136). Prior to this, in January 1958, 'the

first archaeological excavations in Oman were carried out at Suhar by the American Foundation for the Study of Man (Cleveland 1959), but nothing suggesting a pre-Islamic occupation was recorded. This was succeeded by a surface exploration of Suhar by A. Williamson in 1973-1974, as part of the Harvard Archaeological Survey in Oman, who published a preliminary archaeological and historical study of Suhar (Williamson 1973, 1974). The French Mission undertook their first extensive survey in 1980 of site SH 11 (south-east of Suhar) to determine whether one or several pre-Islamic sites named in the written sources (*Mazun, Omana, Damstergird* etc*.)* existed. The first season of excavation in Suhar was in autumn of 1980, followed by other campaigns in 1982, 1984 and 1986 (Fig. 137). The first two seasons were spent excavating inside the compound of the Hormuzi fort at Suhar (14th century AD). This was followed by the excavation of a test pit (Suhar Town 1986) in the next two seasons with the aim of reaching the foundation of the city (Fig. 139). It was completed by a series of lesser sondages (Suhar Moat IV, Suhar Moat I, Suhar Moat 1982) on the slope of the moat (Fig. 138). Suhar of 1970-1980, covering an area of about 800 m NNE-SSE by 350m NE-SW inside its dilapidated walls, was densely built if not very populated. Only a large area of exploratory excavation could have allowed the discovery of the principal parts of the town, including public buildings: the Abbasid layers lay4 to 5 m below the surface, the pre-Islamic are 2to 3 m deeper (Kervran 2004: 264, 270)

4.3 Discussion on chronology of Suhar

The result from all the French excavations was a division of the history of Suhar into twelve Levels or cultural phases (from 0 to XI) (Kervran 1996, 2004). Despite the deep sounding carried out by a French mission in 1984-1986, the pre-Islamic occupation (I-IV) is still controversial (Kennet 2007; summarised in Cuny & Mouton 2009: 110-114). Initially in her earlier publications, Kervran (Kervran & Hiebert 1991: 339-341) proposed placing the foundation of Suhar in the 1st century BC - 2nd century AD (Levels 0-I) and the next Levels (III-IV) to the Sassanid period (3rd century AD - 7th century AD). These dates were contested by other scholars including Mouton (1992: 175-181) who proposed instead that the first four phases of the sequence should be dated from the beginning of the 3rd century AD to the mid

7th century AD. In more recent publications, Kervran agreed partly with Mouton's dating but argued that the Levels 0-IV in her sounding represent a sequence of occupation dating to between the middle of the 2nd century AD and the middle of the 7th century AD (Kervran 2004: 296).

A reappraisal of the dating was proposed by Kennet (2007: 97-99) who states that 'almost no evidence was offered to support this contention'. He suggests that all of the parallels that Mouton suggests with Sasanian-period material can therefore be shown to be unconvincing, as Mouton's proposed dating for the Suhar sequence was heavily influenced by the presence of Indian Red Polished Ware, which he took to be a reliable indicator of third-century AD occupation. Kennet (2004: 65-66) states that this ware has been known to circulate as late as 5th or 6th centuries AD and evidence from Kush has shown its use probably as late as the 8th century AD. Also, none of the key types and wares that are to be expected in a Sasanian-period context in this region (e.g. Namord ware, CLINKY, SMAG etc.) are present at Suhar at all.

Therefore according to Kennet, the proposed dating of the Suhar sequence below Level V is datable to the 8th century AD, which includes some residual pottery and glass from the 1st/2nd century AD. Alternatively, it is also possible that Levels 0 and I, which are below a possible abandonment phase noted by Kervran might represent in situ occupation of the first/second centuries AD within which some eighth-century AD material was inadvertently mixed during excavation, but that there was no convincing archaeological evidence for Sasanian-period occupation at Suhar (Kennet 2007: 99).

The dating of the Suhar pre-Islamic sequence was revisited by Mouton and Cuny (2012: 182-183) who agreed with Kennet (2007) in that the Sasanian period occupation remains controversial owing to the absence of some pottery types characteristic of this period, including Fine Orange Painted Ware and the CLINKY and SMAG categories of Kennet's typology, well represented to the west of the mountains of Oman. They also indicated a general consensus for the presence of Parthian-period pottery from the 1st century AD. Based on parallels with the assemblage at Mleiha and in the Hadramawt, it was suggested that the most ancient levels in Kervran's soundings at Suhar attest to a pre-Islamic occupation that

stretched beyond the Parthian period into the 3rd century AD. Based on the current available documentation, the identification of a pre-Islamic occupation after that date is not possible (ibid 2012: 182). The site however was very active during the whole Islamic period, with evidence of an increase in the number of Indian pottery in Levels III-IV and V-VI.

4.4 Indian pottery from Suhar

Despite the limited soundings excavated by the French Mission, Indian pottery was prevalent in the ceramic assemblage at Suhar. The dating of these archaeological deposits was discussed in various articles but not confidently established. The ceramics from Levels 0-IV at Suhar belong to either the 8th century AD or those associated with the 1st/2nd century AD (Kennet 2007). This sequence could also stretch beyond the Parthian period into the 3rd century AD (Mouton & Cuny 2012: 182). The four deepest levels (0 to IV) contain Indian ceramics documented by the excavator as Red Polished Ware and red or black ware vessels 'identifiable by the particles of mica in the fabric and surface, as well as the morphology' (Kervran 2004: 272). In Level V, much of it in black ware, represents about 18% to 20% of the total ceramic finds (Kervran 1996: 40-42) and by Level VI numerous Indian vessels are recorded albeit with thin walls and low quality fabric, compensated by painted designs ornamenting its surface (Kervran 2004: 316). The evidence of Indian vessels from the different levels at Suhar is presented below, together with a discussion on parallel vessel types from sites in India:

4.4.1 Indian pottery from Level 0

In Level 0, the Indian ceramics included pots with short necks and turned-out rims and lids with a turned-in edge as well as two large basins of probable Indian origin (Kervran 2004: fig. 8 nos. 7, 9, 10-12;pl. 21 no. 33) (Fig. 140: 1-4). The assemblage also included four fragments of the best quality of Indian Red Polished Ware', consisting of a very levigated fabric and a burnished red surface (ibid 2004: pl. 21 no. 32). Level 0 represents evidence of a well-organised community, rather sophisticated and involved in trade with India (Kervran 2004: 271-272). Five

examples of Indian pottery from Level 0 were recorded with respective find numbers from Sector ED5 and from levels 27 (see Appendix 4 nos. 1-5).

4.4.2 Indian pottery from Level I

Indian ceramics of Level I were of two types: pots with short necks and turned-out rims in red or black ware which always include particles of mica (Kervran 2004: pl. 21: 25-26 and fig. 9: 9-10) (Fig. 140: 8-9), fragments of jars of pink ware with wide horizontal ridges (ibid 2004: pl. 21 no. 22 and fig. 9 nos. 7-8) (Fig. 140: 6-7), as well as a lid fragment and painted sherd (Kervran 1996: Fig. 3 nos. 15, 13). Ten fragments of good quality Red Polished Ware (RPW) were noted in a total of 127 sherds (Kervran 1996: 40; Kervran 2004: 272). Four samples of Indian vessels were recorded from Level I from sector ED5 from levels 26 and 25 respectively and nine samples from Level I Kervran's 1996 excavation (Kervran 1996: Fig. 3: 44-45, nos. 1-4, 8, 13, 15, 17-18) (Fig. 140: 10-18; Appendix 4 nos. 6-18).

4.4.3 Indian pottery from Level II

Level II held the highest ratio of finest Indian ceramic pieces: 42 out of a total of 259 sherds. The main types of Indian vessels were pots with turned-out rim (reflecting innovations in rim and circular tenon), the presence of lid-types continuing from the previous levels (Kervran 2004: fig. 10 nos. 1, 20-22, 26-27) (Fig. 141:19-22, 26-27, 33) and those with decoration: painted stripes or floriated patterns in dark red on orange-pinkish slips (Kervran 2004: fig. 10: nos. 23- 25) (Fig. 141: 23-25, 34). Nine samples of Indian ceramics were recorded in Level II from sector ED5 and levels 22 and 24 and seven samples from Kervran's 1996 publication (Kervran 1996: Fig. 3, nos. 5-7, 9-10, 14, 19) (see Appendix 4 nos. 19-34).

The mainly RPW shape represented in levels I and II is a neck-less pot with wide opening, everted grooved rim and globular body 22 cm in width and 18 to 20 cm in height (Kervran 1996: fig. 3 nos. 2-5) (Fig. 141:28); comparable vessels were found at Arikamedu (Wheeler *et al.* 1946: Type 69), Maheswar-Navdatoli (Sankalia *et al.* 1958: Type 120), Amreli (Rao 1966: 53-59, Pinto-Orton 1992: 52-53, fig. 4.2 & 4.3), Bhoji-Kadwar (Pinto-Orton 1992: 56-58, fig. 4.6 - 4.8), Umbari (Pinto-Orton 1992:

66-70, fig. 4.17, 4.18, 4.19, 4.20, 4.21), Sutrapada (*ibid*: 65, fig. 4.16), Baid (Pinto-Orton 1992: 54, 55, fig. 4.4 & 4.5) and Shamalaji (Mehta & Patel 1967: fig. 17). A globular jar with a rather narrow neck above black strips painted on the shoulder was also found (Fig. 141:29-30), comparable to examples from Arikamedu (Wheeler et al. 1946: Type 44), the incised rim of a jar with everted neck (Fig. 141: 31-32) and a fragment of a typical RPW spout of micaceous fabric (Kervran 1996: fig. 3 nos. 6, 7 and 9-10, 12) (Fig. 141: 24).

4.4.4 Indian pottery from Level III

In Level III, the occurrence of Red Polished Ware decreases: 17 out of a total of 585 sherds with excellent quality (Kervran 2004: pl. 21 no. 10). The *handi* or open mouth globular pot with a grooved everted rim was still in use (Kervran 1996: 42) (Fig. 142:40-41). However less fine Indian wares were still important and exhibit new shapes in Level III (Kervran 2004: pl. 21: 9 & fig. 12: 13-19) (Fig. 142:35-39). These seem to be a variation of the RPW since some pieces are pure imitation of its shapes (Kervran 1996: Fig. 4 no. 1) that resembles type 649 from Maheshwar-Navdatoli with a coarser fabric (Sankalia *et al.* 1958). These fine Indian wares were identifiable by morphology of the vessels and micaceous temper in the fabric (Kervran 2004: 275). Other vessels forms like the lid continue from the previous levels (Kervran 2004: fig. 12 nos. 20-22) (Fig. 142:42-44). Ten samples of Indian vessels were recorded from Level III in sector ED5 and from individual levels 17, 19, 20 and 21 and an additional four samples from previous publications (Kervran 1996: Fig. 4 nos. 2, 10, 16 & 20) (See Appendix 4 nos. 35-48).

Indian ceramics have been unearthed in other soundings carried out at Suhar:

4.4.5 Indian pottery from Suhar Moat I (Levels II/III)

Four fragments of Indian vessels were recorded from Levels II/III of Suhar Moat I sondage (SM.I) from stratigraphic levels 19-22 (Kervran 2004: Fig. 17 nos. 1-4) (Fig. 143:49-52; Appendix 4 nos. 49-52).

4.4.6 Indian pottery from Suhar Moat IV (Level III)

The Indian pottery samples from Suhar Moat IV (SM.IV) comprised of four vessels from groups 2 & 3 and stratigraphic levels 18-19 (Kervran 2004: fig. 18, group 2 nos. 6-8, group 3 no. 1) (Fig. 143:53-56; Appendix 4 nos. 53-56).

4.4.7 Indian pottery from Level IV

High quality RPW also decreases in number in Level IV (only 7 out of a total of 246 sherds in this level). The less fine Indian ware is still present (Kervran 2004: pl. 21 nos. 1-2), this time with a very characteristic tenon around the shoulder (ibid 2004: pl. 21 no. 3 and Fig. 14 nos. 9-10) resembling cooking pots with characteristic ridge carination (Fig. 144:57-58). Other Indian cooking vessels with out-turned everted rim were also recorded from Level IV (Kervran 2004: fig. 14 nos. 6-8, 11) (Fig.144: 59-62). A total of six samples of Indian vessels were recorded from Level IV, sector DE5 and levels 15 and 16 and four additional samples from Kervran's 1996 publication (Kervran 1996: Fig. 4 nos. 1, 5, 12-13) (See Appendix 4 nos. 57-68).

The stamped and moulded pottery recovered from Levels III and IV (Kervran 1996: Fig. 4 nos. 18&19) (Fig. 144:63-64) with geometric-cum-floral patterns and animals such as the bull hindquarter with frieze of dotted line and a star below are comparable with a piece from Shamalaji in Gujarat ((Mehta & Patel 1967: Fig. 19-20).

4.4.8 Indian pottery from Levels V-VI (Later Islamic levels at Suhar)

In Level V, Indian ware from Suhar Moat I (Kervran 2004: fig. 26: 4-7) (Fig. 145:69-72) is represented by a particular fabric, neither levigated nor fired as the IRPW of Level III and IV. In sondage Suhar Town 1986, the large proportion of Indian ceramics in Level V indicates the extent of commercial relations of Oman with India, perhaps also indicating the presence of an Indian community at Suhar (Kervran 2004: fig. 21 nos. 20-25 from layers 12, 13, 14) (Fig. 145:73-78). Indian ceramics also show painted decoration (Kervran 2004: Fig. 22 no. 8) in layer 11 (Fig. 145:79). From Layer 10 of Suhar Town 1986, three samples of Indian cooking vessels with tenons or ridge carination at the shoulder were recorded (Kervran 2004:

fig. 23 nos. 23-25) (Fig. 145:80-82). A total of 14 vessels belonging to Level V were recorded from Suhar Moat I (total 4) and Suhar Town 1986 (total 10) as well as an additional three samples from Kevran's previous publication (Kervran 1996: Fig. 5 nos. 2,3 & 6):

Indian vessels were recorded from Level VI of the several sondages that were opened at the foot of the north-west wall of the fortress. Two jars, one with incised decoration on the inside lip were recorded from the context between floors 182 & 176 and above the well 148 (Kervran 2004: fig. 29 nos. 3,4) (Fig. 146a: 86-87). There is an increase in the number of vessels recorded from the context of oven 309, with a total of 9 cooking vessels mostly with painted and incised decorations on the shoulder and tenons (Kervran 2004: Fig. 30 nos. 5-12; fig. 31 no. 1) (Fig.146a: 88-96). From the same context of oven 309, two jar rim fragments (one with incised triangular punctuate decoration) was recorded as well as pots with painted red and black decorations (Kervran 2004: fig. 32 nos. 9 & 10; fig. 33 nos. 5-7) (Fig. 146a: 97-101). Cooking vessels continue to occur in Level VI in other contexts including the north-west wall of the fort in squares PQR (Kervran 2004: Fig. 35 nos. 17-21) (Fig. 146a: 102-106) and south-east wall of the fort in squares BCD (Kervran 2004: fig. 36 nos. 15-20) (Fig. 146a: 107-112). From Level VI, a total of eleven samples were recorded from above well 148, five samples from oven 309, five from Squares PQR and six from Squares BCD (Fig. 146a, 146b: 86-112). In addition to this twenty samples were recorded from previous publication (Kervran Fig. 6 nos. 2, 6-8, 12-13, 17-20, 24-25; Fig. 7 nos. 1-8) (Fig. 146b: 113-132; Appendix 4 nos. 86-132).

4.4.9 Indian pottery from Levels VII-VIII (Later Islamic levels at Suhar)

According to the chronology of Suhar proposed by Mouton (1992: 181) Levels VII and VIII date from the mid 13th-16th and 17th-18th centuries AD respectively. A number of Indian vessels were recorded from Kervran's earlier publication (Kervran 1996: Fig 8a nos. 1-7 and Fig 8b nos. 1-7) (Fig. 147: 133-146; Appendix 4 nos. 133-146), although no mention of these Indian samples from Levels VII-VIII is made in her later publications (Kervran 2004).

4.5 Comparisons with the Indian assemblage from Kush

Parallels for a number of the Indian vessels from Levels V & VI can be drawn from the Indian assemblage at Kush (Kennet 2004; see also Chapter 2 of this thesis) based on morphology, fabric and similarities especially in the decoration (incised and triangular punctuate marks) and painting (see Painted Indian Earthen Wares - PAINT from Kush). Kervran reports an increase in Black Burnished Wares in Levels V-VI from Suhar, which also constitute the majority of Indian wares from Kush dating to the 7th/8th century. Similarly at Suhar, Kevran reports a number of 'less fine Indian imported ware' from Periods III & IV (Kevran 2004: pl.21: 9; fig. 12: 13,14,18,19) which are identical to FIRE sherds from Kush (Kennet 2004: 90, see also chapter 2 in this thesis). The RPW from Suhar in Levels 0-IV shares some similarities with Kush although closed forms like spouts and sprinklers are not reported from Kush. Also the occurrence of RPW at Kush although found in the earliest phases (5th/6th century), most of the RPW occurs in the later levels (8th century AD) (Kennet 2004: 89). The vessels from both Kush and Suhar (levels V & VI) have been compared to pottery from sites in the Indian context particularly in Gujarat and Maharashtra from the later early Historic and Medieval periods. Kervran describes a 'Fine Painted Ware' from Suhar that she dates between the 8th and the 12th century AD (1996: 38). From Kush, 15 PAINT sherds were recorded, most of them in Phase E-11 (late 16th - early 17th century), but four occurred in Phase E-03 (7th/8th century) (Kennet 2004: 91). What is interesting however is the evidence of similar black designs (floriated patterns, striped decoration) seen on coarse and fine red slipped fabric that occur in Level II at Suhar (Kervran 2004: Fig. 10 nos. 22-27). The presence of PAINT wares in the early levels of Suhar could further support Kennet's view (2007: 99) that either the entire sequence below Level V is datable to the 8th century or conversely that the 8th century material was accidentally mixed in with the early deposits during excavations at Suhar.

CHAPTER 4

THE RED SEA AND AFRICAN PORTS IN THE EARLY-LATE ROMAN 'INDIA TRADE'

This chapter is a detailed desk-based collation of Indian ceramic data from the Egyptian Red Sea region and African ports, divided into the two main sections (1 & 2) respectively. The section on the Red Sea ports first gives an overall history of Indo-Roman trade and the role of Arabia (section 1.1), followed by an introduction to the archaeological data relating to settlements, chronology and evidence of 'India trade' from the respective sites of Quseir al-Qadim (section 1.2) and Berenike (section 1.3). The Indian ceramic data from the two sites is presented next with details on vessel forms (section 1.4) followed by discussion on the fabric types (section 1.5). A summary of similar Indian vessel types from India and Arabia is discussed in section 1.6. Details relating to individual Indian vessel samples (e.g. sample number, locus, description of form/fabric etc.) are presented in tables 5 - 10. Section 2 is the other main section which focuses on the Indian ceramic data from the East African ports with emphasis on the site of Ras Hafun (section 2.1). The following sections (2.1.1 & 2.1.2) present the Ras Hafun ceramic information pertaining to the typology of Indian vessel forms and the different fabric categories respectively. Indian trade ceramics from other East African port sites (Kilwa, Pate, Shanga etc.) from the medieval period is also recorded and discussed briefly in section 2.2.

1. Historical background of Indo-Roman trade in the Red Sea and the role of Arabia

Indo-Roman trade comprises a small episode within the much broader history of Indian Ocean activity. Traditionally this trade has been placed between the reigns of Augustus and Marcus Aurelius. Although the Red Sea ports were active before this time, it was the annexation of Egypt by Augustus in 30 BC that the systematic exploitation of trade routes for primarily economic purposes commenced (Tomber

2008: 15). Commercial contacts between the Mediterranean basin and the lands to the east (however) existed as early as the Old Kingdom epoch of Egypt, if not earlier (Sidebotham 1992: 12) including evidence of Old Kingdom links between Egypt and East Africa (Kitchen 2004). Trading links between the Red Sea and India may be viewed as passing through distinct phases, beginning in pre-Roman times in the Ptolemaic era with recorded evidence of the appointment of an *epistrategos* or 'officer superintendent' of the Erythraean and Indian sea, thought to have been prompted by military interests in obtaining South Asian and African elephants. From India, evidence points to a royal edict by Mauryan King Asoka in the 3rd century BC, mentioning Ptolemy Philadelphus (Thapar 2005: 12). According to Salles (1998: 58), during the Hellenistic period under the Seleucids (312-60 BC), Indian trade reached the Eastern Mediterranean via the Gulf, following the Euphrates and eventually overland to Antioch or Gaza. During this period, the ports of Barygaza and Sopara on the west coast of India became important. By the time of the Roman annexation of Egypt (c. 30 BC), elephants were no longer considered an indispensable asset in warfare and Rome did not need to go beyond its borders to acquire gold for government and private expenditures. Roman interest in the Red Sea - Indian Ocean trade was no longer for purely military reasons, but extended to their commercial and political considerations (Sidebotham 1992: 15).

Subsequently, in early Imperial Roman times, judging by the artefactual remains found in India and the statements in various Greek and Latin texts, there appears to a spurt in the trade between the Red Sea and India (concentrating on the Western Deccan and South India) from the late 1st century BC to mid 1st century AD. In the context of Indian history, the Indo-Roman maritime trade has a specific meaning. It refers to the Roman demand, in particular for pepper, pearls, semi-precious stones and textiles, all imported from South Asia and most of which were exchanged for high-value coins. The items in demand from India were not found uniformly everywhere and this too resulted in variations in the patterns of trade. (Thapar 2005: 13 - 14, 26). This interest in Indo-Roman trade as Whittaker (1998) puts it was partly inspired by military conquest with the extension of Roman suzerainty and the reported wonders of the East. This trajectory of trade does not reduce the importance of the Indian counterparts, who saw it essentially as exchange and trade with the

'Yavanas'. The demand from the Indian markets was for lead, tin, coral, glass, wine and in some areas, specie (gold and silver coins) (Thapar 2005: 14, 27). Indian interests in the Red Sea ranged from merchants established in trading ports to suppliers of cargo, either acting for merchants or functioning independently. On the Roman side, the trade was in the hands of Greek and Jewish merchants of Egypt, and of Palmyrene and Levantine merchants from the Hellenistic world. This would be logical given that the concentration of this trade was in Alexandria, Coptos and ports along the Red Sea (Thapar 2005: 32). However Tchernia (2005b) suggests the possibility of an established family of traders residing in Italy but extending their enterprise to trade in the Red Sea and beyond, based on inscriptions suggesting four generations of a family trading in wine and one associated with eastern trade.

The role of Arabia or the Arabs in this trade has its beginnings from the 5th millennium BC when small networks operated within the larger realm, exploiting the main artery of the Arabian Gulf (Salles 1998: 58, 66). One of these examples is the Bronze Age trade between north-west India and the Gulf. Similarly, the Arabs began exploiting the Red Sea as a communication-commercial thoroughfare long before the Romans arrived in the area. Direct Roman contact with the Red Sea from 30 BC expanded with the annexation of the Arab kingdom of the Nabataeans in AD 106 (Sidebotham 2005a: 160). The Kingdom of Axum (Africa) and several of the South Arabian Kingdoms (e.g. Ma'in, Saba and later Himyar and the al-Kinda federation) seem to have dominated trade in the southern part of the Red Sea throughout the last centuries BC until the 7th century AD, while the Romans seems to have dominated the northern part of the Red Sea trade at least until the end of the 2nd century AD (ibid 2005: 168). Rome also sought to expand her political and military control beyond her borders in the Arabian Peninsula through the famous invasion of South Arabia by the Roman governor of Egypt Aelius Gallus in 26-25 BC and later other Roman/Byzantine expeditions in alliance with Axumites in the 4th century AD (Sidebotham 1986, Shahid 1984). Roman involvement in the region is more than has been previously documented and Mediterranean goods reached South Arabia by either land or sea. Roman wares including amphorae from Campania, Rhodes, the Aegean, Spain and Egypt, Egyptian coarse wares, and fine wares from Italy etc. dominated the early periods at both Qana and Khor Rori to be replaced in the later

periods by Eastern Mediterranean/Levantine finds including Gaza and Aqaba amphorae arriving directly down the Red Sea from Aila (Tomber 2008: 102, 104-105). Roman finds in the Arabian Gulf side was indicated by a number of substantial or complete glass vessels (n. 227) from Ed-Dur and glass from funerary contexts in Mleiha (Whitehouse 2000). A small number of Roman fine wares were also documented at Ed-Dur by Katrien Rutten including Eastern and Western sigillata, Roman glazed wares and Egyptian lamps (Rutten 2007). Their presence has been attributed more as a result of trade than for use by Roman residents (ibid 2007: 20).

The Roman influence in this trade seemed to decline after the 2nd century AD, as Indian evidence shows. Much of this could be attributed to historical changes in West Asia and the eastern Mediterranean as well as those regions of India connected with the trade. This could include the greater participation of India traders in supplying goods to Alexandria or India's involvement in the trade with Central Asia may have led to tapping of new resources as well as a decrease in fashion or necessity for Yavana items of trade. From West Asia, the decline of the Red Sea as a major artery would have had to do with a transfer to other routes, particularly with the increasing importance of Byzantium (Thapar 2005: 39). A great revival of commerce and communications is in evidence from the fourth through the fifth centuries, as the port site of Berenike remained the pre-eminent Byzantine emporium throughout the late Roman period. The Aksumites and Ḥimyarites (from South Arabia) appear to have increasingly acted as middlemen to the Byzantines in the 'India trade,' and during this period the Red Sea became integrated into a sequence of overlapping but independent regional networks, turning about Ethiopia, Sri Lanka and Sumatra, which spanned for the first time the southern seas between Alexandria and Canton (Power 2010: 29-30).

1.1 Egyptian Red Sea ports in the Indian Ocean trade

It is essential as part of this thesis to examine the ports which were active during the Ptolemaic, Roman and Byzantine periods at the northern end of the Red Sea (Fig. 148). Today, the western Roman Red Sea is contained within modern Egypt. Here, Claudius Ptolemy (Geography 4.5.8) located six ports north to south as Clysma,

Myos Hormos, Philoteras, Leukos Limen, Nechesia and Berenike (Sidebotham 1992: 15; Tomber 2008: 57). Much of the earlier research of the late 1980s sought to identify the locations of these port sites, followed by intense exploration that radically altered some of the original claims. Today, Clysma, Berenike and possibly Nechesia have been identified and location of the modern site of Quseir al-Qadim though initially to be Leukos Limen (see Sidebotham 1992: 19), is now confirmed as Myos Hormos. In the mid 1st century, the Periplus mentions only Myos Hormos and Berenike. These two sites are the main focus in this chapter from the Red Sea region pertaining to ceramic evidence of trade with India from the early to late Roman periods.

Also to be considered mainly during the late Roman period are the Egyptian ports not mentioned in the Periplus but in Strabo's Geography (4.5.8): Nechesia (equated with modern site of Marsa Nakari) and Clysma (Tell Qulzum in the vicinity of modern Suez). Marsa Nakari is a port site spreading along both sides of a natural harbour situated south from Abū Shaʿar along the Egyptian coast and equidistant between Myos Hormos and Berenike (Power 2010: 52). Excavated by John Seeger for only one season, a sequence from the late 1st - late 4th century AD is indicated by coins, and the presence of amphorae LR1 suggest occupation till the 5th century (Sidebotham pers. comm. quoted by Tomber 2008: 65). Tomber attributes that the site, with a good harbour, serving as an auxiliary port had more in common with Berenike than Myos Hormos, as the latter had ceased to function by the late Roman period. Power (2010: 54) suggests that the late Roman boom at Marsa Nakari is associated with military rather than commercial activities, based on the absence of certain foreign ceramics (Red Sea amphorae from Aila and Axum or turquoise glazed ware from the Gulf) that are present at Berenike, Qana etc, indicating that commerce was not the primary economic rationale.

On the other hand, the fourth and fifth centuries were periods of intense commercial activity at the site of Clysma (Tell Qulzum) situated on the opposite flank of the Sinai Peninsula, giving access to the Eastern Delta and Babylon-in-Egypt through Trajan's Canal (Power 2010: 47). French excavations began in the 1930s and the site was published half a century later. It has a sequence spanning the Ptolemaic up to the

5th or early 6th century where its overlaps with Berenike. With regard to its India connection Mayerson (1996: 124) quotes Antoninus Palentius' 6th century observations… "It is the port for India, which is to say that it receives ships from India, for ships from India can come to no other port but this in Roman territory. And ships there are numerous and great, since it is a port renowned for the Indian merchants who come to it…" However Mayerson in his paper 'A confusion of Indias: Asian India and African India in the Byzantine sources' also questions whether this identification refers to East Africa rather than the Indian subcontinent (Mayerson 1993). In any case the finds from Clysma do little to establish its role in Indo-Roman trade, but indicate that the town was flourishing (Tomber 2008: 67).

On the eastern side of the Red Sea, the site of Aila in Jordan is much better known than Clysma. Founded by the Nabataean Arabs in the late 1st century BC, the city of Aila was engaged in trade between the Mediterranean world and south Arabia, India and East Africa. After the Roman annexation of Nabataea in AD 106, Aila continued as a port under the Roman rule. The turn of the 4th century witnessed the beginning of an economic boom for Aila, which seems to have continued through the Byzantine period and well into the Early Islamic period (Parker 2009: 82-83). Eastern goods may have reached Aila indirectly via Adulis. In the early 4th century Eusebius of Caesarea recorded its role as a port for India via Egypt (Tomber 2008: 69).

The identification of Leuke Kome from the Periplus has been attributed archaeologically to the cluster of seven inter-related settlements in the region of Aynuna in the region of Saudi Arabia, c. 5 km from the coast at the mouth of the Gulf (Ingraham et al. 1981 quoted by Tomber 2008: 68). Surface pottery on the site included Nabataean wares, but no Egyptian or eastern wares have been published. In Petra, however, Gogte (1999) identified a mould-decorated pottery similar to those made in western India during the Hellenistic period, therefore indicating potential for discovering further Indian and Arabian finds in these sites.

Both Myos Hormos and Berenike were founded exclusively to facilitate trade, initially with Africa for the import of elephants to be used by the military, and later across the Indian Ocean. With regard to material remains of trade, Berenike and Myos Hormos on the western Red Sea coast shared an impressive range of Eastern

imports including evidence of Indian ceramics from the late 1st century BC and 1st century AD (Early Roman period), and for this reason will be discussed in more detail in this chapter.

1.2 Quseir al-Qadim (Myos Hormos)

The site of Quseir al-Qadim (old Quseir) lies about 8 km north of the town of al-Quseir, which is situated on the Red Sea coast about 500 km south of Suez. It occupies a coastal ridge that rises to about 8 m above sea level, forming a southward facing peninsula defined by the sea to the east and by a silted lagoon or *sabkha* to the south and the west. In Roman times, this would have been a body of open water approached through a deep water channel, the entrance to which is marked by a break in the coral reef bordering the coast and a sandy cove that would have served as a harbour (Peacock & Blue 2011b: 1). The site has experienced several excavation campaigns under the direction of Donald Whitcomb between 1978, 1980 and 1982 (Whitcomb & Johnson 1979, 1982) and David Peacock and Lucy Blue between 1999 and 2003 (see Peacock & Blue 2006, 2011a). The work at Quseir al-Qadim first began to reveal the true identity of Periplus' Myos Hormos, which was initially believed to be the relatively minor site of Leukos Limen. This was followed by archaeological work at Abu Sha'ar (approx. 355 km south of Suez) that sought to identify with the Ptolemaic-Roman port of Myos Hormos, but its chronology from the 4th - 6th century AD ruled out activity during the time of the Periplus (Sidebotham 2005b: 105-110). Apparently, the port of Quseir al-Qadim may now be identified as Myos Hormos as a result of cumulative work by David Peacock, who compared the ancient description of the site with modern satellite images, and subsequent excavations by Peacock and Blue from 1999 - 2003 that confirmed this identification through written material on a Roman-period papyrus that mentioned 'here in Myos Hormos' and in 'Myos Hormos on the Red Sea' (Inv.P.004) (Van Rengen 2011: 336).

1.2.1 Settlement and chronology at Quseir al-Qadim

The site, which occupies about 10 ha, has an undulating topography resulting from the decay of ancient mud brick buildings, with two phases of occupation; that of

Roman and Islamic periods (Peacock & Blue 2011b: 1). What is perhaps most striking about the site is the lack of well-established street system and substantial architecture. The first point to note with regard to the earlier settlement is that there is no evidence of the classical chessboard layout generally associated with Roman towns. Rather the fragments of streets excavated suggested a somewhat ramshackle maze of narrow winding alleys, a view supported by building orientation across the site (Peacock & Blue 2006).

A chronology from the 1st century AD to late 2nd or 3rd century, followed by a period of abandonment prior to the Mamluk period was proposed as a result of the excavations by the University of Chicago in two major structural periods at Myos Hormos (Whitcomb & Johnson 1979, 1982 quoted by Tomber 2008: 59). This chronology was refined by the Southampton excavations that identified the deposits between the late Augustun period and mid 3rd century AD, although Ptolemaic coin and sherd finds dating to the 2nd - 1st centuries BC reinforce the possibility of earlier occupation of the site.

For the Roman sequence, Whitcomb (2005: 86) describes the site as an orthogonally planned complex, arranged against the steep, western edge of the coral beach. The principal buildings excavated were two large complexes of mounded earth labeled Central Building A and Central Building B. There was no wall around the settlement. Central Building A was provisionally identified as a *horreum* (28 x 36 m) with an attached row of shops (8 m deep) opening on to the street. Attached to the west of this building was a row of rooms each measuring 9 x 4 m. It seems to have been a private storehouse for expensive goods, one in which individual merchants might rent a storeroom. Central Building B is interpreted as the *castellum* (75 x 52 m) or a fort that was the locus for administration and protection of the town in the absence of a city wall. It is also suggested that the presence of a small temple suggests the unattested religious function of Central Building B (Whitcomb 2005: 86-87). However according to Peacock and Blue (2006: 5-6) the identification of a fort cannot be sustained. Other buildings excavated by Whitcomb (2005: 88-89) included a rectangular northeast structure suggesting a function as a stable or animal enclosure as well as the northwest and southwest areas that exhibit a homogenous

archaeological character with thin mud brick walls, concentrations of sherds and evidence of a 'Roman villa'.

The harbour area was noted by Whitcomb (2005: 92) as the existence of a lagoon functioning as a shallow harbour with a minimal size of 700 x 200 m (14 ha.) that gradually silted from the Wadi al-Anz to the north and Wadi Quseir al-Qadim in the south. The major aim of the Southampton excavations was to locate the now silted-up ancient harbour. Over 100 2x2 m test pits were laid on the southern and eastern limits of the site to trace a southern channel connecting the sea to the harbour. The harbours were a far cry from the fine ports of the Mediterranean. However a remarkable feature was uncovered consisting of hundreds of complete amphorae and near-complete pots, many in upright positions, were laid to form a jetty and also to consolidate waterlogged land which in other contexts would have been constructed of stone, totally inappropriate here as they would have sunk into the silt and sand. (Peacock & Blue 2006: 67-74). However a stone harbour was also constructed elsewhere during the 2nd century (ibid 2006: 176). Most of the pots were Roman amphorae and occasionally complete South Arabian organic storage jars. The amphorae were clearly broken when used and some bore marine encrustations suggesting that they were recovered from the water.

Other structures excavated by the Southampton team were mostly made of mud brick in combination with coral and ashlar including a single monumental building with mudbrick walls and dressed limestone foundation interpreted as a synagogue. Areas for baking and activities relating to fishing and smithing as well as pottery associated with East African and Indians on the site (Tomber 2008: 61).

1.3 Berenike: chronology and settlement

Berenike, the southernmost of the Egyptian Red Sea ports located approximately 825 km south of Suez and 260 km east of Aswan at the south-eastern extremity of Egypt, was according to Strabo (Geography 17.1.4.5) probably the largest and most important at least from the 1st century BC. It was founded by Ptolemy II in the early 3rd century BC and named after his mother Berenike I and grew to become the principal Graeco-Roman entrepôt, through which the greater part of the 'India trade'

passed, via the Eastern Desert to Coptos then down the Nile to Alexandria (Sidebotham 1992: 21; Sidebotham 1995 quoted by Power: 57). The geographic position of Berenike was eminently suitable since it was a natural harbour, protected against the prevailing northern winds by a large peninsula. Furthermore, the dangerous shipping route over the Red Sea, with its treacherous coral reefs and its pirates operating from the Arabian peninsula made it desirable to have a safe landing place as far to the south as possible. From Berenike there were overland routes through the Eastern desert to the Nile valley, protected by way-stations (*hydreumata*). These provided the caravans with water and shelter.

A sequence from the mid 3rd century BC in to the early 6th century AD has been identified from eight excavation seasons conducted by the Universities of Delaware and Leiden and published by Sidebotham and Wendrich (1995, 1996, 1998, 1999, 2000, 2007) (cf. Tomber 2008: 61). These excavations have revealed three periods of relative prosperity. The initial one was during the first century or so following its foundation in about 275 BC by Ptolemy II Philadelphus. At that time trade in elephants brought by sea from coastal ports in Sudan and Eritrea for use in the Ptolemaic arm was Berenike's main *raison d' etre.* The second era of extensive activity at Berenike was during the early Roman period, specifically the 1st century AD. At that time, commerce was more commercial and civilian in nature, as it was during the third and final age of economic vibrancy in the late Roman period, beginning in the middle of the fourth through fifth centuries AD (Sidebotham 2002: 217).

Berenike's location south of Ras Benas was carefully considered in that it was an excellent landmark for those sailing along the coast and that it did block the strong, southerly alongshore current that particularly caused the habour at Berenike to silt up and boats anchored offshore to drift. The site covers an area of 300 - 350 m north-south and 670 m east-west and lies atop an extinct coral reef and situated between two wadis: Wadi Madit formed at the northern harbour and Wadi Umm Salim al-Mandit created its southern habour (Sidebotham 2011: 9). The settlement comprised mainly of stone architecture composed of ashlar or coral from the adjacent reef or mudbrick (Sidebotham 2002: 233). Two-storey buildings were evidenced by the

presence of staircases with a commercial or public function on the ground floor and domestic or private above. Small shops or offices indicated other commercial functions with evidence of metal scales and weights dealing with valuable lightweight items (ibid 2002: 220-221).

There was a shift in settlement from the Ptolemaic to late Roman times (mid 4th century onwards) and a gradual migration eastwards and southwards as a result of the silting of the wadi. Activities such as iron working and numerous architectural features including a quay wall, a warehouse, cemetery and temples or shrines for different cults were evidenced. The largest religious building was a 5th/6th century church with an aisled hall and could accommodate 75 and 80 worshippers with several Christian motifs (Sidebotham & Wendrich 2001-2 quoted by Tomber 2008: 62). No streets have been excavated from Late Roman Berenike and equally there were few structures, apart from harbour installations and temples (Sidebotham 2002: 220, 229). Explanation for this may be an increase of funds in the late Roman period that encouraged trade, while in the Early Roman period there was less investment in the ports. Alternatively, it may indicate a decline in the Romanised population and increase in the Egyptian or desert dwellers during the Late Roman times (Sidebotham 2004: 112-133 quoted by Tomber 2008: 63).

1.3.1 Berenike and 'India trade'

Evidence for a busy commerce with India begins in the mid first century BC and continues to be well evidenced through the fourth and fifth centuries. According to Sidebotham, Berenike itself was an important conduit in the southern Maritime Spice Route, which served long-distance commerce ranging from the Mediterranean basin, Egypt and the Red Sea on one hand to the Indian Ocean, including the African coast, the Indian subcontinent, Sri Lanka, and to a lesser extent the Arabian Gulf and perhaps beyond on the other (Sidebotham 2011: 3). Of imports, the largest range of finds at the Red Sea ports are from India: the Periplus (PME 39-63) describes the export of products from a variety of Early Historic period ports along the west and east coasts (Tomber 2012: 205). The organization of trade very much relied on entrepôts that were used for amassing the goods throughout India. Barygaza was

special in that it combined categories of items from different parts of India, whereas the ports of South India were, in the main, exporting items derived from local resources (ibid 2012: 205; Thapar 2005: 26-27). Examples of these Indian imports at Berenike from the early and late Roman levels include Indian archaeobotanical remains such as pepper, coconut, Job's tear cereal, rice and teak recycled from Indian ships and used as building material (Cappers 2006: 327-332). More peppercorns have been retrieved from Berenike than any other Egyptian site. Black pepper had a restricted growing area in modern Kerala, and its export is mentioned only from Limyrike. From the Red Sea, black pepper (not long pepper) has been identified archaeologically, most spectacularly by 7.5kg in an Indian pottery vessel found at Berenike (Cappers 2006: 114-116). Other items of value include Indo-Pacific glass beads (5 from the early levels and 368 from later phases), whose production is first attested in Arikamedu in the 2nd century BC and thereafter moved to Mantai in Sri Lanka, which could imply that late Roman Berenike's trade was principally with Sri Lanka. Chalcedonies had a wider distribution but beryls were more easily obtainable in the Coimbatore region of Tamil Nadu and pearls were largely from Sri Lanka (Thapar 2005: 26). Probable contacts with the western Deccan are evidenced. An Indo-Parthian Saka coin of Rudrasena III (r. 348-90) and minted in Saka year 285 / AD 362 was found in a late fourth century / early fifth century context. Cotton identified as an Indian import makes up an unusually large proportion of the textile assemblage. The Periplus identifies the port of Barbarikon in the Indus Delta as a centre of cloth exports, which continued into late antiquity. Also, to the south, the Deccan port of Kaliana (near Bombay) has been identified as an exporter of cloth based on Late Roman historical sources (Procopius and Cosmas Indicopleustes) (quoted by Power 2010: 58 - 59). According to Sidebotham (2002: 230-234) "(The late Roman) commercial renaissance did not reach the levels it had in early Roman times… Trade with India and Sri Lanka was extensive, though what amount was direct 'Roman Egypt – South Asian' and how much was conducted through 'non-Roman' middle men like the Aksumites, South Arabians and others cannot be determined." Indian ceramics were less common in the late Roman period than earlier and they may be residual. If coarse ware importation continued, it was on a much reduced scale.

1.4 Indian ceramic forms from Quseir al-Qadim and Berenike

Indian pottery has been recognised in the Egyptian Red Sea sites from some earlier excavations along the coast where tentative identifications were made from Myos Hormos (Whitcomb 1982: 67). For a time however there was initial doubt whether the Indian potteries of Quseir could be called so, with Ballet (2005: 136) stating that 'the shapes do not appear to be any different from those of common Egyptian wares belonging to Roman times and the technical information available to us suggests that these so-called Indian vessels may have come from Egypt." This observation was based on the meager details available at the time about the morphology and the type of clay used for Indian pottery in the Red Sea, although Ballet agreed that we cannot completely rule out the presence of Indian vessels on sites and in regions covered by this international trade and that "we have to look for more convincing evidence based on the shape and type of clay used." (ibid 136-137). Based on more recent work by Roberta Tomber and others (Begley & Tomber 1999; Tomber & Begley 2000; Tomber 2000a; Tomber 2000b; Tomber 2002; Tomber 2008), a range of Indian vessels is now securely recognised on the basis of form and fabric. Much of Tomber's study also focused on source identification of specific coarse wares (i.e. organic black wares) from the Red Sea (see Tomber et al. 2011a). In addition to storage jars, red-slipped cooking pots and casseroles are the most common Indian ceramics recovered from early Roman deposits at the Red Sea ports (Tomber 2012). At Quseir, Indian pottery distribution suggests that foreigners lived or worked in separate quarters (Thomas & Masser 2006: 138-140), while at Berenike Indian pottery is fairly evenly distributed across the site, mostly from midden deposits rather than primary levels, but South Asian imported basketry clusters in one rubbish dump (Wendrich 2007: 250 quoted by Tomber 2008: 73). Many of the sherds catalogued from Berenike come from a series of dumps, likely to be related to each other, from trenches 4, 12, 13, 17 and 19. Ceramically these layers were dated mid to late first century, and thought to span the period 50 AD to c. 70 AD, possibly just continuing into the third quarter of the first century (Tomber & Begley 2000: 150). Regarding the coarse wares, body sherds that could be assigned to this category were present in ten of the trenches excavated during 1998 (10, 12, 16, 17, 18, 19,20, 21, 23, 24), and were particularly substantial from trenches 12 and 19 (Tomber & Begley 2000). This

chapter attempts a desk-based synthesis of Indian vessel morphology from the two sites of Quseir al-Qadim and Berenike, followed by an assessment of the different types of fabric.

The forms illustrated from both Quseir and Berenike occur at several Indian sites, but the parallels cited by Begley and Tomber (1999), Tomber and Begley (2000) and Tomber (2000a; 2000b) were primarily those from Arikamedu (Wheeler et al. 1946). This was partly because pottery from the Arikamedu excavations is published in considerable detail and partly because the authors knew the Arikamedu fabrics.

1.4.1 Morphology of Indian fine tableware

Fine ware forms from the Red Sea sites of Berenike and Quseir al-Qadim include:
a) Dish with internally beaked rim, or thickened rim and an oblique lip, contiguous body and base with one to three bands or ‘rouletted’ or ‘chattered’ decoration on the interior (Wheeler Type 1) (Fig. 149: 1-5)
b) Small bowl or cup decorated with bands of parallel incised lines between which are stamped animal motifs (Wheeler type 10) (Fig. 150: 6-8)
c) Closed vessels (Fig. 151: 9)
d) Miscellaneous tableware (Fig. 151: 10-11)

A minimum of six vessels of Wheeler Type 1 was recovered from the 1997-8 excavations at Berenike. At least three vessels of this 'rouletted' dish with flat base and in-turned beaked rim were recorded from 1997, with a further three vessels recovered during 1998 (Tomber & Begley 2000: 150). One of the rims (catalogue 2) in Table 5 (Fig. 149: 2) has a thickened oblique rim, while fragment catalogue 5 (Fig. 149: 4) has a row of dot-like indentations placed in two bands on the interior surface and a hole pierced through the inner band (Begley & Tomber 1999: 163). Two of the new examples from the Berenike 1998 excavations (e.g. Fig. 149: 5) differ in fabric from those already published, having a coarser matrix, more allied to Arikamedu Coarse Ware 1A than the Fine Ware 1 in which they previously occurred. The third vessel, represented by a splinter from a rouletted base, is in the typical Arikamedu FW 1 fabric (Tomber & Begley 2000: Fig. 3-1, pl. 3-2, catalogue nos. 1-2, pl. 3-3 no. 3). Rouletted ware and other fine wares are represented by small numbers i.e. around

20 vessels between the two sites. The only other sherds RW known in Egypt are three from the Nile ports of Coptos (Elaigne 1999 quoted by Tomber 2008: 74).

Wheeler Type 10 form has a simple rim, wide orifice, tapered walls and a flat base. The interior, below the rim, usually has a row of stamped bird or fish motifs in single orientation, placed between two bands of multiple grooves. Bowls without the stamped motifs also exist, but they are rare (Begley & Tomber 1999: 164). While stamps are absent on the two vessels represented by rims at Berenike, one does bear a shallow depression that may have been intended as a stamp: nevertheless, vessels are known in India without the stamp. In addition to two vessels (Fig. 150: 6-7) from the 1997 season at Berenike, a further two came from the 1998 excavations, one of which is in the classic FW 1 fabric (Fig. 150: 8), the second in an allied but poorer quality one (Tomber & Begley 2000: Fig. 3-1, nos. 4-5). Both Rouletted and the related wares i.e. Wheeler 10 have also been documented from Quseir al-Qadim (Tomber 2008: Fig. 5 nos. 1-2).

The third category of Indian fine wares from Egyptian Red Sea sites are closed vessels defined as wares slipped only on the outside. Two sherds including one diagnostic form was noted by Begley and Tomber (1999: Fig. 6-3, no. 8) (Fig. 151: 9). From the 1998 excavations, this ware was represented by a minimum of 25 sherds, out of which 18 came from one vessel (Tomber & Begley 2000: Fig. 3-1, no. 6).

Miscellaneous tablewares were represented by single fragments in Berenike including a body sherd of a cup or bowl with a stubby flange (Fig. 151: 10) similar to Nevasa forms (Sankalia et al. 1960: Fig. 143 no. 6 cf. Tomber & Begley 2000: Fig. 3-1 no. 8) and bowl or jar with a thickened everted rim and internal groove similar in form to RPW bowl from Gujarat (Orton 1991: Fig. 4.26, no. 8 cf. Tomber & Begley 2000: Fig. 3-1 no. 9) (Fig. 151: 11).

Most of the Indian fine wares from the Red Sea were in the contexts of the late 1st century BC or 1st century AD and some were perhaps re-worked in later periods. The distinctive nature of the Indian fine ware forms and fabrics present at Berenike, all belonging to Arikamedu Fine Ware 1 fabric, make it fairly certain that essentially

all the sherds recovered have been identified and recorded (Begley & Tomber 1999). These vessels have been listed and summarised separately for the 1997 and 1998 seasons at Berenike in Tables 5 and 6.

1.4.2 Morphology of Indian coarse utilitarian wares

The vessel types from Quseir and Berenike fall into the following categories of coarse wares:

a) Cooking pots with carinated shoulders (Wheeler Type 24) (Fig. 152: 12-16)

b) Casseroles with out-turned to flat rims (Wheeler Type 25) (Fig. 153: 17-19)

c) Flanged lids or casseroles (Wheeler Type 28/29) (Fig. 154: 20-22)

d) Dish or casserole with plain rim (Wheeler Type 2) (Fig.??) (Fig. 155: 23-24)

e) Cup-and-saucer shaped lid (Wheeler Type 38) (Fig. 155: 25)

f) Large storage jars/containers (Vessels with Applied Strips - Wheeler Types 69c &145 and Paddle-impressed sherds) (Fig. 155: 26)

Based on the findings from the 1997 season at Berenike, the majority of sherds in Indian forms with a probable source in India or South Asia are handmade cooking wares. Of these cooking vessels, Type 24 (cooking pot with sharply everted rim and frequently carinated shoulder) is the most common, followed by Type 25 and finally Types 28/29. In aggregate they form between 1-9% of non-amphora sherds in large quantified early Roman deposits at Berenike. Type 24 is also reported from Quseir al-Qadim along with several other forms, which are similar to Arikamedu, but it is not clear whether they were Indian in origin or produced elsewhere. From the descriptions their fabrics appear to be different from Arikamedu (Whitcomb & Johnson 1979, 1982). It is, therefore, difficult to ascertain whether all the examples from Berenike were Indian made, even though the form is a common Indian shape. In general the Berenike Type 24 vessels appear to have been made in at least two parts, with the rim joined separately to the body. Marks on the vessel walls may indicate that at least some were coil made. Burnished slip normally covers the exterior of the vessel and the rim, sometimes extending a few centimeters below the base of the rim on the inside (Begley &Tomber1999).

Wheeler Type 25 from the 1998 excavations (Tomber & Begley 2000: Fig. 3-5 nos.

12-13) (Fig. 153: 18-19) has a slightly different rim profile i.e. more square in section than the 1997 season (Begley & Tomber 1999: Fig. 6-5 no. 16) (Fig. 153: 17). With regard to Wheeler Types 28/29, Wheeler 28 has a narrower opening and deeper sagging base than Type 29. The distinction between the two may be significant, because Type 28 appears to be earlier, occurring from the first century BC or AD, while Type 29 begins after the middle of the first century AD (Begley 1996: 237; Begley & Tomber 1999: 172). The fragments of Type 28 from the 1998 seasons (Tomber & Begley 2000: Fig. 305, nos. 14-15) (Fig. 154: 21-22) have a more upright rim profile and sharper flange from the one published from the 1997 season (Begley & Tomber 1999: Fig. 6-5 no. 11) (Fig. 154: 20).

Coarse ware forms classified as Wheeler Type 2 at Berenike refers to dishes with slightly rounded bases and plain or sometimes internally beaked rims (Tomber & Begley 2000: Fig. 3-5, catalogue nos. 16 & 17) (Fig. 155: 23-24). Another utilitarian form is Type 38, the cup-and-saucer lid or lamp has been found from poorly dated contexts in Berenike (Fig. 155: 25), but has parallels in form from several sites in India and Arabia

Large storage vessels constitute another substantial group with over 40 sherds from excavations in Berenike and a few sherds from the Roman contexts at Quseir al-Qadim (Tomber 2000a) (Fig. 156). Most of these are represented by vessels forms with grooved shoulders (paddle-impressed) (Fig. 156: 4), or cordoned neck with different decorations (applied/slashed strips) that indicate probable Indian origin. Included in the category of Indian vessels from Quseir are storage jars with graffiti inscribed in Tamil Brahmi and South Arabian script (details in Chapter 8). These vessel forms include a narrow necked storage jar with everted rim and neck cordon (Table 9: 7) as well as a jar with over-turned rim and indentation inside (Table 9: 8) (Tomber et al. 2011b: 8). Some miscellaneous storage vessels have been recorded from the 1998 excavations with enlarged everted rim, ledged on the inside (Tomber & Begley 2000: Fig. 3-12 no. 24) (Fig. 155: 26) paralleled with Arikamedu Types 71 and 73 and with storage vessels from Quseir- al Qadim (Whitcomb 1982: pl. 13f). Another typical form attested to Indian storage vessels from the Red Sea are high-necked jars with everted, occasionally rounded rims (Tomber 2008: Fig. 7 no. 4)

(Fig. 155: 27)

Although parallels can be sought from the Arikamedu types, several forms and fabric variations of storage jars and other coarse wares can be compared to assemblages from several additional sites in the Indian subcontinent. Not all the potentially Indian coarse ware sherds from Berenike and Quseir al-Qadim were recorded separately and, therefore, they are not tabulated in the same way as the fine wares. The quantity, therefore, represents the minimum numbers of vessels present (Begley & Tomber 1999). These have been catalogued and presented for Berenike and Quseir in tables 7, 8 and 9 respectively.

1.5 Discussion on Indian pottery fabrics from Berenike and Quseir al-Qadim

1.5.1 Fine ware fabrics from Berenike

Both Wheeler Type 1 and Type 10 vessels from Berenike belong predominantly to the Arikamedu Fine Ware I fabric class based on the paste, treatment of the surfaces (good quality thick lustrous slip) and colour in the cross section. According to Tomber (2000a) from the 1997-1998 excavations, four out of the six Wheeler Type 1 fragments and three out of four Wheeler Type 10 vessels belong to this fabric. The remaining two RW vessels or Wheeler Type 1 have a coarser sandy paste possibly related to Arikamedu Coarse Ware 1A while the remaining Wheeler 10 bowl is composed of a slightly poorer fabric. Visual examination of the fine ware samples from Berenike (Begley & Tomber 1999; Tomber & Begley 2000) has indicated that the wares comprise a fine, intensely micaceous fabric containing abundant silver mica (BE97-13 *002* PB 23, BE97-5 132 PB 354, BE96-7 &BE97-5 126 PB 345), same fabric including one visible limestone and organic impurity with sparse smaller limestone fragments (BE97-5 152 PB 393), sample with abundant silver mica and common silver mica and rare limestone impurities (BE97-5 132 PB 354). The context, dating and description of these fine ware vessels from Berenike are provided in Tables 5 and 6.

In the past, the identification of Indian fine wares found in both the Red Sea and Indian contexts resulted in their misattribution as Roman products. The most

persistent of these was Rouletted Ware or Wheeler Type 1, which Begley (1988) presented strong arguments for an Indian production based on fabric similarities with Northern Black Polished Ware and dissimilarities in form with Roman types. This was followed by X-Ray Diffraction study by which Gogte (1997, 2001) identified the Ganges (Chandraketugarh and Tamluk regions) as the most likely source. The inspiration for the rouletted decoration, which is a common practice on both Greek and Roman pottery, remains unclear (Tomber 2008: 45). Another variation of RW that has not yet been considered in the Red Sea contexts is 'imitation RW' which has recently been documented from sites like Khor Rori and Tissamaharama (Sri Lanka) (Pavan & Schenk 2012). The evidence of RW vessels in coarse sandy paste (Arikamedu Coarse Ware 1A) from Berenike may indicate the presence of imitation RW from the Red Sea region. Another fine ware historically considered Roman is the Red Polished Ware, based on its similarity to the Roman red-slipped wares. However Pinto-Orton (1992) in her excellent study demonstrated that RPW consists of radically different set of forms (e.g. sprinkler) and Gujarat is now generally accepted as the source for RPW. The absence at Berenike of Red Polished ware, a type closely associated with northwest India, may or may not be significant in assessing the role of Barbarikon and Barygaza during this period (Tomber 2000a: 629). Result studies have revealed that the potential of Arikamedu Type 10 has been overshadowed by Rouletted ware. In comparison, Arikamedu Type 10 has had less examination and evolution of the type. According to Shoebridge and Coningham, Arikamedu Type 10 has been recovered from sites on the east coast of India, Sri Lanka, Indonesia and Egypt. Although scientific studies have unsuccessfully investigated the provenance of these ceramics, a new analytical method using image analysis of the unique features of these wares allows the collection of data to aid the reconstruction of Early Historic networks of contact (Shoebridge & Coningham 2011).

1.5.2 Coarse ware fabrics from Berenike and Quseir al-Qadim

Indian coarse wares exported to the west are more difficult to provenance and date, since some of them were produced from the Early Historic period to the present day in both North and South India (Tomber 2008: 46). At both Berenike and Quseir, this group vastly outnumbers tablewares in quantity, but their source identification is

more problematic.

Wheeler Types 24, 25, 28/29 excavated at Berenike are related in both fabric and surface treatment, comprising a sandy paste, frequently with burnished red slip covering the surfaces either entirely or in part. The sooted condition of many vessels leaves no doubt that they were used over an open fire (Tomber 2000a: 626). Coarse Red-Slipped Wares (CRSW) frequently fall into this category and account for up to 9% of the non-amphora in the 1st century AD assemblage at Berenike (Begley & Tomber 1999: 180). In western Indian Wheeler Type 24 even in red polished ware in addition to coarse wares, but the fabrics are not described in enough detail (ibid 1999: 173). According to Begley (1996), these cooking and other utilitarian vessels from Arikamedu occur in Coarse ware 2 fabric (Coarse ware 2a, 2b& 2c) as well as one example in Coarse ware 1 fabric from Arikamedu. The fabrics of the Berenike sherds do not match the fabric of Arikamedu Coarse Ware 2a in which early Type 24 was made.

Another important fabric from Berenike and Quseir is a coarse black, handmade fabric with very thick walls referred to as Organic Black Ware. This fabric occurs mainly in cooking vessels, jars, casseroles (Wheeler Type 24 & 25) as well as occasionally Wheeler Type 38 (Fig. 157). The vessel in light in weight despite its thickness and has been nicknamed 'light ware' or 'spongy ware'. Recent petrographic analysis of samples from Berenike and Quseir (Tomber et al. 2011a) and Khor Rori (Lippi et al. 2011) have revealed organic temper particularly rice husk in the fabric, indicating Gujarat (Kamrej, Dhatva, Kuda, Nagara etc.) to be the likely source of these rice-tempered wares. For Wheeler Type 38 (cup-and-saucer shaped lid), the Berenike fabric is crude and porous with poorly finished surfaces similar to the 'Limestone and Vegetal-tempered Red Fabric' from Ras Hafun (Smith & Wright 1988: 122) for which a western Indian origin was ascribed by B.B Lal (Henry Wright pers. comm. quoted by Tomber 2000a: 628).

Although these coarse vessels were produced throughout India, a proportion of those found at Quseir and Berenike have distinctive markings or decorative styles in their manufacturing for which geographical sources can be loosely suggested. The Wheeler types 24 from the Red Sea were formed using a manufacture technique

known as ‘scooping’. These vessels display internal wiping with an organic material considered to be a by-product of bamboo tools (Tomber & Begley 2000: 156, pl. 3-4). Saraswati and Behura during the 1960s first ethnographically recorded this technique known only to the potters of North Kerala. The process involved the ball of clay roughly shaped and bamboo tools used to hollow the inside and define the rim and neck, followed by internal beating to achieve the correct thickness after which the vessels were burnished inside out. Some of these vessels were less carefully finished and resulted in visible bamboo marks (Saraswati & Behura 1966: 81-83). Pottery examined from the site in Pattanam in 2003 revealed a match for these wares from the Red Sea and in this way a direct link between Kerala and the Red Sea was established (Tomber 2008: 47).

For the range of storage jars or containers from Berenike and Quseir, a distinct sub-class of wares was produced using a paddle and anvil technique with a grooved paddle (Selvakumar 2004: 616-617; Begley 2004: 202-205 quoted by Tomber 2008: 48). Two sherds from such vessels were identified in 1997, but a larger number approximately 40 additional sherds was recovered during 1998 (Fig. 158a). Two main fabric groups have been identified. The most common (Fabric I) is red brown (between 2.5YR 5/6-4/6) with a grey (5YR 4/1) core, consisting of a silty matrix with varying quantities of larger quartz inclusions. Sherds in this fabric have a distinctive tendency to laminate on the surface. The other fabric (Fabric 2) is orange to orange brown (5YR 5/6) with slightly paler surfaces and contains abundant, densely packed sand-sized quartz resulting in a crumbly, friable fabric. Both variants also contain small black ferromagnesian minerals and some mica. The Berenike fabrics compare well with some found at Arikamedu (Tomber & Begley 2000: 162). In India this type has a fairly restricted eastern distribution where they occur from the 1st century BC: into the 3rd or 4th century AD, are occasionally found in the medieval period and are produced by modern potters in Mysore, Andhra Pradesh, Goa, Kerala, Madras and West Bengal (Saraswati & Behura 1966: 22). The fabrics identified in Egypt indicate sources from both South India and Chandraketugarh region (Tomber 2008: 48).

Another distinct decorative element for utilitarian vessels from Egypt include

applied, thumbed or slashed strips that have a more ubiquitous distribution both in India and from the Gulf (Fig. 158b). Parallels are sought from Arikamedu (Wheeler Type 145) as well as from Ed-Dur in the Arabian Gulf (Haerinck et al. 1993). From Arikamedu this type is known from the 1st century BC till the medieval period (Tomber 2000a: 629).

Visual examination of the coarse wares from Berenike by Tomber and Begley (2000: 156) revealed that these forms all occur in a quartz-rich fabric with common ill-sorted quartz, rarely 1.0 mm, usually to *ca.* 0.5 mm, and in most cases with some accompanying mica and black ferromagnesian minerals. Although macroscopically united by quartz-rich fabrics, red-slipped surfaces and similar technology, their variability indicates more than one production centre. One fabric variant, identified in 1998 (Table 8 catalogue numbers 10, 11 and 15), is distinctively lighter in colour *(e.g.* 7.5YR *8/2-712),* has varying quantities of visible red clay pellets to *ca.* 1.0 mm, and may be similar to Arikamedu Coarse Ware 2. The description of the fabric of individual samples of coarse ware recorded from these sites is provided in tables 7-9.

2. Africa and the Late Roman 'India trade'

The areas of Ethiopia, Eritrea and Somalia, incorporating parts of modern Egypt south of Berenike, and the coastal regions east of the Nile in Sudan are defined in the Periplus (Casson 1989 PME 2- 4) as the region of Barbaroi. Between the third and seventh centuries AD the Aksumite kingdom with their capital Aksum in modern Ethiopia were a powerful international force, who despite their land-locked capital, played an active role in the Indian Ocean commerce through the port of Adulis, c. 150 km to the north-east in Eritrea (Tomber 2008: 88). For much of its history, the boundaries of the territory subject to Aksumite control remained. At their maximum extent their territory included the areas south of Massawa on the Red Sea coast where the port of Adulis was located, together with the highlands of south-central Eritrea and the greater part of Ethiopia's Tigray region (Phillipson 2012: 48) (Fig. 159). Aksum, the capital of the kingdom was extensively investigated by Munro-Hay and Chittick in the 1980s and later excavations, respectively those of the British Institute of East Africa and University of Naples in the 1990s largely confirmed

Munro-hay's findings and further refined the ceramic sequence (Power 2010: 73). The port of Adulis, situated on the Gulf of Zula (Annesley Bay) opposite the Dahlak Islands, was first identified by Henry Salt in 1810, followed by excavations by the British Museum in 1868 and subsequent exploration that revealed a thriving urban centre during the Late Roman or Byzantine periods (Tomber 2008: 89). The Aksumites adopted Christianity in the second quarter of the 4th century (c. 340 AD) evidenced by the presence of three excavated churches (Munro-Hay 1982: 108). The finds from the survey work of David Peacock and Lucy Blue in 2004 and 2005 reinforce the Late Roman date, c. 5th-7th century AD (Peacock & Blue 2007 quoted by Tomber 2008: 90).

The fourth and fifth centuries were further characterised by new patterns of trade, in which Ethiopian ports such as Adulis and Aqiq and Yemeni ports including Aden and Qana were heavily involved. The Aksumites and Ḥimyarites appear to have increasingly acted as middlemen to the Byzantines in the 'India trade,' during this period when the Red Sea became integrated into a sequence of overlapping but independent regional networks (Power 2010: 30) The wealth of this kingdom, apparent from the massive public works still visible in the great granite stelae, stone-walled palaces and the royal tombs which have been revealed by excavation, was based on the strategic positioning of the capital astride certain significant trading routes and, no less important, on the Aksumite monarchy's control of the Eritrean coast. This control gave the kingdom easy access to the trading networks which flowed from Egypt, down the Red Sea and out into the Indian Ocean wherein trade from this direction during Aksumite times was conducted through the port of Adulis (Munro-Hay 1982). From Adulis, a caravan route led south to the imperial capital at Aksum from where further routes tapped into the ivory, gold and slave producing territories between the Tegeze and Blue Nile. The early rise of Aksum lay in the control of the lines of supply bringing such commodities down to the coast, and their export from Adulis attracted considerable attention in the Graeco-Roman sources. By Late Antiquity, the importance of these traditional exports was eclipsed by the 'India trade' now routed through the port of Adulis (Power 2010: 74).

Imported finds from Adulis and Aksum are biased toward the fifth to seventh

centuries and include a range of pottery including Aqaba amphorae, small quantities of east Mediterranean amphorae, Mesopotamian Glazed ware as well as glass and jewellery (Tomber 2008: 91). Aksum also had trading relations with India and Sri Lanka. A find of Indian gold coins, issued by the Kushana kings (who ruled in north India and Afghanistan) in the earlier third century, at the monastery of Dabra Damo on the route between Aksum and the coast, confirms the contact from the Ethiopian side (Mordini 1960, 1967 quoted by Munro-Hay 1991). Indian finds also include 1,139 beads from the Tomb of the Brick Arches and 163 biconical and 883 small Indo-Pacific beads (Harlow 2000 quoted by Tomber 2008: 93) as well as a gold and carnelian ring inscribed in an unknown language (Phillipson 2000 quoted by Tomber 2008: 93). There are also occasional allusions to ships from Adulis sailing to or from the sub-continent. Such instances occur in the in the Christian Topography of Cosmas Indicopleustes who describes how a Roman merchant, Sopatros, who had gone to Taprobane (Sri Lanka) with merchants from Adulis, got the better of a distinguished Persian in the presence of a Sri Lankan king by comparing the gold coins of the Romans with the silver milarision of the Persians (Munro-Hay 1991).

Historical evidence points to direct trade between the Africa and India as Cosmas Indicopleustes suggests that "The inhabitants of Barbaria (Eritrea/Somalia), being near at hand, go up into the interior (of the Indian sub-continent), and engaging in traffic with natives, bring back from them many kinds of spices, frankincense, cassia, sugarcane and many other articles of merchandise, which they afterwards send by sea to Adulis…" (Cosmas, 51 McCrindle 1897). Ceramic evidence of Aksumite trade has been identified from the site of Kamrej, represented by a large storage vessel with a shallowly grooved handle (Fig. 160). Detailed examination by Roberta Tomber of the fabric (red-orange with common, poorly-sorted angular white inclusions and abundant mudstone) confirmed that the fabric is similar to wares produced in the region of Aksum in Ethiopia near the Red Sea where it could also be paralleled to similar vessel forms dating to the late 4th and 5th centuries (Tomber 2005: 99). The exact nature of the Aksumite rule in this trade is a matter of debate as sherds may have reached Kamrej through indirect or direct links with the kingdom. Aksumite finds are also reported from other sites in Indian including a coin hoard from the region of Mangalore containing 27 Aksumite coins from the mid 4th to mid

5th c. AD, another potentially Aksumite coin from the 5th century reported from the river at Madurai basin as well as imitations of Aksumite coins, one cast in Egypt, found in Karur, Tamil Nadu (Hahn 2000 quoted by Tomber 2005: 100). Similarly evidence of Indian ceramics demonstrating contacts with Africa is yet to be identified from Ethiopia, but sailing though the Bab al Mandab strait along the Gulf of Aden to the south of Cape Guardafui is the site of Ras Hafun, where evidence of Indian ceramics from Early and Late Roman contexts has been identified and recorded (Smith & Wright 1988).

2.1 Indian Ceramics from East Africa: the evidence from Ras Hafun

Historical records have shown that the East African coast was connected to ancient global trade networks. These early overseas contacts are evidenced by references to trading voyages in the early 1st millennium AD. The Periplus refers to east Africa's coast mentioning port towns like Opone (PME 12) and the Spice Port (PME 12). Chinese sources mention presence of a cattle economy at Berbera coast, Somali by late 800s AD, as well as their involvement in trade with foreigners from the Far East. Historical records by Arab travelers and geographers in mid 900s AD mention thriving maritime communities along the east African coast (Bita 2012). Though we know of trade with East Africa from classical and other documentary sources, direct archaeological evidence of this contact has not yet been reported until the survey in 1974 of two littoral sites on Ras Xaafuun or Hafun, long equated with Opone (PME 13), 160 km south of Ras Asir or Cape Guardafui by Neville Chittick, Director of the British Institute in Eastern Africa (Chittick 1976, 1980). Chittick identified the site as part of a wider survey of Somalia and subsequently returned there to excavate Hafun West (HW) and slightly to the south-east, Hafun Main (HM) (Chittick 1976). While the promontory suffers as a result of the north-east monsoon winds from November to March, the site itself is well-protected. Present access is from the North Bay of Hafun and small ships could find shelter her in any season. Hafun West (HW) is located faces west across the embayment and Hafun Main (HM) faces south-west across Hafun South Bay (Smith and Wright 1988: 116, fig. 2) (Fig. 161). In contrast to the Hafun West Site, there is no evidence that the sea cut significantly into the

occupational deposit and eroded the evidence of a building complex on the site. On the other hand, HM though relatively undisturbed, lacked architectural features except some rock-cut cairns.

The distribution and density of ceramics on the HW was low (30-35 sherds per cubic metre). On HM however despite the small excavated area, higher sherd densities (20-70 sherds per cubic metre) were noted and deeper deposits resulted in a larger sample of diagnostic sherds (ibid 1988: 118). The ceramic study was undertaken by Matthew Smith who prepared a manuscript on ceramic fabrics and their stratigraphic distributions. Smith and Wright (1988) dated the pottery from HW to the first century BC/AD and the HM assemblages were assigned 2nd-3rd and 3rd-5th century AD dates.

2.1.1 Indian vessel forms from Ras Hafun

The presence of Indian or South Asian pottery was only tentatively suggested by Smith and Wright (1988), including rare sherds of kitchen vessels from HW as well as red slipped large jars and bowls and vegetal-tempered dark brown burnished cooking jars that occurred in the early phases and considerably reduced or were absent by the later phases (ibid 1988: 124-125, 138). Tomber (2008: 97) states that recent studies have enabled more South Asian wares to be identified and that they were more common at HW and early phases of HM than previously thought. A total of 17 Indian vessel samples were identified including kitchen/cooking vessels (Smith and Wright 1988: Fig. 4 nos. f-g; Fig. 5 nos. l-m) (Fig. 162:1-4) from HW and cooking vessels (ibid 1988: Fig. 6 nos. a-c, g) (Fig. 163: 5-8, 13-14), storage jars (ibid 1988: Fig. 8 nos. a-b, d-e, h-j) (Fig. 163: 9-12, 15) and Wheeler Type 38 oil lamps (ibid 1988: Fig. 9 nos. i, k) (Fig. 163: 16-17) from HM. Each vessel form and its corresponding fabric is described and recorded in table 10.

This section of the chapter attempts address the ceramic fabrics recorded by Smith and Wright (1988) in their study of pottery assemblages at Ras Hafun West (RW) and Ras Hafun Main (RM). The fabrics that will be discussed are particularly classes related to Indian vessel forms, in the light of more recent evidence indicating similar

wares in other sites in the Red Sea and the Arabia. A total of 6 out of 15 classes were identified as likely Indian/South Asian fabrics from Ras Hafun (Smith and Wright 1988: 120-123). These include Coarse Sandy Red Fabric (CSyR) 'Coarse Red Ware', Shell-tempered Dark Grey Fabric (ShDG), Sandy Red-slipped Fabric (SyLsRS) 'Burnished Red Sandy Ware', Sandy Light Brown Burnished Fabric (SyLBBr) 'Light Brown Burnished Ware', Vegetal-tempered Dark Brown Burnished Fabric (VgDBBr) 'Dark Brown Burnished Ware' and Limestone and Vegetal-tempered Red Fabric (LsVgR) 'Standard Red Ware'.

2.1.1.1 Coarse Sandy Red Fabric (CSYR)

According to Smith and Wright (1988: 12) this fabric is ubiquitous in the Mediterranean world as ‘Roman cooking ware’ from similar ceramics were made in the contemporary Persian and South Asian worlds. The fabric is comprised of coarse sand present in the clay with inclusions of limestone, mica and possible crushed sherds and grog. Carbonised debris on vessel exteriors indicates that the jars were often used in cooking. The common vessel forms is a small jar with a simple everted rim (Fig. 162-163: 1-2, 5-6). This fabric is rare at Hafun West. It is common in the earlier layers at Hafun Main Site but also occurs in the later layers as well.

2.1.1.2 Shell-tempered Dark Grey Fabric (ShDG)

Two vessels were recorded in this category from the lower levels of Hafun West that comprised quantities of coarsely crushed shell fragments in the clay. The samples comprise a carinated cooking vessel with scalloping at the juncture and one everted rim fragment of a similar form (Fig. 162: 3-4). Whether these were recent or fossil shell at the time of use could not be ascertained until larger samples are recovered from the location of manufacture. Although the carinated form and scalloping was attested an origin in South Asia/India, no precise parallels were cited for the shell-tempered fabric by Smith and Wright (1988: 122).

Recently however, in the course of this research thesis, carinated cooking vessels or ‘handis’ in shell-tempered fabric were evidenced from the site of Mleiha (Sharjah, UAE) from where the present author has documented the Indian vessel forms and

fabric (Chapter 2). Nearly exact morphological and fabric parallels for the cooking vessels with scalloping were identified and categorised as 'shell tempered ridge-carinated vessels' (Chapter 2, section 1.4.3, Fig. 16-18: nos. 17-26). These vessels from Mleiha though, belong to the PIR.D phase (2nd-mid 3rd cent. AD) while from Ras Hafun the samples were identified from the 1st century BC to 1st century AD levels. Although the form was likely to be Indian-inspired, precise parallels could not be cited for the shelly ware from any particular ceramic industry in India. In Dhofar however, Zarins (2001) as well as Pallecchi and Pavan (2011) have defined a local fabric group characterized by its temper made from either grit or 'crushed shells.. Although, it is tempting to ascribe these wares to the Dhofari pottery tradition, more fabric samples (both ceramic and clays) collected from the various sources will have to be subject to scientific analysis before the provenance for this fabric can be ascertained.

2.1.1.3 Sandy Red-slipped Fabric (SyLsRS)

This group of wares restricted to the earlier levels of Hafun Main have a general South Asian origin or have been identified as 'Indian' in contemporary Gulf and Red Sea sites. The forms comprise all diagnostic sherds belonging to relatively large wide-bodied jars with narrow necks and elaborated rims (Fig. 163: 9-10). The fabric has a several inclusions of sand, limestone and plant fragments present in small quantities, probably as a result of incomplete cleaning of the clay rather than intentionally added temper. The vessels are usually fired to a reddish yellow or yellowish red colour, and the surfaces were finished with a red slip, probably burnished. Preservation of these slips, however, is poor and few show remaining evidence of burnishing (Smith & Wright 1988: 121).

2.1.1.4 Sandy Light Brown Burnished Fabric (SyLBBr)

The sole vessel shape in this fabric is a medium-sized jar with distinctively thickened everted rim (Fig. 163: 11-12) made from coarse sand inclusions fired to a red or light brown colour, carbonised debris on the vessel indicates use in cooking and well burnished interior and exterior surfaces. According to Smith and Wright (1988: 123). These vessels have been hand-built with rings or filets, rather than wheel-thrown, produced either locally near Hafun or elsewhere in the region and found in the lower

levels of Hafun Main. However several morphological parallels have been suggested from Red Sea, Gulf and Indian sites that could indicate an Indian or South Asian inspired vessel form.

2.1.1.5 Vegetal-tempered Dark Brown Burnished Fabric (VgDBBr)

Sherds of this fabric were found almost exclusively in the earlier layers of the Hafun Main Site. The most commonly attested form is a heavy, markedly carinated jar with a heavy ledge rim (Fig. 163: 13-15) made from a fabric that has quantities of limestone and plant fragments. Manufacture technique is similar to the jars in SyLBBr fabric and are hand-built rather than wheel-turned. Although no precise parallels for this fabric and shaper were found, the general form is believe to occur in South Asian contexts (Smith & Wright 1988: 122)

2.1.1.6 Limestone and Vegetal-tempered Red Fabric (LsVgR)

Also referred to as 'Standard Red Ware', this fabric has been ascribed to the Wheeler Type 38 (cup-and-saucer shaped lid) vessel form, referred to as 'shallow conical tops' in the Ras Hafun contexts (Fig. 163: 16-17). One of these has been reworked and recycled to some other use, as indicated by chipping of a hole through the small end and burning on the inner lip. This common fabric has a mixed temper of limestone, plant fragments and occasionally sand. The shallow conical tops belong to a variant of this fabric and possibly contain crushed sherds or grog. It is fired to the point that the surface is red or reddish yellow, but the core is often still unoxidized and internal striations suggest production or finishing on a wheel. Though conical tops of this general type are widespread, none with its characteristic inner lip have been recognised elsewhere (Smith & Wright 1988: 122).

Since Smith and Wright's study of this fabric and in particular the shallow conical tops, more evidence of these vessels (referred to as cup-and-saucer shaped lids, lamp/lids or oil lamps) has been identified from several sites in the Red Sea region and Arabia. The distinct nature of this Wheeler 38/cup-and-saucer lid form, its distribution as well as discussion of probable source areas has been presented in Chapter 7 of this thesis.

2.2 Indian trade ceramics from East African coast (Kilwa, Manda, Pate, Shanga)

Along the Indian Ocean coast of East Africa are settlements whose inhabitants share a number of cultural features: an adherence to Islam, a preference for living in stone-built towns and a merchantile economy. These communities are spread along 3,000 km of coastline from southern Somalia to Mozambique, as well as on the offshore islands of Pemba, Zanzibar, Mafia, the Comoro islands and northern Madagascar, classified by historian's and Anthropologists as 'Swahili'. The Swahili were important traders in the monsoon-based commercial systems of the Indian Ocean particularly in raw material available on the coasts of eastern Africa (Horton 1996: 1). A brisk maritime trade was established in the 1st century AD that continued into the later Islamic period. East Africa's Swahili coast is renowned for ruins of Islamic harbour-towns of the 14th and 15th centuries. Kilwa in Tanzania and Manda in Kenya were excavated by the late Neville Chittick. Shanga, on Pate Island, is less well known, being accessible by sailing in a dhow for several hours between islands, mangrove swamps and coral shoals. The excavations at Manda (Chittick 1984) revealed an important coastal entrepot high proportion of imported pottery and main periods of activity from the 8th/9th century AD until the 11th century and re-occupation in the 15th century Pate (Wilson & Omar 1997) situated on the south-west side of Pate Island in the Lamu Archipelago on the north Kenya coast also revealed an occupation spanning the 8th/9th century to the 15th century based on a convincing sequence of imported pottery. Excavations at the southern Swahili harbour and town on Kilwa Island revealed a sequence from 800 - 1800 AD (Chittick 1974).

Although these sites of the Swahili coast belong to the early - late Islamic periods, the summarisation of Indian ceramic data is essential from the perspective of the site of Kush (Ras al Khaimah) from where ceramics of Indian origin were identified and reported (Kennet 2004: 88-91) and subject to detailed documentation in Chapter 2 of this thesis.

Indian pottery has been found at various sites on the East Africa coast in the Islamic period including Kilwa (Chittick 1974: 306) and Manda (Chittick 1984: 101), where

Indian wares were most common in the 9th to 11th century. The pottery of Indian origin from Manda consists almost entirely of water pots or chattis. These are comprised of rim fragments made from grey to reddish grey or buff to red buff fabric with white grits, mica, grey specs and occasionally chaff-like inclusions. The surface is red slipped and burnished. Some of the vessels have grooves on the rim and sometimes with a sharply carinated profile. The diameter of this form ranges from small vessels (10-12 cm) and larger vessels (18 or 19 to 27 cm.) (Chittick 1984: 102; Fig 54, nos. a-q) (Fig.164). Additional vessels include bowls, water coolers or flasks and jars. This group of vessels has molded designs and impressed decoration on the surface (ibid 1984: 104, Fig. 55 a-l).

At Pate, almost no Indian imports are seen until periods IV and V (13th - 19th century) during which time they made up about 0.14% of the total assemblage (Wilson & Omar 1997: table 2, 3, 4). Fragments of Indian water pots or *chatties* are common on coastal sites from the late seventeenth or early eighteenth century onwards. In addition to pots, forms include dishes, bowls and jars on a thin red ware painted with designs in black (Kirkman 1974: 92-93 quoted by Wilson & Omar 1997). There is a red burnished ware - eight sherds from a single vessel in levels 55-56 of Test Pit 1, of grey paste with temper of shell or coral, burned light-brown or tan, possibly slipped but certainly burnished to a pinkish red - that may be of Indian origin. Two forms of large jars, probably from India, made of a fine, well-levigated grey paste with infrequent inclusions of quartz, surface burnished black, with rounded or squared thickened rims, diameter of mouth 14 cm, occur first in level 55 of Test Pit 2, late eleventh or early twelfth century (fig. 6, 2). The second example occurs much later in levels 75 and 71 of Test Pit 1, perhaps as late as the sixteenth century (fig. 6,1) (Wilson & Omar 1997: 57).

From Shanga, all the Indian pottery is unglazed and is found in a variety of different fabrics. According to Horton (1996: 300-303) the exact provenance of Indian pottery is notoriously unreliable. Also some of the decorated redwares from Shanga use a fabric that could possibly be local, with heavy sand temper and much use of coral flecking. However the forms and decoration are non-African, with rim shapes that have an Indian appearance. Much of the Indian vessels from Shanga have been

imported either as water jars or containers for other liquids, which is in contrast to the forms from Kush that consist almost entirely of cooking pots. The vessel forms from Shanga were classified under four groups of probable Indian origin:

a) Form: Narrow necked water jars with elbow rims with globular body; Fabric: Group 15 Grass-tempered grey ware; Dating: earliest type of Indian pottery found in Tr 1 dating to the 9th century (Fig. 165: 1-7)

b) Form: Jars and carinated bowls; Fabric: Group 16 Grog-tempered maroon ware; Dating and Parallels: Tr 1 and Tr 6-10 (12th - 14th centuries AD) (Fig. 165: 8-9); Similar to 'purple wares' from Quseir al-Qadim (Whitcomb & Johnson 1982: pl. 45)

c) Form: Rims with elbows or ridges, thin-walled c. 6mm; Fabric: Group 17 Red-slipped orange ware; Dating: Tr 6-10 phases 9-14 (10th - 12th centuries AD) (Fig. 165: 10-13)

d) Form: Necked jars, plain jars and open bowls; Fabric: Group 18 Decorated redware; Dating: Tr 1 Phase 12 (30% of imports), remaining in use for a long period (Fig. 166: 14-19).

Figure 167 represents the distribution of Indian wares in Tr 1 and Tr 6-10 at Shanga (Horton 1996: 302, Fig. 226). Based on the quantification study by Kennet (2004: 94, fig. 44) the proportion of Indian pottery in the Shanga sequence indicates that the first Indian sherds occurred between phases 9 and 12 (mid-10th to mid-11th century) in very small quantities. In phase 13 (mid-12th century) the proportion almost tripled and remained at roughly the same level until phase 18 (mid-14th century) when it declined slightly (Fig. 168). This was followed by quantification analysis of Indian pottery showing a century-by-century comparison of the Kush and Shanga sequences (Kennet 2004: Fig.45) (Fig. 169).

Taking a cue from Kennet's quantitative study of the Kush and Shanga pottery sequences, the following chapter (chapter 5) will present the statistical results from the quantification of Indian ceramics from southeastern Arabia: Mleiha, Ed-Dur, Kush and Suhar, to provide a preliminary interpretation of the data relating to increased or decreased usage of certain forms, vessel functionality etc.

CHAPTER 5

QUANTIFICATION OF INDIAN CERAMIC ASSEMBLAGES FROM SOUTHEASTERN ARABIA

This chapter outlines the results of the quantification analysis of Indian pottery from 4 sites in southeastern Arabia (UAE and Oman region). The chapter is divided into two main halves. The first section is devoted to the description of the quantification methods used (section 1). The second section (section 2) presents the statistical results from the quantitative analysis of Indian ceramic assemblages from 4 sites located in the Arabian Gulf and Oman. Each of the sites is discussed in turn beginning with the Indian assemblage from Mleiha (section 2.1), Ed-Dur (section 2.2), Kush (section 2.3) and Suhar (section 2.4). The data presented includes the percentage of the individual ware groups (form and fabric). Based on the quantification data, questions pertaining to the proportion of certain Indian fabrics/wares and its corresponding form within a site, functionality, relative increase or decrease in usage of particular Indian vessel forms throughout the sequence as well as intra-site distribution of the Indian pottery etc. are discussed in the final section (section 2.5) of the chapter.

1. Quantification methods

There are four measures of pottery classification that are commonly employed - sherd count (SC), weight, minimum number of vessels represented (MNV) and estimated vessel equivalents (EVEs) (Orton et al. 1993: 168). The quantification methodology followed in this thesis focused on two methods: SC and MNV counts.

The first method, which involved sherd counts, seeks to reflect the proportion of the individual vessel type (form and fabric) within the Indian pottery assemblage from a particular site as well as parallels and links to other sites. Secondly, sherd counts should also reflect brokenness, which is the average number of sherds into which pots of that type have broken. In general, brokenness varies from one vessel type to

another as well as on size and therefore a higher proportion of sherds does not mean that there were more pots of that type, but that it just reflects differences in the brokenness levels. To control this, the level of brokenness is calculated by dividing the total number of sherds by the EVE/100 (ibid 1993: 169-71, 178). The quantification of Indian pottery assemblages as part of this study excludes determining brokenness levels due to several factors: From Mleiha and Ed-Dur, the sherd types consisted mainly of diagnostic elements (rim and base) that have each been ascertained as belonging to separate individual vessels. Particularly from Mleiha, the majority of Indian vessel types comprised of 'cross-mended sherds", that had been physically mended together or reassembled allowing reconstruction of a major part of the vessel that allowed minimum number of vessels (MNV) in each type to be calculated (Voss & Allen 2010: 8). From Kush, the excavation retrieval process ensured that each of the individual sherds collected (base, rim and body fragments) were labeled and recorded. However, the present researcher was unable to record information pertaining to estimated vessel equivalents (EVEs) of the Indian sherds. This precludes the calculation of the brokenness levels of the Indian vessels in the Kush assemblage. Nevertheless the information collected from individual sherd counts and percentage data from Kush has helped to determine the relative proportion and distribution of the Indian vessel types on the site.

The second method employed is the minimum vessel counts (MNV) that uses the number of representative parts to extrapolate the number of complete objects in an assemblage and to best illustrate how items were used before they entered the archaeological record (Voss & Allen 2010: 1). The goal of MNV count is to separate the many fragments back into the vessels from which they originated. As mentioned earlier, taking into consideration the reconstruction and resulting completeness of the Indian pottery vessels from Mleiha and Ed-Dur, the more complete an assemblage, the less the bias is likely to be (Orton et al. 1993: 169). In the case of Kush, to try and overcome the bias, quantitative MNV assessments were based on counts and measurements of rim sherds and base(s), each sherd belonging to a different pot and equivalent to one MNV. Similarly unique body fragments from Kush also represented a single vessel when no rims match that style (e.g. Painted Indian Earthenware and Soft Black Burnished Ware with decoration). There are essentially

two methods of calculating MNV counts: quantitative, based on counts and measurements of rim sherds, bases or handles and qualitative counts, that subjectively assess and group together sherds (including body fragments) that likely represent a single vessel (Voss & Allen 2010: 1). The MNV estimation is determined by several vessel attributes: ware type, form, surface treatment, decoration, body characteristics, burning and completeness (ibid 2010: 4-5).

The first step of the MNV count involved the sorting of the ceramic fragments by their ware type (Indian micaceous ware, shell-tempered ware, Indian Red Polished Ware, Fine Indian Red Ware etc.) and form (*handi*, cooking pot, jar, lid, bowl, plate etc.). This sorting made it much easier to find fragments that mend back together (for example at Mleiha). The second step of sorting involved the separation of base, rim and body fragments for each ware and surface treatment/decoration type. Information pertaining to the above and additional attributes including body characteristics (Munsell colour, temper/inclusions), burning (post depositional - e.g. soot, pre-depositional - e.g. firing technique etc.) is recorded for all sherds and were placed together in groups that could possibly represent a single vessel. In this case some vessels were represented by rims alone because no body or base sherds matched the same style. Each possible vessel was thereby given a number and has been recorded in the inventory of Indian pottery forms from Mleiha, Ed-Dur and Kush (Chapter 2) and Suhar (Chapter 3). (Therefore) to put it simply, people don't use sherds; they use vessels. Identifying minimum numbers of vessels brings the archaeologist one step closer to reconstructing the functional and symbolic role of ceramic artifacts in the past (Voss & Allen 2010: 2).

Following the description and definition of ware categories, the Indian ceramic material was entered into an excel database so that it could be easily interrogated. Quantified data samples from the spreadsheets were converted into graphs and tables and the statistical results are discussed separately for each site.

2. The quantified assemblages

This section provides the results obtained from the analysis of each Indian pottery assemblage from individual sites in Arabia (Mleiha, Ed-Dur, Kush and Suhar).

Chapter 5

2.1 Mleiha Indian assemblage

The ceramics represented in the quantification analysis appear at Mleiha exclusively in PIR.D contexts (2nd - mid. 3rd c. AD). Indian ceramics were first discovered during the 1994 season of work and again in the 2010 and 2011 seasons of the French expedition (Boucharlat & Mouton 1993; Mouton 2008; Méry & Mouton 2011a, 2011b). Three main areas or sectors limited to the central part of the site characterise the PIR. D phase at Mleiha: the Fort (Area CW), House/Dwelling (Area DA) and the Fortified Building (Area H). Table 11 and Figure 170 present the counts of individual Indian vessel forms at Mleiha as they appear in each of the 3 contexts/sectors of the site. Sector H has a highest percentage of Indian vessels (50.4%) with total of 63 vessels, followed by CW (42.4%) with a total of 53 and DA (7.2%) with a total of 9. However it should be noted that precise quantification is not available for the material collected in areas CW and DA as Indian pottery from Mleiha was, during earlier excavations, not subject to detailed quantification analysis by the excavators. The lamp-lid variety or oil lamp dominates among the vessel forms in sector H with a total of 22, with the carinated *handi* vessels at a close second (total 21). This is followed by storage jars and cooking pots that total at 8 vessels in each category as well as 3 unusual forms of flasks that resemble Indian *kalasa* (water pot with ovoid body and narrow, concave neck but without handle) (Ansari 1960: 116 fig. 81). Storage jars comprise a majority of the Indian vessels from sector CW (total 12), succeeded by carinated plates and bowls at 10 and 8 vessels each. Lamp-lid types comprised a total of 9 forms and while a total of 3 typical Indian convex-sided lids were noted in CW. In the cooking vessel category, cooking pots (without carination) exceeded the number of *handi*s with a total of 6 and 3 vessels respectively. Sector DA recorded the least number of Indian vessel forms at Mleiha, but this could easily be ascribed to the lack of precise quantification of Indian ceramics from this area during the previous excavations. Bowls and carinated plates comprised 2 in each category followed by one vessel each for the remainder of the form classes.

The Indian fabric classes at Mleiha have been divided into three broad groups on the basis of several defining factors including surface treatment, inclusions/temper etc. These are Indian Micaceous Ware (MICA), Indian Sandy Ware (SANDY) and

Shell-tempered Ware (SHELL). Table 12 and Figure 171 present the proportion of the respective Indian ware groups based on percentage. In the total sherd count of the Mleiha Indian vessels, it is clear that SANDY wares were most common at 47% (MNV = 59), but this could be attributed to the fact that lamp or lid types (oil lamps) form a majority of this ware category and it is yet to be determined if all of the recorded oil lamp counts are sourced from India. MICA has a more convincing Indian origin and makes up 33% (MNV = 41) of the Indian fabric record at Mleiha. This is followed by the SHELL ware that comprises 14 % of the Indian fabric (MNV = 18). The question of an Indian provenance for this fabric is still undetermined, but it is also evident that SHELL is most commonly represented at Mleiha by a typical Indian vessel form (i.e. *handi*) (discussed in the section below). UNKNOWN wares comprise a total of 7 sherds and constitute 6 % of the Indian fabric classes. The term UNKNOWN has been ascribed to a set of fabric samples at Mleiha that share similarities with Indian wares based on inclusions/temper etc. but are too fragmentary to assign them to any one of the three broad categories.

Table 13 and Figure 172 discuss the proportion of specific Indian vessel forms at Mleiha, on the basis of their occurrence within the 3 fabric classes. As stated earlier, Lamp or lid types (oil lamps) constitute the majority of probable Indian vessel forms at Mleiha (MNV = 32) and makes up 25.6% of the Indian assemblage. These are mostly represented in SANDY fabric (MNV = 28) and also rarely in MICA (MNV = 2) and Unknown fabric (MNV = 2). Among the cooking vessels, the carinated *handi*-type clearly dominates the Indian assemblage at Mleiha and constitutes 20.8% (MNV = 26). What is interesting here is that this typical Indian form is mostly represented in SHELL ware (MNV = 11), a fabric that bears more affinity to the Dhofari pottery industry than to any known Indian ceramic tradition. *Handi* is also represented in equal proportion in MICA (MNV = 7) and SANDY (MNV = 7) as well as one unknown ware. Storage jars follow next with 16.8% of the Indian assemblage (MNV = 21). These are mostly represented in SANDY fabric (MNV = 8) and in equal proportion in MICA (MNV = 6) and SHELL (MNV = 6) respectively. Cooking pots (without carination) comprise 12 % of the Indian assemblage (MNV = 15). SANDY ware dominates this form category at Mleiha (MNV = 7) followed closely by MICA (MNV = 6). Coarse tablewares (carinated plates and bowls)

represent 10.4% (MNV = 13) and 8% (MNV = 10) of the Indian assemblage at Mleiha. MICA and SANDY fabric mostly represent both these vessel forms. Typical Indian convex-sided lids were also recorded from Mleiha mostly in MICA fabric (MNV = 3) and one in the unknown ware. This form constitutes 3.2% of the India assemblage along with the water flask (MNV = 4) category at Mleiha.

2.2 Ed-Dur Indian assemblage

The Indian pottery from Ed-Dur analysed in this study is from the nine continuous seasons of excavation at Ed-Dur from 1987-1995 conducted by the Belgian team from the University of Ghent, excavating several areas of the site. The Indian pottery at Ed-Dur (along with other ceramic assemblages) was retrieved mainly from the large exposures made on the site (e.g. Area BQ, BS, BO etc.), small mounds encompassing structural remains (e.g. temple or Area M) and special remains detected on the surface (Areas AV, BA etc.). Indian vessels were identified from a total of 17 areas or contexts on the site. From Table 14 and Figure 173, it is evident that Area BS contained the majority of Indian wares from Ed-Dur (MNV = 47) and makes up 39.2% of the assemblage. This was followed by areas BQ and BO with MNV counts of 18 and 10 that make up 15 % and 8.3% of the Indian assemblage respectively. These were closely succeeded by Areas L (MNV = 7), BR (MNV = 7) and N (MNV = 9) that consist of 5.8% and 7.5% of the Indian assemblage. The remainder of the areas revealed small amounts of Indian vessels in the percentile range of 0.8% to 1.7% and 3.3%.

Figure 174 presents the data pertaining to the proportion of Indian vessel forms occurring in the 17 different areas on the site. For example, in Area BS alone, bowls dominated the assemblage with a total of 12 vessels followed by *handis* and other cooking vessels from India (MNV = 10), short-necked globular vessels (MNV = 9), high-necked globular vessels (MNV = 7) etc. Another example is Area BQ, where Indian pottery comprised globular pots with short-necks (MNV = 5), carinated *handis* (MNV = 3), plates/dishes (MNV = 2), bowls (MNV = 4) and globular high-necked jars (MNV = 4). However, as demonstrated in Table 14, high-neck globular vessels (most likely used as storage or water jars) dominate the total Indian

assemblage at Ed-Dur (MNV= 28) and make up 23.3%. Indian bowls come in a close second (MNV = 25) and constitute 20.8%, followed by short-neck globular vessels (MNV = 23) at 19.2% of the Indian assemblage at Ed-Dur. Cooking vessels (*handi*-type and other cooking pots) constitute 15.8% (MNV = 19) and 7.5% (MNV = 9) of the assemblage respectively. The remainder of Indian vessels at Ed-Dur comprise of plates/dishes (MNV = 6; 5%) and convex-sided lids (MNV = 3; 2.5%).

Table 15 and Figure 175 present the proportion of the respective Indian ware groups at Ed-Dur based on percentage. Based on Rutten's (2006) classification of the Indian pottery fabric in Ed-Dur, it is evident that three types of 'fine wares' (Very Fine Greyish Red Slipped - VFGR, Fine Red Slipped - FRS and Fine Reddish-brown and Grey slipped - FRBG) and five types of 'coarse wares' occur in the assemblage (Coarse red slipped - CRS, Coarse reddish brown - CRB, Coarse Brown Slipped - CBS, Very coarse orangish - CORW and Coarse vegetal reddish-black - VFGR). Fine wares make up a bulk of the Indian assemblage at Ed-Dur with FRS at 37.5% and followed by FRBG at 21.7%. Coarse wares (CRS and CVRB) constitute 20% and 10.8% of the Indian wares respectively. The remaining fine ware (VFGR) comprises 3.3% of the assemblage where as the remainder of coarse wares (CRB, CORW and CBS) make up 3.3% and 1.7% respectively.

Figure 176 discusses the proportion of specific Indian vessel forms at Ed-Dur on the basis of their occurrence within the 8 fabric classes. A clear majority of the high-neck globular vessels fall under the Indian fine ware (Fine red slipped) category (MNV = 20), followed by short-neck globular vessels (MNV = 18). Similarly Indian bowl forms are mostly represented in fine ware fabric (Fine reddish-brown and grey slipped) with 13 vessels. On the other hand, the majority of cooking vessels comprising *handi* and pots belong the coarse ware categories at Ed-Dur. The *handi* forms are mainly represented by coarse red slipped wares (MNV = 17), with the exception of one vessel in fine red slipped fabric, and other cooking pots in coarse vegetal reddish-black wares (MNV = 9). These statistics provide contrary results in relation to the Indian pottery assemblage from Mleiha where no Indian fine wares have been reported. Moreover the Ed-Dur Indian assemblage is dominated by tablewares in fine fabric as opposed to Mleiha where the majority of Indian ceramics

are cooking vessels in coarse ware.

2.3 Kush Indian assemblage

The site of Kush in the Emirate of Ras al-Khaimah has been subject to detailed quantification study of its pottery assemblage by Derek Kennet (Kennet 2004). This thesis focuses on quantifying the Indian ceramics from the site while incorporating the statistical results from previous studies. According to Kennet (2004: 94), a surprisingly large amount of pottery from South Asia was found in both the Period I and Period II assemblages (IRPW, IRAB, FIRE, PAINT, INDIA, SBBW). Together they make up 0.97% of the Period I and 1.21% of the Early Islamic assemblage by sherd count and 0.91% and 3.55% respectively by EVE. Period II was the high point, in period III the figure dropped to 0.53% and then to about 0.2% for the remainder of the Kush sequence. The proportion of Indian sherds thorough the Kush/al-Mataf sequence is presented in Figure 177 (Kennet 2004: Fig. 43). Table 16 shows the dating of the Kush and al-Mataf phases including the total number of sherds at both sites (ibid 2004: Table 28).

Figure 178 presents the proportion of the respective Indian fabric groups at Kush based on percentage. Higher proportion of coarse wares is evident in the Indian assemblage with IRAB comprising 33.3% (MNV = 27), SBBW making up 28.4% (MNV = 23) and PAINT constituting 21% (MNV = 17). The remaining coarse ware category INDIA makes up 7.4% of the Indian assemblage with an MNV count of 7. Fine wares represent a small proportion of Indian pottery at Kush with IRPW (MNV = 4) at 4.9% and FIRE and FGRW at 2.5 % (SC = 2) each.

With regard to Indian vessel forms represented, Kennet (2004: 95) notes that the examples from Kush consist almost entirely of carinated cooking pots. Although this classification is correct for the most part, a careful study of Indian vessel forms in this thesis (Fig. 179) has revealed that while the carinated *handi* vessels represent 22.2% (MNV = 18) of Indian ceramics at Kush, the remainder of the cooking pots i.e. 29.6% (MNV = 24) are those without carination. Nevertheless this is only a minor variation in form as both vessels satisfy a similar function of cooking at the

site. In addition to this, another category belongs to the short-neck globular vessels that consist mainly of medium sized pots. These comprise 24.7% (MNV = 20) of the Indian assemblage. Careful consideration of their form indicates that the constricted or tapering neck, and medium to large globular bodies make them more suitable for storage than cooking purposes. Moreover, a majority of these short-necked forms do not provide evidence of soot or other traces of cooking. In addition to this, high-neck globular vessels (storage purposes) constitute 3.7% (MNV = 3). Unknown Indian vessel fragments comprising 14.8% of the assemblage (MNV = 12) usually consists of very small pieces (although diagnostic) are too fragmentary to identify, or body sherds with unique painted decoration (e.g. PAINT). Indian tablewares (beakers, bowl and carinated plate) are the least represented class of vessels at Kush and constitute 2.5% and 1.2% of the Indian assemblage respectively.

Table 17 and Figure 180 show the proportion of vessel forms from Kush in relation to the Indian fabric classes. Cooking pots are most represented in the IRAB fabric (MNV = 17) and a few vessels in SBBW (MNV = 4), while *handi* vessels are predominant in SBBW category (MNV = 12). In the PAINT category, 7 short-neck vessels were represented and a similar number of vessels are represented in IRAB fabric. INDIA wares mainly comprise cooking vessels both handi-type (MNV = 3) and pots (MNV = 2). Other forms such as beaker, bowl and carinated plate are represented only in SBBW fabric at Kush.

Another important statistical quotient in the quantification of Kush pottery is the century-by-century comparison of the Kush and Shanga sequence in relation to the proportion of Indian pottery at both the sites (Kennet 2004: Fig. 45). The results indicate that while no Indian pottery was present at Shanga in the 4th/5th to 9th century, a relatively large amount of Indian pottery were traded to Kush (1.2% of the assemblage in 7th/8th century). Smaller amounts were subsequently traded at both sites in the 10th to 13th centuries AD, while in the 14th and 15th centuries Indian pottery continued to reached Shanga and ceased being traded to al-Mataf (ibid 2004: 95).

2.4 Suhar Indian assemblage

Indian pottery that has been found at Suhar during the four seasons of excavation by the French Mission in the 1980's has been published by Monique Kervran (Kervran 1996, 2004). According to Kennet (2004: 95), although the Suhar pottery is not quantified, all of the diagnostic Indian material is illustrated, giving some idea of the changing quantity through the sequence. The published Indian pottery illustrations from Suhar have been utilised in this chapter to determine their proportion and distribution across the site. By following Mouton's dating of the first four sequences (Mouton 1992: 182), Kennet (2004, Table 30) presented the list of Indian vessels illustrated from Kervran's Suhar sequence (Table 18). A re-evaluation of the illustrated Indian material revealed two discrepancies: Firstly, only one article on Indian pottery from Suhar (Kervran 1996: figs. 3-6) was available at the time and therefore referenced by Kennet (2004). Secondly, it is evident that when Kevran's two publications (Kervran 1996, 2004) are compared, there are notable differences in the number of Indian vessels illustrated. This thesis therefore has combined the Indian ceramics data from both publications and has presented new figures pertaining to the number of vessels illustrated (Table 19). In terms of the dating, as mentioned earlier (Chapter 3 section 4.3), the case of Suhar has been debated in a number of articles (Kervran 2004; Kennet 2007; Cuny & Mouton 2009). Although the Sasanian period occupation (3rd century AD - 7th century AD) remains controversial at the site, it is generally agreed on the presence of Parthian-period pottery from the 1st century AD at the site (see Mouton & Cuny 2012: 182). In terms of Indian pottery, levels I-II and III-IV record a high number of vessels. By level VI there is a noticeable increase in the number of Indian vessels and by levels VII-VIII the numbers are drastically reduced (Table 19).

On the basis of the Indian vessels from Suhar illustrated in the present thesis, Table 20 and Figure 181 show the changing quantities all through the sequence from Level 0 - Level VIII. While Level 0 comprises 3.4% of the Indian assemblage (n = 5), there is a steady rise in the number of vessels in Level I at 8.9% (n = 13), Level II at 10.9% (n = 16) and Level III at 12.3% (n = 18). A few Indian vessels were also recorded in Suhar Moat I from Levels II/III constituting 2.7% (n = 4). This is

followed by a brief slump in Level IV, which comprises 8.22% of the Indian pottery (n = 12) and then a steady rise noted in Level V at 11.6% (n = 12). Indian pottery increases exponentially in Level VI with 32.1% (n = 47) followed by 4.7% (n = 7) each for Levels VII and VIII. It will be important to mention here that the additional vessels from Levels II/III and Level III were illustrated by Kervran (2004: Fig. 17 - 18) from Suhar Moat I and Suhar Moat IV respectively.

Table 20 and Figure 181 also indicate the occurrence of individual Indian vessel forms through the sequence at Suhar. In Level 0 the Indian forms comprise basins (n = 2) as well as one each of a cooking pot, globular pot and lid. It should be mentioned here that Kervran made a distinction between cooking pots and other 'pots' (globular) while recording the Indian vessels. It seems based on functionality that the former variety that included *handis* was mainly used for cooking purposes, while the latter can be classified as supposed storage and/or multi-functional vessels. By Level I, the majority of the Indian vessels are pots (n = 8) while in Level II, both jars (n = 5) and pots (n = 5) dominated the assemblage. By Level III, globular pots account for 10 vessels, while only one true cooking vessel is recorded. Jars (n = 3) and lids (n = 3) comprise the remainder of the Level III Indian forms. In Level IV, globular pots (n = 5) and cooking pots (n = 3) continue to dominate the Indian pottery and this trend continues until Level VI where 25 globular pots and 10 cooking pots are illustrated. By Level VIII no other Indian vessel form but pots (n = 7) remain in the assemblage.

Table 21 and Figure 182 display the proportion of the specific vessel forms in the Suhar Indian assemblage. As indicated above, cooking vessels 16.4% (n = 24) and other pots at 51.3% (n=75) are predominant. Together these two vessel groups account for 99 vessels comprising 67.8% of the assemblage. Jars (n = 19) follow next in terms of number of illustrated vessels at 13.01%, while other forms including lid (4.7%), basin (2.7%), bowl (1.3%), goblet (0.68%) and spout (0.68%) account for a small percentage of the assemblage. Body sherds (with unique decoration) and not associated with any of the diagnostic elements are also recorded here at 8.9% (n = 13).

Chapter 5

In determining the ware classes of the Indian pottery at Suhar, Kervran (1996, 2004) recorded the variations in the fabric. So instead of broadly defined ambiguous groups of red or black wares, the Indian fabric is classified into five categories of coarse wares (coarse blackish, coarse grey, coarse orange, coarse pinkish and coarse red) and five groups of fine wares (fine black, fine grey, fine orange-red, fine pink and fine red). Table 22 and Figure 183 show that coarse red, (with and without evidence of red slip), predominates the Indian assemblage at 31.5% (n = 46). A variation of red ware is evident is the presence of coarse pinkish ware at 15.07% (n = 22). Coarse grey comprises 13.7% (n = 20) and coarse blackish at 9.5% (n = 14). In the Fine ware category, fine red constitutes 10.9% (n=16) of the total Indian assemblage, followed by other variations of fine red including fine orange-red at 9.5% (n = 14) and fine pink at 6.7% (n =10). Fine black and grey comprise a small percentage of the fine wares at 1.2 % and 0.6% respectively. It is important to point out here that Kervran (2004) has classified fine red as a separate class of wares, distinct from the Indian Red Polished Ware. This fabric variation noted in several other sites in Arabia like Kush and Khor Rori and will be discussed in detail in Chapter 7.

Table 23 and Figure 184 show the occurrence of particular Indian vessel forms within the fabric classes at Suhar. For example, a majority of cooking pots (n = 8) and other globular pots (n = 23) are mostly represented in coarse red, while coarse pinkish ware comprises 8 pots and 4 cooking vessels. This is followed by coarse grey ware with a total 15 globular pots and 4 cooking vessels and coarse blackish ware with 8 globular pots and 5 cooking vessels respectively. In the fine ware category, examples of globular and cooking pots were seen in fine orange-red (n = 11), fine red (n = 7) and fine pink (n = 4) fabrics. With regard to containers, jars comprise another important Indian vessel form at Suhar with a majority represented by coarse red (n = 7) and 3 vessels each in the coarse pinkish, fine orange-red and fine red fabrics. The remainder of the vessel forms such as lids are represented in coarse pinkish (n=4) and coarse red (n = 3) and basins with two vessels each in coarse pinkish and fine pink fabric.

2.5 Discussion

The quantitative assessment of the Indian pottery assemblages as part of this thesis allows for the preliminary interpretation of the data:

What are the limitations of the quantification methodology used in the present thesis?

The quantitative methodology applied in this thesis, although provides important information pertaining to the proportion and distribution of Indian pottery, is not without its shortcomings. Firstly, out of a possible three quantitative measures, only two were used (Sherd count and Minimum number of vessels). Estimated vessel equivalents (EVEs), for reasons previously explained, were not calculated in the study. Moreover owing to the unavailability of EVE count, brokenness levels of the various Indian vessel sherds from Kush could not be determined. Further, the proportion of the vessel forms, fabric etc. is based on the quantification data from Indian vessels alone and not in relation to the complete pottery assemblage at the sites. Nevertheless, the information available from the individual Indian assemblages gives a useful picture of their relative quantity and distribution in the southeastern Arabia and Oman.

What does the quantification of the Indian pottery forms tell us about the individual vessel function on a particular site?

Taking into consideration the possible functionality of Indian vessels at Mleiha, the *handi* and cooking pots both constitute cooking vessels but have been classified separately here based on their body characteristics. The *handi*-type is carinated and has a wide mouth and round base. It is generally used to prepare boiled food (Ansari 1960: 106-107 Fig. 77). Indian pots from Mleiha (wide mouthed vessels with constricted neck and curved or rounded sides but without carination) have been identified as cooking vessels based on the post-depositional evidence of soot or burning on a majority of these wares. However some of these vessels (that resembled cooking pots but with a ring base or without evidence of cooking ‘marks’) could also have been used for water and food storage along with typical storage jars. Similarly

storage jars at Mleiha have large globular bodies and wide shoulders, but with relatively narrow necks and mouths that render them unsuitable for cooking.

At Ed-Dur, the short-neck globular vessel category bears close resemblance in form to the Indian cooking vessels at the site (*handi* and cooking pots). These have however been categorised separately based on functionality, as it is likely that these short neck vessels provide a multi-functional use at the site (e.g. transportation and storage for food/water), while cooking vessels were utilised only for cooking purposes. Moreover a majority of the short-neck globular vessels are available in fine wares and may be classified as tablewares, while vessels for cooking are mainly represented as coarse, utilitarian/domestic wares. A similar category of short-necked globular vessels has also been classified at Kush. Another important Indian vessel form from Ed-Dur has been classified as the high-neck globular vessel. The broad, extended and relatively constricted neck portion of this vessel makes its unsuitable for cooking but the large capacity of its globular body makes it useful for storage purposes. The Indian high-neck vessels from Ed-Dur also resemble Indian water jars illustrated from Manda, an Islamic period settlement in East Africa (Chittick 1984). It may therefore indicate that these high-neck vessels served the purpose of transporting water to Ed-Dur and storage at the site during the late pre-Islamic period.

At Suhar, Kervran (1996, 2004) noted a difference between 'cooking pots' and 'pots' in her classification of Indian vessel forms. Kennet (2004: 95) states that carinated cooking pots predominate at Suhar. However when examine closely, the majority of the illustrated vessels from Suhar do not necessary have a ‘true’ carination at the shoulder as in the case of a typical *handi*, but actually comprise slightly elongated ledge ‘handles’ on either side of the globular pots. Only 7 actual carinated *handi* vessels are represented in the illustrations of the Suhar assemblage. Moreover as mentioned earlier, functionally many of these vessels were not necessarily for cooking, but could also have been storage or container vessels, especially during the later periods at Suhar.

How does the intra-site distribution and quantification of Indian vessels contribute to understanding their significance in the context of the site?

With regard to Mleiha, the distribution of Indian pottery in the three sectors (CW, DA, H) indicates that storage jars are a clear majority in the Fort Area or CW followed by tablewares (bowls and lids) as well as cooking vessels (*handis* and pots). The Indian jars (along with imported amphorae, torpedo jars etc.) were mainly recovered from storage rooms around the residence which probably served as a depository for reserves stocked by the authority and/or the inhabitants of the site for times of danger. The ground floor of the fort comprised 14 small rooms for kitchens and domestic activities and the material recovered (including Indian tablewares and cooking vessels) indicates a place for living, not just a building for defence or reception (Benoist et al. 2003: 71). The frequency of pottery imported from the Indo-Pakistani region represents 28% of the all containers recorded in Building H (Mouton et al. 2012: 211). At Building H or the elite-residence, Indian vessels such as carinated *handi* and cooking pots dominate the assemblage. This indicates the use of a large number of coarse/common kitchen and storage vessels imported from as far as the Indian sub-continent and also questions the existence of local pottery production during the late pre-Islamic period at Mleiha (Mouton pers. comm.).

In terms of the distribution of Indian pottery in the 17 different contexts/areas of Ed-Dur, the occupational remains provide clues leading to a possible domestic and/or ritual use of these vessels in the preparation and storage of food. Discolorations of the sand caused by small fires for cooking or other activities are omnipresent, as are a large number of edible shells (*Marcia, Murex, Terebralia* and large oysters) and sherds of all sorts of vessels. Animals and fish bones are also common (Haerinck 2011: 21). In addition to, Areas BS, L, AF contain rectangular platforms made of stone which could have served as a table or a dining place, adjacent to circular ovens composed of stone and mud plaster (areas BS and BQ). Additionally, several storage jars are dug into the sand, as also rectangular bins and small boxes made of mud (AH, BR, L). Nearly all the 'areas' that contain the Indian pottery reported show evidence of 'fireplaces' connected with either domestic/cooking or ritual activities or both. Test pits excavated on these fireplaces have revealed animal and fish bones in addition to fragments of worked shells (indicating craft-activity). Additionally, several objects signifying an Indian source like coins, carnelian beads, lead knob etc. have been found in a similar context. Other industrial areas could be denoted by the

presence of iron slag and bitumen in relation to a number of fireplaces in area BS. It is obvious from the occupational remains found in the different areas of the site, that the Indian pottery was used in relation to several activities on the site. The Indian pottery is concentrated in the 'areas' of the site that provide evidence of domestic activities (indicative of a kitchen area? with ovens, dining area, storage bins, remains of animal, shell, fish bone etc.) - for preparation of food (handis, short-necked globular vessels and other Indian cooking vessels), storage of food (globular storage vessels - high-necked variety, lids etc.) and consumption of food (incl. fine Indian tableware - bowls, plates etc.) as well as probable ritual use (as indicated by the fire-places and the Indian sherd from Area M or the temple) and craft/industrial activities (slag, bitumen, worked shell fragments etc). It is notable that single evidence of Indian pottery discovered in Area M (the temple) turned out to be a typical domestic vessel sherd of a ridge carinated vessel (body sherd). This could lead us to believe that the so-called 'utilitarian' Indian ware from Ed-Dur also served in ritual purposes.

Does the quantitative study help to determine the relative increased or decreased usage of particular Indian vessel forms throughout the sequence and across the sites?

At Suhar, it is evident that particular Indian vessel forms such as globular pots predominate the assemblage throughout the sequence. It is another question whether all of these pots were actually utilised for cooking purposes. In this case, cooking pots (as specifically categorised by Monique Kervran) appear in the sequence only from Level III until Level VI. On the other hand, globular pots (including storage and transport containers) are seen right from the beginning of the sequence in Level 0 (n = 1) right upto to Level VI (n = 25) where they are a clear majority until level VIII (n = 7) where they are the only Indian vessel forms represented in the assemblage. At this stage of the research, it is still undetermined whether the quantification should consider all the pots under one group or if they should be classified as cooking pots and globular pots (based on supposed functionality). Jars also constitute an important vessel type in the Indian assemblage at Suhar and are

present from Level II (n=5), with increased usage in Level VI (n=7), a sharp decrease in Level VII (n = 1) and disappear completely by Level VIII.

The chronology of the Indian pottery at the individual sites ranges from 1st c. AD - 2nd c. AD at Ed-Dur, 2nd-mid 3rd c. AD at Mleiha, 5th-16th c. AD at Kush and 1st/2nd - 17th/18th c. AD at Suhar. Table 24 and Figure 185 show an increase in the use of generic Indian pots (cooking pots and other globular pots as well as carinated *handis*), which in total account for 54% of the Indian assemblage in the four sites, out of which a majority is from Suhar (21%). This increase could however be ascribed to the longer chronological sequence at Suhar. While bowls constitute a sizeable number of the Indian assemblage at Ed-Dur (MNV = 25) and Mleiha (MNV = 10), they constitute a negligible quantity at Kush (MNV = 1) and Suhar (n = 2). Storage jars/containers are predominant among the Indian vessels at Ed-Dur (MNV = 27), followed by Mleiha (MNV = 18) and Suhar (n = 19), while only 3 jars are reported from Kush. Other forms such as plates/dishes are seen mainly at Mleiha (MNV = 13) and Ed-Dur (n = 6) and none at all at Suhar, while lids form an important vessel group at the site (n = 7). It is clear from this preliminary quantification study that the occurrence of Indian style tablewares (bowls, plates/dishes) was restricted to the sites of Ed-Dur and Mleiha dating to the early centuries AD. On the other hand, globular pots and cooking vessels continued to increase in use throughout the sequence until the later Islamic periods. Finally, this quantification also reveals the presence of certain vessel forms like lamp-lid types (oil lamps) that occur in great numbers at Mleiha and is yet to be determined if all of the recorded vessels are sourced from India. Also the occurrence at Mleiha of the majority of Indian *handi* vessels in a shell-tempered fabric, with no parallels with any known pottery industry in India, raises several questions pertaining to the sourcing of these specific wares which will be discussed in Chapter 7 of this thesis.

CHAPTER 6

SCIENTIFIC AND TECHNICAL SOURCING ANALYSIS OF INDIAN POTTERY FROM THE ARABIAN CONTEXT

This chapter presents the results of the preliminary technical sourcing investigations undertaken by means of X-Ray Fluorescence (XRF) analysis of select Indian pottery samples collected from the site of Mleiha (Sharjah) and compared with sherd samples from various key sites in Western India. A brief introduction to Indian pottery from Mleiha followed by a general discussion on vessel form and fabric is presented in sections 1.1 and 1.2. The various scientific methods utilised in the present study are addressed in section 1.3 including sampling (section 1.3.1), XRF analysis methodology (section 1.3.2) and statistical tests (Chi-Test) (section 1.3.3). The analytical results are presented in section 1.4. Discussion and summary is presented in section 1.5 with regard to the significance of the XRF results in the identification of likely provenance areas for the Indian pottery found at Mleiha.

1. X-Ray Fluorescence (XRF) analysis of Indian pottery from Mleiha

1.1 Introduction: Indian pottery as an indicator of overseas trade at Mleiha

In recent research at Mleiha (Emirate of Sharjah, United Arab Emirates), fieldwork has focused on the later period of occupation of the site, period PIR.D (mid. 2nd - mid. 3rd c. AD). Mleiha was involved in long-distance trade from the early phases of its occupation (late 3rd c. BC) but in the later period the Indian pottery types increased in number, providing evidence of systematic trade across the Indian Ocean (Benoist et al. 2003: 66; Mouton et al. 2012: 211-212). These goods were part of a more general lucrative trade between the Indian Ocean regions and the Roman world at least from the 1st c. BC to the 3rd c. AD, including for instance, as far as pottery is concerned, transport vessels from South Arabia, glazed table wares from Mesopotamia, and cooking wares and storage jars from India (Tomber et al. 2011a: 360).

On the basis of the macroscopic observations, pottery from the Indian subcontinent represents 18.5% of the ceramic assemblage at building H, excavated during the two last seasons of work at Mleiha (2010-2011). The samples analysed and presented in this research thesis focus on some very well represented wares showing morphological parallels with western Indian sites, and more precisely from the modern states of Maharashtra and Gujarat. After taking into consideration parallels in vessel shapes, the next step should be chemical characterisation. X-Ray Fluorescence (XRF) Spectrometry analysis involving both mineralogical and geochemical methods, has been applied to samples from the sites in Western India in order to compare the results with supposed Indian ceramics collected at Mleiha. The primary objective was to establish the eventual correlation with pottery production sites, regions and/or trading/supply centres in India in order to establish the likely geographic origin of these wares.

More importantly from an archaeological point-of-view, the samples were selected from a range of Early Historic sites that emerged in Western India, particularly Gujarat, more than a millennium after the decline of the Harappan harbours (Gupta 1997). These include the sherd samples selected from the sites of Dwarka, Prabhas Patan and Padri - signifying the continuation of sea-borne connections that evolved in the Bronze Age between Mesopotamia, the Oman peninsula and India. From Maharashtra, the selected sites have a strong historic significance, and are mentioned in the Periplus as important hinterland trade centres which transported goods (including pottery) via caravan routes (e.g. the sites of Ter - mentioned as 'Tagara' in the Periplus - Nevasa, Junnar and Nasik) and ultimately participating in the Indian Ocean trade involving the Arabian Gulf, South Arabia and the Red Sea sites in the early centuries AD. The present selection of sherd samples from India were collected from levels dating to the Early Historic period in India; From Maharashtra - Ter (Period II - c. 1st century AD - 3rd century AD), Nevasa (Period V - c. 50 BC - 200 AD), Nasik (Period IIB - c. 200 BC - 50 AD) and Junnar (Phase I & II - c. between 2nd century BC and 2nd century AD) and from Gujarat – Dwarka (Period II – c. 1^{st} – 4^{th} century AD), Padri (1st century BC), Prabhas Patan (Period IV - 0 AD - 6th century AD) and Gorasa Hanuman (surface site - Early Historic Period) (Fig. 186).

Chapter 6

1.2 Mleiha Indian pottery: General discussions on vessel form and fabric

The Indian pottery from Mleiha has a form - fabric combination that is easily recognizable as distinct from the Mesopotamian, Egyptian, South Arabian and Arabian Ware in the ceramic assemblage at Mleiha. However, in the absence of Indian fine wares, the analysis is restricted to samples of coarse wares from Mleiha.

Parallels with ceramics from India can be listed in the Mleiha repertoire based on both unusual as well as typical Indian pottery forms. These include *handis* (Indian term for carinated cooking vessels), carinated plates, lamps or lids, flasks or funnel-mouthed vessels, globular vessels with ridged carination and large storage jars or cooking pots. The second, more important determinant in the identification of Indian pottery is fabric. In earlier publications, coarse-ware fabrics of possible Indian origin from the Mleiha ceramic assemblage have been broadly defined as "brown ware with chalky / shelly / sandy grits" (Benoist et al. 2003: 69; Mouton et al. 2012: 211). Presently, based on visual examination of Indian vessel samples from Mleiha, three broad categories of fabric can be defined 1 - Brown reddish sandy ware with white chalky/gritty inclusions, Fabric 2 - red ware with black core and micaceous temper and Fabric 3 - Brown reddish ware with 'shelly' temper (Chapter 2 section 1.4).

1.3 Materials and Methods

1.3.1 Samples

Sherd samples from India were obtained by both excavation and surface collection from coastal and hinterland sites including Ter, Nevasa, Nasik and Junnar in Maharashtra and Dwarka, Padri, Prabhas Patan and Gorasa Hanuman in Gujarat. The selection was based partly on published pottery illustrations from excavation reports and partly on familiarity with Indian ceramics from these sites (by one of the authors).

A total of 21 sherds from various key sites in Western India were compared with 7 samples collected from phase PIR.D at Mleiha, representing the three main types of wares (as described in section 1.1) with shapes paralleled to industries from Western India (ML-10014 P, ML-10043 Q, ML H-5004 R, ML H-5008 S, ML H-5002 T and

ML-10068 U), and a unique sample (ML-2280) of a very characteristic industry from the early PIR.A period at Mleiha (layer 3rd - mid 2nd c. BC) which can be compared with productions from the Early Historic period in Maharashtra (Fig. 187).

1.3.2 XRF analysis

The analysis were conducted using an X-ray Analytical Microscope (XGT 7200, Horiba, Japan), on powder samples collected from the clay matrix core of the sherds, thereby excluding any treatment of surface or temper so that the correlation between the various sherd samples is based on the geo-chemical and elemental concentration. Each sample was analysed under vacuum for 1000 seconds using a 1.2 mm X-ray beam generated from a Rhodium (Rh) X-ray tube operating at 50 kV and 0.5 mA. The collected spectra were used to identify and quantify elements present in the pottery fabric.

On a routine basis the following 16 elements were detected on each individual sample: Aluminum (Al), Silicon (Si), Sulfur (S), Potassium (K), Calcium (Ca), Titanium (Ti), Chromium (Cr), Manganese (Mn), Iron (Fe), Nickel (Ni), Copper (Cu), Zinc (Zn), Rubidium (Rb), Strontium (Sr), Zirconium (Zr), and Tin (Sn). The mass and molecular percentage of the major and trace elements of each sample were calculated. To begin with, X-ray intensity values were used to test the correlation levels in the sherds' geochemical origin. The samples were analysed and classified by statistical means using the Chi-test.

1.3.3. Chi-Test

CHI-TEST returns the value from the chi-squared (χ^2) distribution for the statistic and the appropriate degrees of freedom. χ^2 tests can be used to determine whether hypothesized results are verified by an experiment.

The χ^2 test first calculates a χ^2 statistic using the formula:

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{\left(A_{ij} - E_{ij}\right)^2}{E_{ij}}$$

where:

A_{ij} = actual frequency in the i-th row, j-th column

E_{ij} = expected frequency in the i-th row, j-th column

r = number or rows

c = number of columns

A value of 1 confirms complete correlation between the two tested variables, while a low value of χ^2 is an indicator of independence. As can be seen from the formula, χ^2 is always positive or 0, and is 0 only if $A_{ij} = E_{ij}$ for every i,j.

1.4 Analytical Results

X-ray fluorescence spectra were de-convoluted using the Fundamental Parameter method to quantify elements present in the samples in their oxide form (Al_2O_3, SiO_2, SO_3, K_2O, CaO, TiO_2,Cr_2O_3, MnO, Fe_2O_3, NiO, CuO, ZnO, Rb_2O, SrO, ZrO_2, SnO_2). Concentrations within the different samples varied considerably but some samples seem to have similar elemental compositions as shown in Tables 25 and 26.

Statistical results (Table 27) indicate that out of the seven Mleiha samples, 2 samples (ML 2280 and ML H5004 R) have the highest correlation values with 11 western Indian samples based on elemental concentrations and geo-chemical composition (Fig. 188).

1.5 Discussion and summary: Significance of the XRF results on the Indian pottery samples from Mleiha and future prospects

Only two sherds from Mleiha have strong correlations of chemical composition with the sherd samples from sites in Maharashtra and Gujarat, indicating more than a 90% probability that they are from the same environment. Out of the 21 samples selected in India, 13 samples showed a high correlation with these two Mleiha samples (i.e. ML 2280 and ML H5004 R). From Gujarat 4 samples, out of a total 8 samples, (Dwarka CRW 2, Dwarka Red Slipped, Padri Red Slip and Gujarat Prabhas Patan RPW) indicate parallels with the Mleiha samples. With regard to Maharashtra, out of a total of 13 samples selected, 9 samples (Junnar Common CRW, Nevasa CRW NVS, Ter SVG-34, Nevasa NVS Sa 341 RCW, Nevasa CRW, Junnar Red Slipped, Nasik Red Slipped, Nevasa Black Ware and Nevasa RPW I D2) correlate with the 2

samples from Mleiha (For individual spectra graph images see Figs.189 a-p).

These results suggest a possible trade relationship between the Arabian Peninsula and the western Indian regions in antiquity. More precise analysis may isolate the sources of each type of imported vessels. Principal Component statistical analysis is required as well as a combination of the current geo-chemical/XRF investigation methods with the petrographic analysis of pottery samples (X-Ray Diffraction, Thin-Section analysis etc.). The limitations regarding the places of production may be also addressed by focusing on surface slips or pigments rather than clay matrices (Peacock 2009). That work has to be done on a larger number of samples to determine characteristic groups of each ware

Analysis of the samples from Mleiha have shown three groups of related wares that are most probably representative of regional industries (Table 28): the two samples discussed above, ML H-5004 R and ML-2280, of brown ware with a gritty temper and reddish slip, are strongly related (0.99); two samples of brown reddish ware with sandy and micaceous temper, ML H-5002 and ML-10014 are also related (1.00) forming a second group; the third group of related wares (0.92, 0.95, 0.96), is represented by the two samples of brown reddish ware with white chalky inclusions, ML-10043 and ML H-5008, together with sample ML-10068 of brown reddish ware with shelly temper. These three groups are clearly different from one another (0.00 to 0.42). They are representative of three different regional industries, from which only one (ML H-5004 and ML-2280) was represented in the collection of samples from India that are at our disposal. The two other groups may originate from other regions of India, as the shapes of the vessels represented in these three groups of wares can be compared and are culturally related.

At this stage of analysis and research we cannot determine the exact provenance of the industries represented at Mleiha. The correlations recorded at present between the Mleiha sherds and samples from Western India do not necessarily indicate the actual pottery production/manufacturing areas within India. Future research based on further sampling from Indian sites will therefore help define or locate the Indian industries more precisely. This requires careful selection of samples (20 to 30

different samples from each industry). The results from the correlations between each group/industry will determine the exact parallels between the Indian wares found in the Oman peninsula with the regional industries within India.

At present, we can hypothesise that the Indian material was imported to Mleiha most probably through Dibba harbour (Jasim 2006) in the north-east of the Arabian peninsula. The abundance of Indian domestic vessels in these sites in antiquity leads us to enquire into the likely presence of an Indian population on the coasts of Arabia, at Dibba, Khor Rori (Dhofar), Qani (Hadramawt), and even at inland sites like Mleiha, on the western foothills of the Oman Mountains.

CHAPTER 7

IDENTIFICATION AND SOURCE OF INDIAN CERAMICS IN ARABIA

Chapter 7 examines the evidence of specific Indian vessel forms and fabric based on archaeological data, visual examination as well as results from petrographic study of pottery samples. The main objective of this chapter is to identify distinguishing features between 'actual imports' and 'local imitations' of Indian ceramics in Arabia based on data from morphological and fabric analysis. It also includes a discussion of possible import status relating to sourcing or production centers from India. Evidence for manufacture in different sites by adopting the techniques as attested in the Indian sub-continent is discussed.

1. Evidence for imported and imitation Indian pottery in Bronze Age Arabia

The integration of Eastern Arabia into the economy of the Middle East was the result of its involvement in trade with several regions in the Indian Ocean: Mesopotamia from the 5th millennium BC, south-eastern Iran and south-western Pakistan in the 4th and 3rd millennium and the Indus Civilization in the 2nd half of the 3rd millennium. The evidence was primarily in the types of ceramic vessels that were exchanged that varied through time and according to the region that was involved in the trade. Moreover the ceramics also reflect the following attributes: type of vessels (containers, cooking, decorated) and destination of pottery vessels (transport of foodstuff, tableware, funerary deposit). Lastly, an important characteristic in understanding trade ceramics is the different means of exchange: actual import and borrowed technique or style and counterfeiting (Méry 1996: 167). According to Méry (1996: 168-169), "contacts with Baluchistan and Makran are at the origin of a local pottery production in eastern Arabia. Details of the decoration and technical features (high-necked pots with beveled rim and geometrical decoration painted in black on red slip - multiple chevrons or hatched lozenges) show close similarities between Omani ceramic vessels and pottery wares from southeastern Iran and

southwestern Pakistan. They prove that Omani potters mastered their art completely: pottery was wheel made and then fired in kilns. Incised or black painted grey wares (canister jars decorated with painted friezes of stylized caprids) and black-painted red wares of Iranian and Pakistani style had copies made locally in at least two areas (one of which was located at Hili), which could not be distinguished from real grey wares without the help of archaeometry. Harappan pedestalled dishes were also sometimes copied in Arabia, at Hili for instance. Finally with regard to Indus black-slipped jars, these were never copied in Arabia, perhaps for technical reasons. The body of the jar was manufactured in several stages and both outer and inner walls were coated with a black slip indicating technical aspects of pottery manufacture that were completely alien to Omani traditions (ibid 1996: 171).

2. Sourcing of specific Indian vessel forms and fabric from Late Pre-Islamic Arabia

The question pertaining to identifying and sourcing ceramics of likely Indian/South Asian origin refers to the entire Indian pottery assemblage recorded from the Arabian contexts (see chapters 2-4). This research thesis seeks to present available data and generate discussions concerning the source of true imports of Indian pottery found in Arabia as well as those wares that may have been imitated adopting similar techniques but using local clays. For this purpose, three vessel forms: Indian cooking pots, oil lamps (lamp-lid variety) and Rouletted ware and three fabric types (Shell-tempered ware, Black ware and Fine Indian Red ware) are selected to represent some potential examples of actual imports and local imitations:

2.1 Indian/South Asian cooking vessels

Description: The types of Indian pottery traded in the late pre-Islamic period from the Arabian context consist almost entirely of cooking vessels. Although carinated cooking pots (*handis*) comprise a clear majority at most sites, several other forms of cooking pots are classified based on morphological variations. The vessel variations include ridge carinated vessels and globular vessels with ridge carination (based on examples from Mleiha and Ed-Dur). Cooking pots (without carination) are defined as

a separate class of cooking pots although a similar use/functionality has been ascribed to these vessels.

Distribution: The handi is the most common type of the carinated cooking vessel from India and is widely used in all parts of the subcontinent, referred to by other names such as 'chatti' in South India. From Mleiha, Indian cooking vessels were recorded from three contexts on the site: Building H and Areas CW (the fort) and DA all from the Period PIR. D phase. At Ed-Dur, majority was located in Areas BS, BO and BQ along with evidence of kitchen and dining areas (Rutten 2006). Cooking vessels are also widely represented in both the Kush and Islamic period al-Mataf sequences (Kennet 2004). At Suhar, this vessel type is recorded from various sectors: ED5, Suhar Moat I & IV, Suhar Town 1986, above well 148, oven 309, Squares BCD, and PQR etc. from Levels I to VIII (Kervran 1996, 2004). Indian/South Asian cooking vessels from Khor Rori are available in a variety of contexts including Area A, Trench A13, Area B and Area F (BF3 and Square A20, street A29 & A48) (Sedov & Benvenuti 2002; Avanzini ed. 2008). Indian cooking vessels have also been recorded from the site of al-Hamr al Sharqiya, a medieval trade entrepot at Khor Rori (Rougeulle 2008). Lastly at Qana, although so-called Indian cooking pots were recorded from 'Lower' (BA-I) and in the middle BA-IIperiods at the site (Sedov 1992, 1996, 2007), it is also likely that some of these represent Egyptian red slipped wares in the Lower period.

Beyond Arabia and looking into context of the Red Sea ports, Wheeler Type 24s were recorded among the Indian pottery assemblages at both Berenike (Begley & Tomber 1999) and Quseir al-Qadim (Tomber 2000a, 2000b). Indian cooking vessels in East Africa were recorded at Ras Hafun (Somalia) where four kitchen vessels were identified in Hafun West and six cooking vessels from Hafun Main (Smith & Wright 1988) and vessels with grooves on rim and a sharply carinated profile referred to as 'chatties' at Manda (Chittick 1984) and Kilwa (Chittick 1974). Finally from the Indian context, the widespread distribution of carinated *handi* and other cooking pots includes several sites in western (Gujarat and Maharashtra) and southern India (Kerala and Tamil Nadu) from the Early Historic to the medieval periods (see Chapter 2 for list of cooking vessel parallels from India). Further east, in

Southeast Asia, at the site of Sambor Prei Kuk in Cambodia, Groslier (1966; 1981 quoted by Bong 2003: 100-10; Fig. 5.12) classified a group of wheel-made vessels with hemispherical and globular bodies covered by a red slip that he concluded were influenced from India through the adoption of ritual and religious practices that demanded their use. Similar carinated pots were reported from Chansen (Bronson 1976: 229, 309 quoted by Bong 2003: 113-118; Fig. 5.18) and Dvaravati (Bhumadhon 1996: 21 quoted by Bong 2003: Fig. 5.20) (Fig. 190), both located in Thailand, amongst other sites.

Dating: The *handi* shape generally is widespread in most Indian sites and can be dated from the first century BC – 11th century AD (Begley & Tomber 1999). The dating of the *handi* and other Indian cooking vessels is available from Mleiha (PIR. D phase - 2nd - mid 3rd cent AD), Ed-Dur (c. 1st - 2nd cent AD), Khor Rori (3rd-1st cent BC and 4th-5th cent AD), Qana (BA-I period - 1st cent BC/1st cent AD; BA-II period - 2nd and 5th cent AD), Berenike (Late 1st cent BC - early 1st cent AD, mid-late 1st cent AD or 1st/2nd cent AD), Quseir al-Qadim (1st cent BC/AD - 2nd cent AD) and Ras Hafun West (1st cent BC - 1st cent AD). This firmly coincides with the dating of these vessels from contemporary Early Historic sites in India (Ter Period II, Nasik Period IIB, Arikamedu AK II, AK V etc.). From the Early Islamic period onwards, Indian cooking pots are recorded in Arabia at Kush (5th - 13th cent AD), Suhar (Level III - VIII) and Al Hamr al Sharqiya (11th/ 12th cent AD); the Red Sea coast at Berenike (4th/5th cent AD); and East Africa at Ras Hafun Main (2nd - 5th cent AD) and Manda (9th - 11th cent AD). From Southeast Asia, the 'Indian-influenced' carinated pots from Sambor Prei Kuk in Cambodia had been assigned a dates that ranged from 6th - 8th centuries AD (Groslier 1981: 14 - 15 quoted by Bong 2003: 101), Changsen from Phase II (c. 600 BC - end of 6th cent AD) (Bronson 1978: 14-15 quoted by Bong 2003: 114-115) and Dvaravati Phase V (AD 600 - AD 950) (Bronson 1976: 15 quoted by Bong 2003: 119).

Visual examination: The results from the study of Indian cooking pots were based on a visual examination of the fabric classes and morphological features identified to this vessel group. This study could therefore benefit from a summary of the fabric data (see detailed study in chapters 2, 3 and 4) concerning Indian cooking vessels

based on both primary study and published sources. At Mleiha, *handi* and other cooking pots are represented in equal parts by Indian Micaceous fabric (Fabric 2) with mica temper and red slip as well as Indian Sandy ware (Fabric 1). The most remarkable characteristic of carinated vessels at Mleiha is that majority vessels are represented in shell-tempered ware (Fabric 3), which presently cannot be identified with any clay source or pottery tradition within the Indian subcontinent. At Ed-Dur, the Indian cooking vessels are recorded mainly under three fabric classes: one fine ware (fine red slipped) and two coarse wares (coarse red slipped, coarse vegetal reddish-black and coarse brown slipped). At Kush, Soft Black Burnished Ware (SBBW) mostly represent *handis*, while majority of other cooking pots fall within the Indian Red-and-Black Ware (IRAB) category. At Suhar, coarse wares (red, blackish, pinkish) and fine wares (fine red, pink and orange-red) are representative fabrics for cooking pots. Similarly at Khor Rori (and possibly Qana), cooking vessels are represented by coarse red slipped and black burnished wares, including rice-tempered as well as shell-tempered wares (also identified at Mleiha). A reassessment of these wares by Sedov and Benvenuti (2002) led to their identification as 'Indian cooking pots', which earlier had been inserted among the Indian Red Polished (RPW), based on the knowledge at the time (Pavan & Schenk 2012: 192). The most common Indian form at the Red Sea sites of Berenike and Quseir al-Qadim are carinated cooking vessels paralleled to Wheeler's Type 24 seen in coarse red ware, frequently with red slip and burnished (CRSW) (Tomber 2008: 46). Another fabric type representative of cooking vessels in the Red Sea region is organic black ware or 'spongy ware'/ 'light ware' with its lightness resulting from its vesicular fabric caused by organic temper, particularly of rice (ibid 2008: 48). As indicated above, rice-tempered cooking wares are also recorded at Khor Rori. Lastly from Ras Hafun (Somalia), cooking vessels were identified in both a coarse sandy red fabric (CSYR) and sandy red slipped fabric (SyLsRS) with fine sand/mica. Further, two carinated cooking pots were recorded in a shell-tempered dark grey fabric (ShDG) identical to the *handi*-type vessels identified at both Mleiha and Khor Rori, in addition to two pots in a vegetal-tempered dark brown burnished fabric (VgDBBr) reminiscent of coarse vegetal reddish-black fabric from Ed-Dur.

In terms of morphological features, certain common characteristics like the series of ridges at the shoulder, just above the point of carination, the externally extended rim (to afford an easy grip of the vessel), and the occasional decoration at the shoulder of the vessel are present in most of the carinated vessel forms recorded from the Arabian and Red Sea contexts. Slip sometimes covers the rim and exterior of the vessel, which was mostly horizontally burnished ('strip-burnishing'), and often sooted, thereby confirming its use as a vessel for cooking. The upper body including the rim and neck was possibly wheel made while the lower portion or base was handmade or mould pressed. Carinated *handi*-type vessels in the shell-tempered fabric were however completely handmade. Decorative elements including scalloped edges around the ridge-carination are noted in examples from both Mleiha and Ras Hafun. Special manufacturing techniques used on Wheeler Type 24s first identified in the Red Sea include internal wiping with an organic material (bamboo-tool) (Tomber & Begley 2000: 156) and scooping, involving the use of bamboo tools to hollow the inside and define the rim and neck of the vessel (Saraswati & Behura 1996: 81-82) At Mleiha, evidence indicates a large cooking pot (ML4457) made with micaceous red slipped ware that displays internal wiping, still used today in India particularly at the site of Pattanam, Kerala (see Tomber 2008: 47).

Petrographic analysis: Specific samples of Indian cooking wares representing two fabric types were subject to different petrographic studies. Two separate analyses were conducted followed the source identification of rice-tempered wares from Quseir/ Berenike (Tomber et al. 2011a) and Khor Rori (Lippi et al. 2011) based on a combination of thin-section analysis and Scanning Electron Microscopy (SEM). The identification of rice husk as temper in the preliminary investigation (for cooking pots/dishes) was important as an initial criterion for locating the source of this ware. The Chaff was attributed to rice (Oryza sp.) of the sect Oryza, indicating India as the possible area of origin of this type of ceramic The examination of this pottery using SEM and petrographic techniques confirmed a source in Gujarat for vessels distributed throughout the Indian Ocean (Tomber et al. 2011a: 362-366; Lippi et al. 2011: 1173-1178).

The more recent study involved the sourcing of Indian coarse wares from Mleiha

(including samples of carinated cooking pots) using X-Ray fluorescence (XRF) spectrometry analysis (Reddy et al. 2012). The results, presented in Chapter 6 of this thesis indicated that two sherds (out of a total of 7) from Mleiha have strong correlations of chemical composition with the sherd samples from sites in Maharashtra and Gujarat, indicating more than a 90% probability that they are from the same environment. Out of the 21 samples selected in India, 13 samples (4 from Gujarat and 7 from Maharashtra) showed a high correlation with these two Mleiha samples (i.e. ML 2280 and ML H5004 R). It is also important to point out that the sample ML H5004 R belongs to a typical carinated *handi*-type vessel from Mleiha.

Discussion: From the data presented to this point, it is plain to see the cooking vessels that count as genuine imports from the Indian subcontinent. Based on fabric classes, micaceous ware or mica-tempered pottery documented from Mleiha is part of a long tradition of pottery manufacturing technique from Gujarat beginning from the Chalcolithic to Early Historic times. Additionally the surface treatment of horizontal burnishing is similar to the 'strip burnishing' of pottery vessels from sites in western India, as is working techniques like 'internal wiping' and 'scooping' using bamboo/organic tools (recorded from Berenike/Quseir and more recently at Mleiha) identical to those used by potters today in Kerala and North India. Similarly coarse red slipped and brown slipped wares from Ed-Dur (represented mostly by carinated *handis*) comprising of medium sized transparent angular quartz grains, fine mica particles and iron-rich particles or grog/clay pellets appears to belong to the same fabric class as Indian micaceous ware (Fabric 2) from Mleiha. Mica-tempered cooking pottery has also been recorded from the Red Sea at Quseir and Berenike (Wheeler type 24s with silty matrix, micaceous, with sparse quartz and unmixed clay pellets) and Ras Hafun as indicated sandy red slipped fabric (SyLsRS) with fine sand/mica. Other coarse red wares (without slip and predominant mica content) are more difficult to precisely provenance, but in general point towards a likely Indian/South Asian origin based on fabric and parallels cited from published sources. For example, the coarse Indian Red-and-Black ware (IRAB) from Kush has several parallels amongst the cooking vessels in 'crude red and black wares' from Nagara, Shamalaji, Dhatva and Devnimori in Gujarat. Among the black wares, Black Burnished Ware (BBW) is a well-represented fabric in Early Historic assemblages

from India. BBW cooking pots are recorded at both Khor Rori and Kush in Arabia, but the presence of rice-temper in many examples from Khor Rori (as well as from organic wares at Berenike and Quseir) indicates precise source areas in Gujarat. Similarly the results of the XRF study of coarse wares from Mleiha have shown that some of these cooking vessels are 'actual imports' from western India.

The question concerning local imitations of typical Indian cooking vessels is more complex, and evidence from fabric study and morphological features suggests borrowed technique in several recorded pottery samples. The forerunner in this category is the carinated *handi* from Mleiha, in a shell-tempered fabric (Fig. 191). So far, there are no known pottery traditions in India that employs medium to large fragments of crushed shell as temper. Although, shell is occasionally naturally present in clay sources from coastal/riverine sites in India, these handmade carinated *handis* appear to have large quantities of clay intentionally added as a tempering agent. As mentioned earlier, the closest parallels have been recorded from the Dhofar region in Oman in terms of ceramics, associated material appears to be primarily either grit or shell-tempered, with evidence of local buff wares with 'crushed shell temper' and applied punctuate design (Zarins 1997, 2001: 87). The significant evidence from Mleiha could indicate one possibility that the shell-tempered h*andis* were handmade vessels manufactured in the Dhofar region, baked in open bonfires (indicating the lack of kiln evidence). Similar shell-tempered cooking vessels at Ras Hafun (n=2) could also suggest that these wares may have also travelled from South Arabia to Somalia.

Cooking pots representing Indian vessel forms were also noted in a special 'fine ware' fabric. Previously, nearly all Indian cooking vessels from the Dhofar region (Khor Rori, Ayn Humran, Shisr etc.) were attributed to the Red Polished ware tradition (Yule & Kervran 1993: 91, Fig. 3 nos. 1-5; Avanzini et al. 2000: Fig. 24; Zarins 2001: 97, 112, Figs. 42-43, 46, 50) (Fig. 192) although it is more likely that these represent a number of coarse red slipped vessels and fine Indian red wares (FIRE) originating from various sources in South Asia, while some could have been locally produced. Similarly At Ed-Dur, 'Indian' cooking pots were represented in a fine red slipped fabric, which was originally thought to be Red Polished Ware, but as

De Paepe et al. (2003: 214) pointed out are most likely imitations of the finer Indian ware. Visual examination of the FIRE samples from Kush, Khor Rori and Ed-Dur as part of this thesis (Chapters 2 and 3) has revealed several variations in the fabric that could indicate that some of these wares were imitated and produced locally in Arabia (see detailed discussion on Fine Indian Red Ware in section 2.4 of this chapter).

Finally, an important aspect to take consider in the identification of Indian cooking vessels was put forth by Ballet (2005: 136-137) with reference to the "Indian" potteries of Quseir. He stated that "the shapes do not appear to be any different from those of common Egyptian wares belonging to Roman times and the technical information available suggests that these so-called Indian vessels may have come from Egypt". Forms similar to Arikamedu (India), but which could also be Roman or Egyptian, depending on their fabric, were recorded at Quseir (see Whitcomb and Johnson 1979: pl. 23b, 27e and 29a; Whitcomb and Johnson 1982: pl. 9g-h, 11u, 28l). Hayes (1996: 156; Fig. 6-14 no. 15) has also pointed out that the commonest shape (at Berenike) is a shallow cooking-pot with a wide, sharply everted rim. The ware is noted at Quseir al-Qadim, where Indian connections were first suggested. At Berenike it is perhaps the most widespread of the early cooking wares, forming 5-10% of some assemblages; a regional Egyptian (or Red Sea) source is, therefore, probable (ibid 1996). These vessels share the red-slipped treatment (with South Asian cooking vessels). A similar notion was also presented at Qana where vessels were recorded as Indian cooking pots in BA-I period, although it is also likely that they represent Egyptian red slipped wares. Likewise at Mleiha, Fabric 1 (Indian sandy ware) comprises several varieties of fabric ranging from buff wares to light brown, reddish brown and orangish clay (with gritty/chalky calcareous inclusions and occasionally no mica) indicating more than one source for the recorded cooking vessels. More detailed study is required in order to determine the Egyptian cooking vessels in the ceramic assemblages at Mleiha and other sites in the Arabian Gulf.

2.2 Oil Lamp (Lamp or Lid type)

Description: The shape is of a concave shallow vessel, with round bottom, oblique walls, thickened rim and a round concavity in the centre. Its use as a lid is well

attested at sites in southeast and south Arabia (Mleiha, Qana and Khor Rori). Evidence indicates that these were reused as lamps, with the central cavity serving as an oil container and the edge of the reservoir is usually slightly burnt. From the Red Sea context, this form is referred to as Type 38, described by Wheeler as a 'cup-and-saucer' shaped lid or a lamp as reported from Arikamedu (Tomber 2000a: 628).

Distribution: It has a widespread distribution within India, but closer to Berenike variants have been recorded by Smith and Wright (1988: 136, figure 9, I & k) from Ras Hafun in Somalia, by Sedov (1992: figure 3.6-7; 1996: figure 6.11- 12) from Qana in the Yemen, who also notes its presence at early Christian sites along the Nile in Nubia (Sedov 1992: 1,3,4) and Abou Mina, east of Alexandria (Negm 1998; fig. 12). At Khor oil lamp fragments (based on illustrated examples) were recorded from Areas A and F (Sedov 2008a, 2008d: pl. 11 nos. 3-4, pl. 17 nos. 8-9). By far, the most numbers of this vessel form comprising thirty-two samples of lamp/lid forms were recorded at Mleiha from the PIR.D period from the three areas of the site (CW, DA and H). The form is not very common at Indian sites and has been reported from Bet Dwarka lid type 12 (Gaur *et al.* 2005: fig. 39), the type 34H at Ter (Chapekar 1969: type 34H fig. 18) and type XXXIV at Kamrej (Gupta 2004: fig. 6) (Fig. 193) amongst other sites. In Southeast Asia, lids of this type are produced in Thailand at Khao Sam Kaeo; the latest evidence was found in Vietnam at Oc-Eo (Malleret 1960: type 55; Manguin 2002).

Dating: From a poorly dated context, the Berenike vessel is likely to be 1st- or 2nd-century AD; the Qana pieces from its 'middle' period dated from the late 2nd to the 4th century AD; and at Ras Hafun from the 2nd to the 5th century AD. The Mleiha samples date from the 2nd - mid third century AD and the Khor Rori forms from the 2nd and 3rd phases of the site (1st cent AD and 3rd cent and late 3rd and late 4th/ early fifth centuries respectively). From the excavations of Early Christian sites, (Bietak & Schwartz 1987), oil lamps from Shabwa date close to the 2nd - 4th centuries AD (Badre 1992) and 4th to 7th centuries AD along the Nile in Nubia. In India the type is known from the 1st century AD into medieval times (Begley & Tomber 1999: 171). Finally in South-east Asia from Thailand as early as the 4th - 2nd c. BC at Khao Sam Kaeo (Manguin 2002) and Vietnam at Oc-Eo in a context

dated to the late 1st c. BC to the 3rd c. AD (Malleret 1960)

Visual examination: The fabric classes that represent oil lamps belong to several clay sources and types of temper (inclusions). From Mleiha, visual examination of lamp/lid samples indicates that they occur in the Indian sandy ware (Fabric 1) category. Several variations were noted in these fabric samples (see Appendix 1 in this thesis) indicating more than one clay source for the Mleiha lamp-lid form. From Khor Rori, some of the recorded fabrics for oil lamps include a coarse red ware with inclusions, mica and straw and grit temper with wet smoothing and slip or reddish brown to brownish medium compact with white and dark inclusions as well as mica (Sedov 2008a: 83, 95). At Berenike the fabric recorded for Wheeler Type 38 includes a crude and porous ware with poorly finished surfaces. The fabric has been tracked previously in India by Sunil Gupta whose own petname for it was 'spongy ware' (with organic/rice inclusions) (Tomber 2008: 48). A variety of lamp-lid forms (morphologically distinct from the Berenike type) in a similar organic black ware or spongy ware fabric have been recorded from Kamrej (Gupta 2004: Fig. 11 nos. VIII and X; Fig. 6 no. XXXV) (Fig. 194). At Ras Hafun, where the type is common, it occurs in a 'Limestone and Vegetal-tempered Red Fabric' (Smith & Wright 1988: 122), which from published description alone seems similar to the Berenike (and Kamrej) fabric (Tomber 2000a: 628).

Another fabric noted at Kamrej representing the lamp-lid form is a coarse red ware, well-fired with white (quartzite and limestone), red inclusions, mica and vegetal temper (Gupta 2004: Fig. 6 no. XXXIV) (Fig. 195). The closest fabric parallels for Kamrej coarse red lamp-lid have been identified at Mleiha (e.g. nos. ML10146, ML10147; Appendix 1 nos. 68-69) (Fig. 196), and the recent examination of a fabric sample from an oil lamp at Khor Rori (e.g. SUM11A US470, 45) (Fig. 197) revealed nearly identical inclusions and texture of the clay as the Kamrej coarse red lamp-lid fabric.

The uses attributed to the samples from Mleiha and Kamrej however appear different. At Mleiha, traces of fire (blackening) along the inside edge of the central reservoir indicate possible reuse as oil lamps with the distinct presence of a small opening or nozzle on one side of the central cup to place a wick, in addition to

evidence of bitumen and burning along the edges of the broken cup and rim. The samples from Kamrej appear to be have been used as lids or stoppers rather than oil lamps, based on their form as well as lack of burning/sooting evidence. Oil lamps very similar to the Mleiha fabrics have been noted at Shabwa (Yemen) where a complete lamp and a rim sherd of this type were noted in pinkish-red clay covered with a brown slip (Badre 1992: Fig 16 nos. 331, 334). Some examples at Mleiha are also present that were probably used only as lids (e.g. ML 10142, ML10148, ML4593).

In terms of morphological characteristics, the diameter of the central aperture for lids at Mleiha is relatively narrower (c. 3 cm) and the depth of cup is shallow (c. 1 cm). Other examples have a wider cut reservoir (c. >4 cm). The rim of the lamp-lids at Mleiha is also varied wherein some samples have a thick sloping rim and others a deep undercut rim. Most of the vessels have radial striae that suggest production of these vessels on a wheel, while some appear to be handmade. In contrast, the evidence of lamp-lid forms from Kamrej indicates that the two examples in the organic fabric are both handmade while the samples in coarse red are wheel-made (with evidence of striations/wheel-turned marks). Moreover the central reservoir is elevated (4 - 5 cm) above the level of the rim, indicating that these could have been originally used as jar 'stoppers'. The Kamrej lid in coarse red fabric displays a slight variation in form with the central reservoir that has a wide aperture (c. 4 cm) but is not raised and the rim portion is slightly incurved like a bowl.

From Southeast Asia, lids similar to those characterised above, have been reported from several sites including Ankor Borei and Tra Kieu (Cambodia), Go Tu Tram, OcEo (Vietnam) (see Fehrenback 2009: Fig. 6.3) (Fig. 198). These comprise lid forms with the central reservoir as well as with a central conical knob. The lids with a central knob have been related to a variety of vessels from across the Indian subcontinent including Kamrej (Gupta 2004: Fig. 11 no. IX) and Arikamedu (Type 36: Wheeler et al. 1946: Fig. 25). In terms of fabrics, from Oc-Eo (Vietnam), Malleret (1960: 133-174) recorded the lids (Type 55-67) (Fig. 198) under Group 5, comprising ceramics with fine paste, relatively hard vessel walls, and a homogenous texture. The clay is pink or salmon, yellow, light gray, and dark gray colour, and a

smooth surface (cf. Bong 2003). This fabric is also very similar to the lamp-lid varieties reported from the site of Batujaya (Indonesia) by Pierre-Yves Manguin (Fig. 198).

Petrographic analysis: The petrographic analysis of an oil lamp sample from Qana (Inv. 124/4) confirmed a Nubian origin (Davidde et al. 2004: 94, Fig. 7). The fabric was noted as very distinctive and fairly coarse, Scattered throughout the clay matrix were large discrete grains of clinopyroxene and plagioclase feldspar. Also present were grains of quartz, flecks of mica, some potash feldspar and a little fossiliferous limestone. The range of inclusions in the fabric was presumably derived from the basement formations of the region, which are composed of igneous and metamorphic rocks (ibid 2004). An oil lamp of possible Indian production (Inv. 35A) was recorded at Qana (similar to the Berenike example) but unfortunately no petrographic analysis of this sherd was undertaken and could not be compared with fabrics of Nubian type or other Indian wares (Davidde & Petriaggi 1998: 43, Fig. 7).

Discussion: The lamp-lid form adopted different functions/uses depending on the site. From the Egyptian and Arabian sites, these are mostly recorded as oil-lamp (with wick nozzles and evidence of burning in the central concavity). Traces of bitumen were coated along the edges of the rim and central cup. This form was used mostly as a lid in the Indian and Southeast Asian contexts with form variations that functioned as ‘jar stoppers’ and ‘lids with a central knob’ in the place of the concavity.

With evidence based on visual examination and preliminary petrographic analysis, it is evident that oil lamps or lamp-lids are presented in a variety of forms and fabrics. The representative fabric groups indicate a wide range of sources for this vessel form. Based on chronology, it appears that the earliest occurrence of these wares is from Southeast Asian contexts (4th - 2nd c. BC at Khao Sam Kaeo and late 1st c. BC to the 3rd c. AD at Oc-Eo). Based on the chronological sequence, it may be too easy to suggest an eastern expansion of this vessel form (from Southeast Asia) into India, Arabia and Nubia. The discovery of abundant oil lamps from sites along the Nile in Nubia (Bietak & Schwartz 1987: 171-172, fig. 24, 764449, 76460, 42, 76712, 76750, 76762, 44, 76687, 76688, 76713, 50, 76777-76779, 65, 76788-76795) could instead

imply that this vessel form was developed and manufactured in and around southern Egypt and introduced to Arabia and the east. A precise source for the oil lamp (lamp-lid) form is therefore undetermined. The Indian subcontinent as a provenance is questionable, given that relatively few sherds have been recorded from early historic - medieval sites. However it is a likely source for some of the oil lamps from Berenike and Qana recorded in an organic spongy fabric as well as some examples from Mleiha and Khor Rori in the coarse reddish fabric with vegetal temper, mica and quartzite inclusions similar to samples from Kamrej.

2.3 Rouletted Ware

Description: Most characteristic of distinctive RW fragments found in excavations are bases with the eponymous decoration (two bands of rouletted or better-called chattered indentations applied on the inside the base of the wheel-thrown dish). This part of the dish surface commonly is blackened with a grey core similar to NBP (Northern Black Polished Ware), whereas rim and wall sherds display a Black-and Red Ware (BRW) firing technique. Particular forms include a flat dish with the so-called beaked rim. A simple featureless rim also occurs (Schenk 2006: 127,129). Falling into a different category are rim fragments that are of a shape identical to RW but have coarsely textured clay that contrasts markedly with the fine grey paste of the original. Moreover, the base fragments of coarser quality were never decorated. Imitation RW is a less refined, local production from all over southern India and Sri Lanka where BRW tradition existed (Pavan & Schenk 2012: 194-195).

Distribution: The distribution of Rouletted ware is widespread and can be divided into sites outside of South Asia and sites in South Asia (Bangladesh, India and Sri Lanka) (Schenk 2006: 142, 146; Fig. 3 - 4). Sites outside of South Asia include Myos Hormos (Tomber 2002: 27; Fig. 6), Coptos (Tomber 2000a: 630) and Berenike (ibid 2002: 27, figs. 4 - 5) in Egypt, and at Khor Rori, Oman (Sedov & Benvenuti 2002: 186, 219; pl. 10 no. 3). In Southeast Asia, RW comprising of reduced burnished bowls with impressed circular patterns, have been found at sites in Bali, Java and Vietnam, daring roughly to the early centuries of the first millennium CE, and possibly the last few centuries of the first millennium BCE (Bellina & Glover 2004:

78, quoted by Fehrenbach 2009: 135). According to Schenk (2006: 132), the distributional pattern of RW in South Asia shows a concentration along the eastern coast of peninsular India and Bangladesh and includes sites alongside rivers such as Krishna, Godavari and Kaveri used as natural transportation routes (ibid 2006: Fig. 3; Ray 1996: 352, fig. 1). For the Malabar coast, recent investigations at Pattanam near the Periyar River revealed the first fragments of RW on the west coast (Shajan et al. 2004: 317). Only two sites, Ayodhya and Rajghat, are noted in northern India from whence NBP supposedly originated. Several other sites cover the Ganges Delta, facing the Bay of Bengal and six such sites in Sri Lanka (Tissamaharama, Anuradhapura, Mantai, Godavaya, Kelaniya and Kantarodai) are published (see Schenk 2006; Fig. 3 and appendix).

Dating: The manufacture of RW is restricted from the 3rd century to the 1st century B.C. at the latest. Imitations in local BRW emerge in the 1st century B.C. (phase c2) as evidenced in many contexts at Tissamaharama in Sri Lanka (Schenk 2006: 143). Assuming that this premise holds true for the entire region of southern India and not only for Tissamaharama, all the 'Fine Grey Pottery' must have been imported to its various destinations more or less during this period (ibid 2006). A continuity for it as late as the 4th century A.D. has often been suggested. But, finds in later contexts are taken to be residual heirlooms, which occur inevitably on sites with long settlement sequences (ibid 2006: 123). According to Pavan and Schenk (2012: 198), RW must have arrived in Sumhuram prior to the first century BC. The RW examples found at Sumhuram feature the parameters of the later variety of this pottery based on the typologies of Tissamaharama. The same pattern applies to the imitation RW found in Sumhuram. The BRW technique was widely used in Sri Lanka and southern India during the second half of the first millennium BC. BRW occurs in the pottery of South Asian origin at Sumhuram from the earliest occupational layers comparable to the typical shapes from Phase c1 (2nd century BC) at Tissamaharama (Pavan & Schenk 2012: 196; Fig. 1).

Visual Examination: This study involves the first-hand visual examination of samples of imitation RW (from Khor Rori), in order to distinguish from specimens of 'true' RW from Alangankulam in South India. As Pavan and Schenk (2012: 195)

noted from samples of RW from Sumhuram, 'the treatment of the surface of this imitation RW was often of similarly high quality, but a cross-sectional examination of the fragments will always reveal the differences both in the colour and the high temper content'. True RW is categorised to “Fine Grey Pottery”, a group of different vessel forms that all have in common a very dense and extremely fine grey clay (Munsell 2YR N6) (Schenk 2006: 129). Both qualities (true and imitation RW) were made using the firing technique of Black-and-Red ware (BRW), which was employed in pottery workshops all over the southern region of South Asia at this time (Pavan & Schenk 2012: 194). Figure 199: 1-4 illustrates typical BRW vessels from Khor Rori (Pavan & Schenk 2012: Fig. 1 nos. 10-13). The vessels fired in this way are black inside, with the black colour overlapping the rim, and red on the outside over the remaining part of the body, and may be considered examples of an imitation of RW pottery (ibid 2012: Fig. 6 nos. 3, 5; Schenk 2006: 127, fig. 2k.1; 131–132) (Fig. 199: 5-8). This BRW-imitation of RW belongs to the final development status of BRW in phase c2 (1st century B.C.) at Tissamaharama. A quite thick shiny slip is a common feature for this late stage of BRW. Additionally, the reddish colour is more distinctive than can be seen on the preceding BRW of the 3rd/2nd century B.C. At that time, the slip was coalesced with the surface and hardly can be recognized, similar to RW. On later specimens of BRW the slip often flakes off (Schenk 2006: 132).

Based on the above definition, the cross-section of a sample (SUM 10C, US174, 78) of so-called imitation RW (fired in BRW technique) was examined under a hand-held digital microscope. The fabric belonged to a coarse red ware fired to a light grey colour. The inclusions comprised of elongated white particles of plant/vegetal temper and aplastic inclusions of sand, mica and possibly feldspar. Some organic yellowish particles were also noted, but could not be presently identified (Fig. 199: 9a-b). These results from the imitation RW sample from Khor Rori were compared with the examination of a sample of BRW (AGM_16 No. 87), and three samples of true RW from Alangakulam (Tamil Nadu). The inclusions in the BRW sample from Alagankulam comprised predominantly mineral particles of white and red quartz/quartzite, mica, sand and a small amount vegetal temper and shell (very sandy fabric) (Fig. 200: a). The true RW samples from Alangankulam have a hard surface

with a soapy feel and the fresh fracture is smooth and curved, with a grey-fired paste, no visible inclusions except small particles of mica that belong to the 'Fine Grey Pottery' (Fig. 200: b). The Alagankulam RW samples were made using the firing technique of Black-and-Red Ware with chattered indentions visible on the base of the vessel. Another fragment examined from Alagankulam consisted of RW sherd not manufactured in BRW-technique but in a plain red ware. The fabric is sandy and slightly coarse with visible impurities and mica (Fig. 200: c). It has a well-burnished red surface with chattered indentations (rouletting) on the vessel base. This indicates a sample of true RW (based on the evidence of decoration), but in a sandy red ware fabric. It was not possible therefore to find any fabric parallels for the Khor Rori imitation RW from the examined Alangankulam samples, although the exercise was successful in presenting some of the variations in RW and BRW fabric from Alagankulam.

Petrographic analysis: In 1997, V. Gogte published an analysis using samples of RW of Arikamedu, Alagankulam, Kottapatnam, Manikpatna, Sisupalgarh, Nasik and Tra Kieu in Vietnam. And for the first time he included samples from outside peninsular India, from Chandraketugarh in Bangladesh. His study included Wheeler type 10 and Roman amphorae from Arikamedu as well as so-called African Red Ware from Alagankulam and NBP from Nasik. He also added fired local clays from Arikamedu, Chandraketugarh, Nasik, Sisupalgarh, Kottapatnam and Manikpatna. The analysis showed that the clay used for RW from all sites as well as for Wheeler type 10 and for NBP were identical. However, among the local potteries only the clay of Chandraketugarh matched in terms of mineralogical content RW and the other fine grey wares. Gogte therefore proposed an origin in the Ganges Delta (Gogte 1997 quoted by Schenk 2006: 134). Gogte repeated x-ray diffraction (XRD) analysis on samples from Tissamaharama where he noted that specimens of BRW from Tissamaharama proved entirely different, but the "Fine Grey Pottery" and the other samples matched the clay from Chandraketugarh (Gogte 2001). Schenk (2006) stated that previous analyses were based solely on samples from peninsular India and Sri Lanka, despite the results that local clays do not match with RW, scientists never considered NBP despite its easily visible closeness to RW and the other members of

its pottery group, and its North Indian origin would have given a clue to the whereabouts of the "single geological source".

Further laboratory analyses had been carried out (Das et al. 2002 quoted by Schenk 2006: 135), apparently in order to challenge Gogte's suggestions of a similarity of local clay from Chandraketugarh to RW, NBP, Wheeler types 10 and 18. This study uses chemical analysis as well as scanning electron microscopic study and also X-ray diffraction (XRD) analysis. They included Black-Slipped Ware and recent local clays from Chandraketugarh itself. This above-mentioned recent laboratory study reveals that the chemical composition of all "varieties" of both wares (RW and Black Ware) is "more or less" comparable. Yet, the XRD analysis shows no real similarity of either variety. Local clays collected in a radius of 10 kilometers prove to be "similar in nature" but apparently not so when compared to RW and Black-slipped Ware. Astonishingly, XRD-analysis used by Gogte showed a similarity of RW and local clay. This indicated that the outcome of laboratory analyses depends on the quality of samples, which are submitted, and needs the suitable preparatory studies to verify the contemporaneousness of the samples.

According to Magee (2010: 1044), the location of RW production within southern India and Sri Lanka remained unexamined until Robin Coningham conducted geochemical analysis on RW and other fine wares from a number of sites in this area, to analyse samples from the key sites of Arikamedu and Anuradhapura, a major settlement in Sri Lanka excavated by Coningham (Ford *et al*. 2005). The chemical analyses reported here suggest that the clay of the majority of the fine wares analysed (Grey ware, Rouletted ware, Arikamedu Types 10 and 18 and Omphalos) came from the same or a set of closely related geological sources. The Grey ware, which appears to be an ancestral form of Rouletted ware, has only been identified at Arikamedu (south-east India), Anuradhapura and Kantarodai (Sri Lanka), thus supporting a southeast Indian origin (Ford *et al*. 2005: 917 - 918). Magee (2010: 1046) however argued that although the Principal Component Analysis (PCA) of the geochemical data from Ford et al 2005 report seemed to indicate that all the south Asian fine wares, including RW and Greyware, are geochemically homogenous and different from the Sri Lankan coarse wares, it does not necessarily suggest 'that the vast

majority of the archaeological fine ware and Greyware samples are all from a similar provenance' (Ford *et al*. 2005: 913). A new Principal Components Analysis of this data conducted by Magee (2010: 1047; Fig. 1) suggests a broadly similar characterisation for all these fine wares wherein both the Greyware from Anuradhapura and the RW from Arikamedu exhibit uniformity in their composition and are differentiated from the RW at Anuradhapura, raising the possibility of two distinct workshop traditions. Group A comprising of sherds of RW Arikamedu and Greyware from Anuradhapura was produced somewhere in southeastern India (c. 500 BC - AD 300). Group B consists solely of sherds from Anuradhapura (RW and Wheeler Type 10) were produced somewhere in Sri Lanka, probably in the northern part of the island (c. after 200 BC - AD 300) (ibid 2010: 1050 - 1051).

Discussion: The origin of RW is still disputed, probably due to the failure in the past to differentiate between imported 'true' RW made of clay and the coarser imitations (Schenk 2006: 127). In the light of different material analyses, one indeed must accept that "Fine Grey Pottery" (RW and Wheeler types 10 and 18) doubtless was not produced in southern India and Sri Lanka (ibid 2006: 140). In the context of imitation RW pottery, the production of pottery in southern India and Sri Lanka was most probably decentralized and relied on clay from various sources (Pavan & Schenk 2012: 198). Recent research by Magee (2010) has identified one area where this imitation RW was made. No parallels could be found from the BRW and RW samples from Alangankulam examined in this thesis as well as the imitation RW sample from Khor Rori. The Alagankulam RW samples in this study belonged to the 'Fine Grey ware' fabric of the true RW tradition (with evidence of rouletting on the base fragments). However it is evident that the BRW samples from Alangakulam with fine sand, mica, coarse inclusions of red and while quartz/quartzite, some vegetal temper and shell, are nearly identical to the locally produced Black-and-Red Ware (fabric A) from Tissamaharama (see Schenk 2001: 69).

Thus according to Pavan and Schenk (2012: 200), a broader investigation of the provenance of imitation RW could yield even more information regarding the source area of South Asian pottery found outside South Asia. In contrast to studies on true RW — only trespassing along the east coast of India from somewhere in the north —

analysis of the southern copy of RW might far better indicate the regions engaged in commerce at this time.

2.4 Fine Indian Red Ware

Description: Fine Indian Red Ware or FIRE is a term coined by Kennet (2004:90) and represents a number of different classes from South Asia and elsewhere, similar to IRPW in aspect but with the quality of slip and fabric is much coarser. It has a deep red slip on the exterior and unlike typical IRPW; Fine Indian Ware has a weak slip that erodes and often flakes at places. Burnish streaks are visible on the surface of some samples and may be part of the 'burnished red ware' tradition, which is common in South Asia in Early Historic and Medieval contexts (Mehta 1979: 45-6).

Distribution and Dating: FIRE has been identified and categorised as special class of Indian fine wares separate from RPW at numerous sites in the Gulf. At Khor Rori, they are referred to as Indian-style table jars dating c. from the 1st - 2nd centuries AD (Sedov & Benvenuti 2002: 187). From Ed-Dur, two variations of fine Indian wares were recorded: Fine Red Slipped (imitation RPW) and Fine Reddish Brown and Grey Slipped dating to the first centuries AD (De Paepe et al.. 2003: 214; Rutten 2006). At Kush, twenty-three FIRE sherds occurred throughout the sequence without any clear chronological pattern (Kennet 2004: 90). At Suhar, Kevran reports a number of 'less fine Indian imported ware', identified by vessel morphology and micaceous temper in its fabric in Periods III and IV dating from the $4^{th}/5^{th} – 5^{th}/7^{th}$ centuries AD (Kevran 2004: pl.21: 9; fig. 12: 13, 14, 18, 19; dating based on Mouton 1992: 181). Fragments of fine red ware vessels were also found in the strata of middle (BA-II) period between the 2nd and 5th centuries AD at Qana (Sedov & Benvenuti 2002: 187) and from among the related red-slipped wares of probable South Asian origin identified from a recent re-examination of the IRPW in the Williamson Collection (Priestman & Kennet 2002).

For the Indian-style table jars (Fine red wares) from Khor Rori, parallels have been cited from several Indian sites: Arikamedu (Wheeler et al. 1946 Fig. 28: Type 69), from the coarse red wares from the early and middle levels of Period II at Amreli (Rao 1966 fig. 15: 1.2.9, 18, 24; Fig.16: 28, 29) as well as the early Historic period in

Ahar (Sankalia et.al 1969: Fig. 94: T271, T272). From Sri Lanka, at the site of Tissamaharama, Schenk (2001: 68 - 69) reported Fine Red Ware (fabric B) occurring in such huge quantities that local fabrication in the region of Tissamaharama itself is indicated.

Visual examination: Kennet's (2004: 90) observation that the FIRE sherds represent a number of different classes, and that there is a lot of variation in the material holds true, based on the visual examination in this thesis of several fabric samples from sites in southeastern Arabia and Oman (Kush, Khor Rori and Ed-Dur). Preliminary observation of FIRE fabric samples from Kush under a portable microscope identified three fabric variations: a) no inclusions with the exception of mica, b) with homogeneous inclusions - small sized inclusions c) medium sized particles (Fig. 201: a-c). Similarly from Khor Rori, variations in fabric were noted ranging from red to reddish-brown fine compact paste to a sandy/silty fabric. The dark grey core in the section of some fragments clearly testifies to the poor firing. (Fig. 202: 1-2). Next, microscopic examination of samples of fine red slipped and fine reddish-brown and grey slipped from Ed-Dur indicated that both wares belonged to the same petro-fabric but variations were noticeable in the manufacturing (firing) technique (Fig. 203a: 1-4). Fine-reddish brown and grey slipped is nearly similar in texture, inclusions and surface finish to the Ed-Dur fine red slipped, but for the shades of grey to dark grey/black in the core and slip of the vessel, which is in combination with the original red core and slip or in some cases the complete vessel fabric is grey or dark grey slipped (Fig. 203b: 5-8). From the South Asian context, Fine Red Ware (fabric B) has been recorded from Tissamaharama (Sri Lanka) amongst the locally produced house-hold wares as a red-fired pottery with a polished, slightly shining slip (variants 1 - 3) and some variations with an untreated surface (variant 4) (Schenk 2001: 69). The inclusions comprise clay that is slightly tempered with quartz sand. The most striking characteristic is the black core indicating incomplete firing, which is also evident amongst Fine red wares from Khor Rori (Sumhuram).

Several different morphological classes have been represented by the Fine Red wares: At Ed-Dur, the fine red slipped fabric comprises ceramic forms ranging from v-shaped bowls to carinated dishes and *handis* as well as globular storage or cooking

vessels with horizontally everted rim and narrow neck with beaded rim. Several of the closed shapes can be compared to Indian Red Polished ware vessels, but the very distinctive open forms at Ed-Dur are not represented in the Gujarat repertory assembled by N. Pinto-Orton (Pinto-Orton 1992: 48, Figs. 2.2, 3.2, 4.1, 7.4, 10.4, 11.1, 13.1, 15.1, 18.2, 22.3, 23.4, 24.6). The second type of fine red ware from Ed-Dur is fine reddish brown and grey slipped, represented by bowls, bases and high-necked globular vessels as well as the single example of a narrow-necked 'sprinkler' variety. The Ed-Dur survey report contains several shapes grouped under the label *céramique rouge commune* (Salles 1984: 243–4, Figs. 6.36–40, 42, 44, 48).

On the other hand, from Khor Rori, Sedov and Benvenuti (2002: Pl. 12: 1-7) (Fig. 204) have noted that the shapes and dimensions of this fabric are nearly similar to RPW forms recorded in Gujarat by Orton (1992). These vessels from Khor Rori usually consist of table jars and bowls with beaked or beaded out-turned rim varying from 11-16 cm to 23-26 cm diameter.

From the South Asian context, Fine Red Ware, or local fabric B reported at Tissamaharama (Sri Lanka) comprised mainly of carinated pots (form A1), bulgy pots (form A2), large wide-mouthed bowls (form B1), and waterpots with narrow neck (Form D), small jars with spout or funnel-shaped neck (Form F) etc. (Schenk 2001: 69-70).

Petrographic analysis: Six samples (*AR5368, AR5377, AR5386, AR5390, AR5599* and *AR5681*) of so-called Indian Red Polished Ware (Imitation RPW or Fine red slipped wares) were subject to three analytical methods: thin-section petrography, chemical analysis and study of plant phytoliths (De Paepe et al. 2003: 215 - 216). The most common mineralogical components of the temper of AR5377 consist of rather angular quartz grains and mica flakes (both muscovite and biotite). Red-brown hornblende, plagioclase, microcline, orthoclase, clinopyroxene, garnet, epidote, rutile and opaques occur in accessory amounts. Results from the petrographic study of the Ed-Dur fine red slipped ware indicated that from the mineralogical and petrographical point of view, the non-plastic inclusions are not very distinctive and are consistent with those reported by Méry (2000) relative to pottery from the Indus region covering earlier periods. The phytolith analysis revealed that all the analysed

samples of RPW (fine red slipped) from Ed-Dur contained opaline forms derived from grasses of the subfamily of the *Pooideae* that dominates the grass flora in the temperate zones of the northern and southern hemispheres and that the Indian subcontinent has the climatic conditions suited for the growth of these grass species (De Paepe et al. 2003: 224 - 225).

Discussion: Based on the evidence presented from both visual (microscopic) examination and petrographic analysis of 'Fine Indian Red' fabric samples from Arabia, the ultimate goal of this discussion is in provenance determination. Questions arise concerning the source of what is now defined as 'Imitation RPW' with its many fabric variations that represent either low-quality products from South Asia, or local imitations from the Gulf (Kennet 2004: 90). Visual examination of the other fine ware from Ed-Dur, fine reddish brown and grey slipped, indicated that it belongs to the same petro-fabric as the Fine Red Slipped wares (hard, compact and fine granular clay), and so both wares probably shares the same provenance or production area. With reference to these fine red wares from Ed-Dur however, De Paepe et al. (2003: 214) note that the sandy fabric, firing, surface finish and shapes differ from the very fine Indian Red Polished ware, which leads us to believe that the Ed-Dur fragments are most likely imitations of the finer Indian ware that originated to the west of the main production centres in Gujarat, in the Indus valley and/or possibly Pakistani Baluchistan.

A critical aspect involved in this discussion is determining the distinguishing features between actual imports of true Red Polished wares and the reproduced copies of fine wares, based on the evidence from the visual study. For example, at Kush, the material of the Fine Indian Red Ware was mentioned as being similar to IRPW, but the quality of slip and fabric much coarser (Kennet 2004: 90). However closer microscopic observation of Kush IRPW has revealed that although the fabric is better levigated and thin-walled (1 - 2mm), the size and range of inclusions in IRPW is greater than in FIRE. FIRE samples at Kush range from a fabric with no mineral inclusions except mica (FIRE-1) to a fabric variation with small-sized mineral inclusions, mostly fine lime (FIRE- 2A) and medium-sized mineral inclusions (FIRE-2B). These slight fabric variations set the FIRE sherds apart from the Kush

IRPW. The fine Indian red fabric or Indian-style table jars from Khor Rori are nearly identical to vessels often identified as RPW (Fig. 204), but for the quality of the pieces, especially the rather weak treatment of the surfaces and the sometime poor firing. The fabrication of this pottery never achieved the glossy criterion of RPW (Sedov & Benvenuti 2002: 187). Moreover the clay used for the Indian-style table jars was medium compact, sometimes even coarse, with a considerable amount of vegetal and mica temper together with white (lime bits) and black (grit) inclusions (ibid 2002: 189), while some samples also comprise grog or clay pellets (visual study of sample SUM11A; US 174, 295). Moreover at Khor Rori and generally in the Dhofar region, a number of red slipped vessels, labeled as being imported, were erroneously identified as Indian Red Polished wares (e.g. Yule & Kervran 1993: 91; fig. 3 nos. 1-5; Zarins 2001: 112-116; Figs. 43, 44, 46). Based on the reassessment by Sedov and Benvenuti (2002), these can now be termed simply as 'Indian' cooking pots, distinguishable from the true RPW at the site.

Surface treatment is another important criterion in identifying imitation RPW or Fine Indian Red wares. Kennet (2004: 90) has already inferred that FIRE sherds from Kush may be part of the 'burnished red ware' tradition from the Early Historic and Medieval contexts in South Asia. Burnish 'streaks' or 'strip burnishing' marks are also evident in the fine red wares (Indian-style table jars) from Kush. On the other hand, the Ed-Dur samples commonly display a dull, or occasionally a faint natural gloss. No clear examples of burnishing were attested (De Paepe et al 2003: 214).

Fine Indian red wares recorded from the Arabian context lack genuine parallels from Early Historic-Medieval Indian sites, as in the case of most excavation reports in India that use generic terminology in describing fabric and the want for distinct classes based on fabric variations. Fine Red Ware as a manufacture technique surely is as much widespread in India and may be mistaken for the actual RPW due to the shiny surface (Sedov & Benvenuti 2002: 193). Recent re-examination of some of the "RPW" samples from Western Indian sites (as part of this study) indicated some fabric parallels for the Kush FIRE from the so-called RPW samples at Nevasa (Maharashtra) (see Chapter 2 Fig. 88). Similarly petrographic analysis by De Paepe et al. (2003) indicated a possible Indian source for the imitation RPW found at Ed-

Dur. Morphological and fabric parallels evident from Tissamaharama (Sri Lanka) where several variations of a locally-produced fine red ware tempered are rather similar to the different FIRE vessel forms recorded from Ed-Dur and Khor Rori mentioned earlier. However there may also be other regions in the Arabian Peninsula that produced local imitations of RPW or fine Indian red wares. For example, Newton (2009: Fig. 43 F, G, N) recorded several examples of red earthenwares with grit or mica temper and burnished which she termed as 'Imitation RPW' from the Islamic period sites of Hairidj and Ghayda al-Kabir (Yemen). It is likely that these were manufactured using local clays. Further analytical studies will therefore have to be undertaken in order to identify local Arabian productions of fine Indian red wares in the Late Pre-Islamic period.

2.5 Shell-tempered Ware

Description: 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. This ware (based on evidence from Khor Rori) is designated as part of the Dhofari tradition of wares which is characterised by pottery with reddish/buff fabrics which usually employs, as temper, crushed shells or calcareous microfossils, with upto 2-3mm in diameter, never wheel-made (Pallecchi & Pavan 2011: 85). At the Islamic site of Al Baleed (Dhofar, Oman), shell-tempered fabric was classified as 'local coarse wares 1 and 2' (Yule & Muhammed 2000).

Distribution: In this thesis, shell-tempered wares were first identified and recorded at Mleiha from the PIR.D context. References have been made to the pottery repertoire in the Dhofar region where in terms of ceramics, associated material appears to be primarily either grit or shell-tempered (Zarins 2001: 87) and have been reported from Khor Rori (Sedov & Benvenuti 2002: 189; pl. 15 nos. 4-6). Such vessels were also found at Ayn Humran and at several other coastal and inland sites in Dhofar and were identified by Zarins as ‘Iron Age Local Wares’ as well as Shisr in the Nejd revealed evidence of local buff wares with ‘crushed shell temper’ and applied punctuate design (Zarins 1997). From Al Balid, known as the largest

medieval Islamic settlement in Salalah, Yule and Muhammed (2000) recorded local coarse wares with ground shell, mineral grit and limestone fragments. At Khor Mughsayl, 40 km southwest of Salalah, local fabric wares (with shell and/or limestone inclusions) were recorded (Glanzman 2013: 12). Archaeological excavations carried out in Wadi Masila (Yemen) recorded pottery in 'red earthenware with shell temper' at several early Islamic sites including Hairidj and Ghayda al-Kabir (Newton 2009: 262; Fig. 43). At Ras Hafun (Somalia), this ware was reported from the lower levels of the Hafun west site (Smith & Wright 1988: 122; Fig. 5 l, m).

Dating: The shell-tempered wares from Mleiha have been recorded from the 2nd - mid 3rd century AD (PIR.D level). At Ras Hafun, this ware was recovered from lower levels of Hafun west dating from between the 1st century BC to 1st century AD. Smith and Wright (1988: 129) have also compared the everted jar rim (ibid 1988: Fig. 5 m) at Ras Hafun in coarse crushed shell temper with form T104a from Nevasa dated to a 2nd century AD context (Sankalia et al. 1960: 306; Fig. 140) and a 4th/5th centuries AD for Form T135a at Maheshwar (Sankalia et al. 1958: 155; Fig. 82) that shares similarities with the handmade jar from Ras Hafun (ibid 1988: Fig. 5 l) based on parallels in form, firing and use of scalloping. From the context of the Islamic period, local shell-tempered fabric has been documented from the medieval sites of Al Baleed in Salalah (c. 12th century AD?) and Hairidj in Yemen (9th-10th centuries AD), indicating a continuation of this pottery tradition from the Late Pre-Islamic period.

Visual Examination: As a result of the examination of sherd samples of shell-tempered ware from Mleiha, two broad fabric variations were identified based on the primary inclusions i.e. shell fragments. Fabric 3A with buff to light brown clay comprising primarily flat, lamellar (plate-like) crushed shells in the temper (Fig. 205: 1) and Fabric 3B comprising reddish-brown clay with powdered or finely ground shell temper in combination with mineral grits (Fig. 205: 2). The shell content in Fabric 3A is only marginally in higher proportion than Fabric 3B. Examination of shell-tempered sherd samples from Khor Rori belonging to the Dhofari group (Chapter 3 section 2.6.3) revealed a fabric rather similar to the Mleiha Fabric 3 (Fig.

205: 3-4). The distribution of the shell inclusions in the Khor Rori samples appears to be more clustered together, while the shell temper in the Mleiha samples was more evenly distributed. Moreover the size and range of mineral inclusions (transparent quartz, feldspar, limestone etc.) in the Khor Rori shell-tempered samples were in a slightly higher proportion than Mleiha.

The use of ground shell in the local pottery is also documented at the medieval period site of Al Balid (Salalah), where Local coarse Ware 1 has a highly gritty core and ground shell. The vessel has a wide-open mouth, medium neck and slightly everted rim. Neither the exterior nor the interior is burnished (Yule & Muhammed 2000). Examination of a surface sherd from Al Balid (courtesy Prof. Juris Zarins) indicated medium sized particles of shell (flat and at right angles to surface) with limestone and occasional plant temper (Fig. 205: 5-6). At Khor Mughsayl, an Islamic settlement approximately 40 km SW of Salalah, Glanzman (2013: 12) detected various clays with shell fragments including a brown ware with grit and many shell fragments (also referred to as Zarins' local shell temper ware) comprising big and small jars. Previously these were also referred to as local fabric wares with shell and/or limestone inclusions often found in contexts associated with so-called Indian Red Polished Wares (IRPW) (but now identified as Indian cooking vessels or Indian-style table jars) (Glanzman 2012: 165; Table 1). From East Africa, Smith and Wright (1988: 122) have reported a Shell-tempered Dark Grey fabric (ShDG) from Ras Hafun (Somalia) with 'quantities of coarsely crushed shell fragments in the clay.' The excavators have questioned as to whether the shell inclusions were recent or are fossil shells. Although no precise parallels for the fabric were known, the carinated form and scalloping seen on the example from Hafun West are attested in South Asia.

From sites in the Yemen, local shell-tempered red wares were recorded at Ghaydah al-Kabir and Hairidj, the latter mentioned in several early Islamic texts of the 9th-10thcenturies (Newton 2009: 253). Select wares from these sites include Red earthenware with shell temper (Types 2 and 5) or Red earthenware with shell temper and incised/punctuate design (ibid 2009: 262; Fig. 43), indicating a continued local tradition of using shell as temper for pottery in the Islamic period.

In terms of vessel forms, shell tempered wares from Mleiha are represented mainly by carinated cooking vessels or Indian *handis* with everted rims (Fig. 206). Occasionally a few examples of storage jars in shelly fabric (some with traces of red slip) are also attested (e.g. see ML10068, ML2486, ML2629, ML2692 etc.). The closest morphological parallels have been reported from two sites: Khor Rori, where vessels with out-turned beaked rims were made from brown medium fine paste with white inclusions (lime bits or crushed shells). It seems the body of this type of cooking pot was elongated with carination in the lower part (Sedov & Benvenuti 2002; pl. 15: 4-6) (Fig. 206). From East Africa, at the site of Ras Hafun, Smith and Wright (1988: 129; Fig. 5 l, m) have identified a small hand-made jar with scalloped carination and 25 percent crushed shell, dark grey with carbonised cooking debris on the exterior. Another example is of an everted jar rim with 35 percent coarse crushed shell. The former vessel with scalloped carination has nearly exact morphological and fabric parallels at Mleiha where it is classified as 'shell tempered ridge-carinated vessels' (Fig. 207). Additionally, according to Pallecchi and Pavan (2011: 85-86), the ancient Dhofari pottery (with shell temper and calcareous inclusions) consists of rounded bottomed vessels with incised decorations at the base of the neck (rosettes, chevrons, slashes, dot-circle motifs etc.), made with sharpened tools and or with a rouletting technique. The decorations are made after burnishing the vessels with shells or pebbles.

Petrographic analysis: Samples of building materials (comprising calcareous blocks) and samples of local pottery from Khor Rori (Sumhuram) were analysed through mineralogical and petrographic analysis, x-rays diffractometer and the optical polarization microscope (Pallecchi & Pavan 2011: 83). Samples of local Dhofari pottery (in addition to crushed shells and calcareous microfossils) indicated silicates, sub-angular quartz, feldspar and micas (ibid 2011: 85; Figs. 7). Similarly, the analysis with the polarising microscope within a section of a sample of mud-brick (building material) shows a main carbonatic composition, with a small quantity of quartz, feldspar, white micas and pyroxene traces. The carbonatic component for its main part comprises microfossil calcareous fragments and shells (ibid: 84). The choice for both building material and local pottery therefore it seems was linked by the availability of raw materials found in the immediate areas surrounding the site. A

second phase involving a petrographic study of shell-tempered ware samples from Khor Rori and Mleiha has been submitted for analysis, using a combination of X-ray Diffraction (XRD) and Scanning Electon Microscopy (SEM). The analysis will be undertaken by Department of Archaeology, Deccan College, Pune in collaboration with Tata Institute of Fundamental Research (TIFR), Mumbai.

Discussion: Shell-tempered ware is well attested as a local fabric from several sites in the Dhofar region (Khor Rori, Ayn Humran, Shisr, Al Balid, Khor Mughsayl etc.) and Yemen (Ghaydah al-Kabir and Hairidj etc.) during Late Pre-Islamic and Islamic/Medieval periods. This demonstrates a long tradition of pottery manufacture where even today, the clay used by modern potters shows the presence of tiny inclusions, whitish in colour, recognised as limestone fragments but, according to the place of provenance, in some cases, the temper could be made by white shells (Pallecchi & Pavan 2011: 94). On the other hand, no parallels could be cited for the shelly ware from any particular ceramic industry in India. Current fabric studies show the existence of small particles of shell in the vessel fabric is recorded in some vessel types along the western Indian coast as a result of naturally occurring shell fragments in the local clay, but never intentionally added as temper.

It is the evidence of typical carinated *handis* in shell-tempered fabric particularly from Mleiha that leads this study to speculate possible 'Indian-influenced' wares. Handi, the most common type of the carinated cooking vessel, is synonymous with a widespread pottery tradition from the subcontinent that can be dated from the first century BC and continues to be manufactured in the present day. The evidence from Mleiha points towards a high quantity of *handi*-type vessels (n = 11) and globular storage vessels (n = 6) produced in shell-tempered fabric (Fabric 3). At this stage of the study, it could be possible to hypothesise the combination of two long-standing pottery traditions: the *handi* vessel form from the Indian subcontinent and local clay from the Dhofar region and other parts of Southern Arabia tempered with shells and limestone, that inspired the production of local imitations of the *handi*. These vessels may have been manufactured for the Indian residents/traders in the Arabian Peninsula, who for cultural reasons perhaps preferred to use their own familiar cooking vessel forms (see Kennet 2004). However some differences in surface

treatment and decoration are apparent: while ancient Dhofari (shell-tempered) pottery was often burnished and decorated with incised motifs, the Mleiha vessels show some traces of slip and burnish, but were decorated. Cooking vessels with out-turned beaked rims and carinated lower portions have been recorded from Khor Rori and Ras Hafun, but the higher proportion of Indian cooking vessels (*handi* form) from Mleiha could lead to speculation that this particular shell-tempered variation was produced (in the Dhofar region?) predominantly for the Mleiha market and its resident Indian population. Petrographic study (XRF analysis) of Indian coarse wares from Mleiha have also identified the presence of actual pottery imports from India (Gujarat and Maharashtra) that enquires into the likely presence of an Indian population on the coasts of Arabia, at Dibba, Khor Rori (Dhofar), Qani (Hadramawt), and even at inland sites like Mleiha, on the western foothills of the Oman Mountains (Reddy et al. 2012; see also Chapter 6).

Local pottery with shell temper have been recorded in association with a number red slipped Indian vessels from the various stratigraphical contexts of sites in Dhofar (Yule &Kervran 1993: 91; Fig. 3 nos. 1-5; Glanzman 2012: 165; Table 1; Zarins 2001: Fig. 42, 43, 46) and Yemen (Newton 2009: Fig. 43, 47). Evidence from the Early Islamic site of Hairidj in Yemen for example indicates large amounts of Indian cooking vessels, probably resulting from the use of this site as a starting point for India and the main harbour for departure to Socotra (ibid 2009: 253). The data from select wares from Hairidj indicates similar cooking vessel forms made from red earthenware and shell temper (Type 2) and 'Imitation RPW' using Red earthenware with grit temper and burnished. The evidence of Indian-inspired vessel forms in local shell fabric from the Islamic period could indicate a similar influence in the production of shell-tempered cooking *handis* during the Late Pre-Islamic period. Although, it is tempting to ascribe these wares to the Dhofari tradition influenced by an Indian pottery form, the fabric samples (both ceramic and clays) collected from the Mleiha and Khor Rori will have to be analysed before the provenance for this fabric can be ascertained.

2.6 Coarse Black Ware

Description: The term 'Black Ware' has been used by Salles (1984: 241-270) to describe a batch of thick grey-black to black coarse pottery (occasionally red or orange due to firing) from Ed-Dur, often decorated with appliqué and incised designs and finger-tip impression, compared with similar pottery excavated from the site of Nevasa in western India (ibid 1984: 246-247). This group has been split up in earlier excavation and survey reports into *Thin Grey (ceramique noire fine)* and *Thick Black ware* (*ceramique noire grossiere)*, mainly on morphological grounds (Haerinck et al. 1993: 187, Figs. 3 nos. 1–13; Salles 1984: 246–7, Figs. 10 nos. 86–99, 11 nos. 100–09. The ware presents a diverse repertory of shapes, in which closed vessels predominate. The fabric is also typified by its hardness, which gives the more thin-walled vessels a metallic ring. A variety of functions associated with serving, preparing, and transporting can be distinguished, but it is the non-porous and hard fabric that makes the Black ware vessels extremely well suited for both short and long term storage of liquids and foods (Rutten 2008: 204).

Distribution and Dating: According to De Paepe et al. (2003: 211), the earliest examples of this ware from Southeastern Arabia appear in Period IIIA at Mleiha (Mouton 1992: 71–72, 103, Figs. 39 nos. 1–5; 69 nos. 6–10; Boucharlat & Mouton 1993: 226, 231, Figs. 16 nos. 1–3, 8) where its production continued into the 3rd century A.D and probably even later. A considerable number of fragments are equally attested in the 3rd century occupation of area F at ed-Dur (Lecomte 1993: 199, Figs. 8 nos. 1–8, 10–11, 9 nos. 1–14) and samples collected from the surface by Salles (1984: Figs. 10 nos. 86–99, 11 nos. 100–09). Several sherds, collected by the Abu Dhabi Islands Archaeological Survey, were identified as Black ware by the authors from the island of Ghagha and Ra's Bilyaryar (King & Tonghini 1998: 131, Fig. 5.b, d), from the Khatt area in the 3rd to the 5th century A.D (Kennet 1998: 111,115, Figs. 6 nos. 19–21) and Asimah-98, Shimal, Hail and Salhiyya in Ras al-Khaimah, at Dibba in Sharjah (Jasim 2006: 220; Fig. 27 nos. 1-11, Fig. 30 no. 1) and the Island of Ghallah in Umm al Qaiwain (Mouton 1992: 182; Fig. 136: 17). The excavations at Kush identified a related ware, dated to between the 3rd and 9th century AD (Kennet 2004: 58). Such kind of vessels were also abundant in the strata of the 'lower' (BA-I) and 'middle' (BA-II) periods at Qana (Sedov 1996: 16), from

the surface of al-Hajar site on the island of Socotra and at Ras Hafun main site (Smith & Wright 1988: 123; Fig. 7 no. 1), suggesting a wide local distribution of these Black wares.

Visual examination: From Ed-Dur, the Black ware fabric is tempered with large amounts of coarse laminar and angular black, grey and brown grits coarse grits, besides organic impurities. The occurrence of large air holes filled with powdery lime, which leave the surface pitted, is a common feature (De Paepe et al. 2003: 211; Rutten 2008: 203). Similar wares from Khor Rori a vessel made from dark grey, fine and very compact paste containing a small amount of while lime bits and golden mica with a thin wash covering the exterior (Sedov & Benvenuti 2002: 181; Pl. 3 no. 1). The fragment of a base (Sherd no. SUM10C US425, 7) in black and grey ware from Khor Rori was examined as part of this thesis. The surface was pitted with a large amount of lime bits (Fig. 208)

In terms of morphology, closed vessels (from Ed-Dur and other sites) predominate and are mainly represented by wide and narrow-necked jars and large storage jars with horizontally ridged walls, all provided with a flattened base. Open shapes are limited to a number of small to large plates and very large bowls (e.g. De Paepe et al. 2003: 211; Fig. 3 nos. 12 – 16; Salles 1984: Figs. 10 and 11; Rutten 2008: Fig. 2 nos. 1 - 9) (Fig. 209). Besides domestic vessels, the black ware also includes incense burners, which most likely served in religious and mortuary rituals or other ceremonies (Rutten 2008: Fig. 2 no. 7).

Parallels from western Indian were sought largely based on surface treatment and motifs/decorations (Gupta 1997: 159 – 160). The degree of disparity in the surface colour of coarse black ware (grey-black and orange-red) was compared with plain and burnished black wares from the excavation at the coastal site of Nagara in Gujarat: 'This wheel-turned pottery is characteristed by tones of grey and black, and smoky gritty core' (Mehta & Shah 1968: 36). Again, the description for 'Black ware' in Early Historic levels of Dwarka is recorded thus 'This ware is dark-grey to black in appearance, the surface being coarse, smooth or burnished' (Ansari & Mate 1966: 67 quoted by Gupta 1997: 159). Additionally, according to Gupta (1997: 160), 'a study of surface decorations of Black Ware from the Arabian Gulf and India reveals

a set of designs common to the pottery corpus on both sides of the Indian Ocean. The decorations are either made directly upon the body of the vessel or using appliqués. The shared tradition of decorations is represented by the following motifs: a) finger-tip or 'rope' impressions b) oblique grooves c) incised oblique or wavy lines. More significant as indicators of trans-oceanic connections (according to Gupta), are the combinations in which motifs are also seen to appear. In particular, the combination of oblique grooves with fingertip impressions is to be found on Early Historic coarse black and coarse red storage pottery all over western and northern India' (e.g. Shamalaji, Nagara, Dwarka, Nevasa see Gupta 1997: Fig. 25; Gupta 2012: Fig. 3 for Dwarka) (Fig. 210). Parallels in vessel forms were noted recently for the black wares at Mleiha (Mouton ed. 1994: Fig. 15) from the north-western part of the Indian subcontinent at Shaikhan Dheri in Pakistan (Dani 1966: Fig. 149 nos. 4 – 6) (Fig. 210).

Petrographic analysis: Beside visual comparison of the Black ware from the Arabian Gulf and India, a selection of 9 sherds of black ware from Ed-Dur and one similar pottery fragment prospected from the Early Historic occupational deposits at the island of Elephanta (Mumbai, Maharashta), were thin-sectioned and photomicrographs were prepared (Gupta 1997: 155-160; Appendix II). The analysis showed that out of the 10 thin-sectioned sherds, three similar specimens (2 from Ed-Dur – EDR 5 and EDR 6 and Elephanta sherd) could be contrasted from the other seven samples in terms of petrology. The examination of the three samples under a polarising microscope revealed the presence of ferrugenous clay having high haematite content. Though the rest of the seven samples also showed a ferrugenous clay base, the haematite content was not as high. Secondly, the samples EDR 5, 6 and the Elephanta sherd contain negligible amounts of carbonate, while carbonate congregates are conspicuous in the clay matrix of the other samples. Thirdly the aplastic inclusions (quartz and feldspar) closely matched with each other in shape, size and volume percentage in the samples EDR 5, 6 and the Elephanta sherd, while these perceptibly varied in the remainder of the samples. The differentiation in the petrology of the thin-section did not indicate separate clay sources. The high haematite content and negligible carbonates was attributed by Gupta (1997: 159) to higher heating of the clay resulting in lessening of carbonate content and augmenting

the haematite content in the clay. In this regard, the petrological variations between the samples EDR 5, 6 and Elephanta sherd and the rest of the black wares was indicative of different firing regimes rather than different clay sources for the pottery. Based on typological and petrological analysis, a connection between the Black Wares from Ed-Dur and similar wares from Early Historic sites in Western India (Elephanta) was demonstrated.

A separate petrographic analysis was conducted on ten sample of Black ware from Ed-Dur in order to determine provenance (De Paepe et al. 2003: 218 – 219). The samples were noted as heavily tempered with charred organic material and sand to gravel-sized rock fragments (4 mm). Carbonate nodules and cavities partially filled by calcite were copiously distributed throughout.. Another particularity of the Black ware was its high alumina (aluminium oxide), potash and lithium content. Only one vessel (AR5591) of this category carried phytoliths (subfamily of the Pooideae). The results indicated that source of the non-plastic inclusions taken in the coarse-tempered Black ware is clearly a sedimentary one. An origin for this fabric or for its temper is a region with abundant gravels and coarse-grained *wadi* sediments. According to De Paepe et al. (2003: 223), alikely provenance for the raw materials of the Black ware is in the alluvial fans covering the areabetween the site and the northern part of the Oman Mountains.

Discussion: The petrographic analyses of Black wares from Ed-Dur have presented two sets of contrasting results indicating two entirely different provenance areas. Whilst the first study by Sunil Gupta as part of his PhD thesis indicated a source in Western India (Gupta 1997: 155 – 160), the analytical results from the study by De Paepe et al. (2003: 211 – 212; 218 – 219; 223) suggested an indigenous or local Arabian origin for the Black wares. Gupta's assessment was also based on visual similarities in motif-combinations and surface decorations on both Ed-Dur and western Indian samples. An Indian source for these wares was also proposed by Salles (1984: 247),based mainly on parallels to a grey and black ware with similar decoration from Nevasa and suggested that the Black Ware represented 'Indian containers' that were used to carry essential commodities (wheat, rice, clarified

butter) to West Asia and East Africa as mentioned in the Periplus (PME 31; Salles 2005: 135).

Alternatively, research on the distribution of the Black ware in southeastern Arabia and petrographic analysis of samples from Ed-Dur, have identified the northern wadis and alluvial gravel fans to the west of the northern Oman Mountains as its region of origin (Rutten 2008: 206). Large grey storage jars with ridged walls made in sub-modern Bani Shumayli ware from Ras al-Khaimah show a connection to the ancient type in paste, temper and texture based on the analyses of two samples of the pottery from 20th century kilns at Wadi Haq'il (De Paepe et al. 2003: 211). Further on, an Indian origin for this ware was questioned as the comparison was restricted to colour and decoration, while the shapes of these vessels from western India did not resemble those of the Black ware from southeastern Arabia (ibid 2003: 212). Moreover, the study by Rutten (2008: 203 – 219) on a small number of large Black ware storage jars from Ed-Dur decorated with low relief snakes and scorpions were identified as very similar to the decorated Iron Age II (1100 – 600 BC) pottery recorded at several sites in the Emirates and Sultanate of Oman (Rumeilah, al-Qusais, Tell Abraq, al-Khatt, Bithnah etc.) in both shape and finish of the snake appliqués. Conventionally, snake decorated pottery is considered a typical feature of the southeast Arabian Iron Age, pointing towards evidence of a continuing Iron Age II motifs in the Late pre-Islamic Black wares at Ed-Dur. Based on the above evidence (petrographic analysis by De Paepe et al. and the widespread occurrence of Black wares in the Arabian Gulf), the present study is more inclined towards the affiliation of the Black ware with a long tradition in the production of this ware in the northern Oman region, though further work must be done to substantiate such a conclusion.

CHAPTER 8

ARCHAEO-HISTORICAL ANALYSIS OF INDIAN OCEAN TRADE: REFERENCES TO INDIA AND ARABIA

Chapter 8 examines the evidence of trade in the Indian Ocean based on the data from archaeological and historical sources. As Tomber (2008: 18) has noted … 'pottery alone is not sufficient to achieve a balanced picture of activity in the Indian Ocean and will (need to) discuss the different types of material and textual evidence.' The chapter is divided into different sections each focusing on a particular source of evidence. Section 1- 'The Written Word' focuses on evidence from classical texts (Periplus of the Erythraean Sea for the Early Roman period and Christian Topography representative of Late Roman literature), historical sources from India (Sangam literature and Arthashastra), papyrus documents (Muziris Papyrus), cave inscriptions (Brahmi inscriptions in Hoq Cave, Socotra Island) and Ostraca (graffiti marks on pottery). The second section is termed the 'Evidence of pre-Periplus trade of Indian pottery in Arabia (3rd cent BC - 2nd cent BC'). The ceramic data presented includes Rouletted/BRW ware and Paddle-impressed wares from Khor Rori; Indian stamped and moulded pottery from Failaka island (Kuwait) as well as first-time evidence of Indian 'high-necked' vessels from Mleiha PIR.A levels. Section 3 focuses on 'Pottery and its Contents' and provides information concerning the archaeo-botanical evidence of spice trade as well as other possible evidence of perishable goods carried from India based on literary sources. This section also discusses culinary change and ceramic functionality in the eastern Arabian seaboard indicated in part by the Indian vessels forms. The fourth section documents the important evidence of sailing vessels/ships in India and Arabia from the Bronze Age to Islamic periods from various sources including archaeological evidence, cave inscriptions, graffiti/paintings, coins, potsherds, Indo-Arab anchors etc. The final section (section 5) of this chapter corroborates all the evidence from historical and archaeological sources (including ceramic evidence) to examine the possible Indo-Arab trade routes in the Indian Ocean during the Late Pre-Islamic period.

Chapter 8

1. The Written Word

1.1 Classical texts and Indian literature in the Early-Late Roman period

Reference to classical documents is essential in the present study of Early-Late Roman 'India trade' to add a personal dimension frequently absent in other classes of evidence and to provide a historical backdrop to archaeological data. However as Tomber (2008: 20) points out much of their value relates to what can be inferred rather than what is explicitly stated owing to a range of caveats including the bias of the writer and inaccuracies resulting from lack of knowledge or as intentional propaganda to idealise a situation. Moreover practical difficulties exist arising from errors in the copies of documents available today due to various transcriptions during antiquity or later. For the classical period, the surviving texts are Periplus of the Erythraen Sea (AD 48 or 52), Pliny's Natural History (c. AD 77), Strabo's Geography (c.64/3 BC- AD 23) and CosmasIndicopleustes' Christian Topography (c. AD 535-550) (Tomber 2008: 20-23). The Indian sources comprise Sangam literature, with references to *Yavanas* (or foreigners) in classical Tamil poetry and Arthashastra, an important economic and political treatise (comprising 15 volumes/books) by Kautilya dealing with aspects of warfare, social conduct, law, trade etc. as important literary accounts. Presently, this section of the chapter focuses on four of these oft-cited textual sources (with emphasis on trade, trade routes and other geographic references in their content. Other textual sources such as Natural History by Pliny and Strabo's Geography have been referenced in the additional sections of this chapter concerning pottery and its contents (section 2) and trade routes (section 5).

1.1.1 The Periplus of the Erythraen Sea: references to Arabia and India

Among these texts, the Periplus of the Erythraean Sea (*Periplus Maris Erythraei*), a merchant handbook consisting of 66 concise paragraphs written in a straightforward style of Greek that was popular in the Roman era, holds a uniquely important position. The earliest preserved manuscript of the Periplus dates to the early 10th century. In this study, Casson's 1989 commentary is relied upon as the most recent

English translation of the text. The anonymous author of the Periplus, a Graeco-Egyptian merchant living in Alexandria, was probably a trusted authority who wrote the report to inform contemporaries about the condition of Eastern commerce, probably for the benefit of speculators who wanted to invest in the trade, or perhaps for less experienced merchants who were considering undertaking the voyage themselves (McLaughlin 2010: 7). The Periplus also contains elements of a maritime manual and a navigational aid with the author offering significant information on sailing routes, marine hazards, landmarks, safe anchorages and useful supplies (Robin 2005: 42).

The date of the Periplus has been the subject of a longstanding debate between the 1st and the 3rd centuries AD. Based on the examination of evidence from South Arabia, Jacqueline Pirenne concluded that the Periplus had been written around 225-30 AD (Pirenne 1961) on the assumption that the data pointed to a political picture of Yemen in the 3rd century AD. Through political geography however a mid-1st century AD timeframe has been suggested for the Periplus. The principal arguments on which the dating of the Periplus is based include the references to Malichas, king of the Nabataeans at Petra (PME 19), and while there was more than one king of this same name, only the second among these two whose reign extends from AD 40 and 70 is securely dated (Casson 1989: 7; Robin 2005: 44). This dating is further enhanced by the mention of an Indian king Manbanos (PME 41), taken to be a Hellenisation of the Saka ruler Nahapana who ascended the throne in AD 78, known through Indian literary traditions, inscriptions and coins based on an article by A.M Boyer published in 1897 (ibid 2005: 45). The more revised dating of his reign however is suggested to begin in either AD 48 or 52 (Turner & Cribb 1996 quoted by Tomber 2008: 22).

The author begins his work with a short section - about the quarter of the whole; Arabia takes about another quarter and India half - on the African trade route (Casson 1989: 12). It appears that the writer of the Periplus had direct experience of the distant East and clues in the text suggest that he had visited India on past trade missions (Ball 2000: 123), although it appears his first-hand knowledge (of Arabia) was only to around Khor Rori and thereafter continuing through the Straits of

Hormuz and into the Gulf, information was limited (PME 33-7) (Tomber 2008: 109). Only two ports are mentioned, Apologos, at the head of the Gulf near modern Basra (PME 36) and the second, Omana on the Arabian side of the Gulf (PME 36-37). Scant information is also provided on the geography of the region, more especially of the eastern Arabian seaboard and the Straits of Hormuz. It is certain that the harbours of the Arabian Gulf are ignored and there can be little doubt that the author of the Periplus never sailed in this part of the Indian Ocean and his knowledge comes from secondhand and hearsay (Salles 2005: 121).

On the other hand, South Arabia occupies an important place in the Periplus. The author of the Periplus knew these ports well and has described them in great detail with references made to the kingdom of the Homerites (=Himyar) and to Mapharitis (=Ma'afir). PME 16 mentions that the last port of trade on the coast of Azania called Rhapta is under the rule of the governor of Mapharitis, Cholaibos. From the observations recorded in the Periplus, there were four major ports in South Arabia: Mouza, Okelis, Eudaimon Arabia and Kane, located in one principality and two kingdoms (Robin 2005: 49-50). From the Periplus, the political situation in South Arabia can be deduced with the first country mentioned being Mapharitis, under the control of the feudal lord Cholaibos with the capital at Saue. The location of Saue is now firmly established 22 km south of the region of Taizz in Yemen. In addition to this, the principality of Cholaibos included Mouza, Okelis and African possessions Rhapta and Azania. It is also clear that while the feudal lord was Cholaibos, his suzerain was Charibael. The Periplus mentions two other kingdoms in South Arabia governed by Charibael: Homerite and Sabaeans with its capital (S)aphar (or Zafar, capital of the Himyar tribe and the second kingdom of Eleazos, the land of incense with its metropolis Saubatha, now identified with Iliazz and Shabwa in South Arabia. Therefore it is clear that the information concerning South Arabia in the Periplus is not a mere compilation of facts but the unified account of a single person (Robin 2005: 50-51).

With regard to Roman Egypt's trade with India, its importance is evident when the author of the Periplus devoted almost half his book to it (Casson 1989: 21). For the merchants of Roman Egypt, India's west coast was the prime trading area while the

east coast played a secondary role. Barygaza (Baroach, Gujarat) (PME 39-49) was specified as one of the three major Indian destinations of the Roman merchants active in those seas – the other two being Barbarikon (Minnagar, Pakistan) (PME 39) at the mouth of the Indus, and the emporia of the Limyrike (PME 57), in present-day Kerala (De Romanis 2012b: 330). Immediately after Barygaza the adjoining land extends from north to south. For this reason the region is called Dachinabades: the south, indeed, is called dachanos in their language (PME 50) (De Romanis 2012b: 329-330) To the southwestern coast the sites Muziris (Pattanam, Kerala) and Nelkynda (PME 56) are mentioned (PME 56) and the northeast comprising Masalia and Desarene (PME 62) and Ganges (PME 63) (Casson 1989: 16).

A key difference between the two areas (Northwest and southwest coast) lies in the nature of their commercial communities. At Barygaza it appears local merchants handled the import-export; at least there are no indications otherwise. At Muziris/Nelkynda there are unmistakable indications of a foreign colony from the evidence indicated in the *Tabula Peutingeriana* of a temple to Augustus next to Muziris. Moreover it is stated that Muziris/Nelkynda imported grain " insufficient amount for those involved with shipping, because the merchants do not use it" (PME 56). This has been explained by Casson (1989: 24) in that the merchants do not use the grain because they are natives of the area and eat the local grain, whereas the shippers were westerners who prefer to eat what they have been accustomed to even though it means importing it for thousands of miles away. Interesting in connection with the nature of objects of trade and particularly food and drink, it appears that from India to ports other than those in Roman Egypt the major imports comprised grain (PME 14, 31, 32), rice (PME 14, 31), sesame oil (PME 14, 32), ghee and cane sugar (PME 14). From Arabia (including Persia and Gedrosia), food and drink exports to ports other than Roman Egypt consisted of wine (PME 36, 49) and dates (PME 36). In terms of textiles and clothing, from India to ports (other than Roman Egypt) exported cotton garments, garments of *molochinon*, cloaks (*kaunakai*) (PME 6), cotton cloth (PME 6, 14, 31, 32) and girdles (PME 6, 14). From Arabia, purple cloth and clothing (PME 36) was exported. Raw materials from India to other ports except Roman Egypt comprised iron/steel (PME 6), copper and teak (PME 36) while Arabia exported pearls, gold (PME 36), tortoise shell (PME 31) and frankincense

(PME 32, 36, 39) overseas (other than Roman Egypt). By deducting the trade items exported and imported to Roman Egypt (which were plentiful), it would appear that the items of trade to and from India to Arabia mainly comprised perishable items of food/drink, clothing and aromatics. Although it is too soon to theorise, these food items could account for the large number of Indian cooking vessels and storage jars in the Arabian context.

According to Casson (1989: 36-37), when Egypt came under Roman rule, the number of ships that sailed from there to Arabia and India increased dramatically. They were still privately owned, carrying the goods of individual merchants, but unlike Ptolemaic times, the government no longer exercised a direct control over these goods. Yet there are some who still see the emperors' hands at work in the area by the numerous embassies that the rulers of the trading nations of Arabia and India dispatched to Rome. With reference to embassies in Arabia, the Periplus (23:7. 29-30) reports that Charibael, ruler of the state that comprised the southwestern corner of the peninsula, sent them continuously in order to cement his friendship with the emperors, while from India one of the embassies was sent to Augustus by Porus, probably a king in northwestern India, offering Rome the rite of passage through his realm and cooperation in "suitable ventures, although there is not the slightest hint that any commercial matters were discussed. In short, Casson (1989: 39) indicates that the historical record reveals no measure taken by the Roman government that was part of a policy for promoting maritime trade with the east, although it did receive the backing of wealthy Roman financiers and even of members of the royal family as indicated in the Muziris papyrus (ibid: 35).

1.1.2 Christian Topography and evidence of Late Roman 'India' trade

Christian Topography penned by an Alexandrian merchant nicknamed Cosmas *Indicopleustes* (Indian traveller) from atleast AD 535 is the one of the best written sources documenting the Late Roman 'India' trade. Unlike *Periplus,* which largely dealt with maritime and trade matters, Cosmas' main interest was theology and the spread of Christianity to the East. Nevertheless Cosmas' account has provided accurate descriptions of his travels to the Mediterranean, the Nile valley, Sinai, the

Arabian Gulf, Ethiopia, Eritrea and even Socotra, although he appears to have had only second-hand knowledge of India and Sri Lanka (Tomber 2008: 23).

In the context of this thesis, it will be important to highlight references in the text to Arabia as well as the Late Roman 'India' trade. In terms of the political situation, Cosmas indicates that in the year 525 AD, Elesboas the king of Axum was preparing an expedition against the Homerites in Arabia. He used the terms Arabitae and Cinaedocolpitae to refer to the inhabitants of Arabia Felix and the people of the Homerite country (McCrindle 1897: 66). Geographical references are made to the Arabian Gulf called Erythraean and Persian, both of which advance from Zingium to the southern and more eastern parts of the earth from the country called Barbaria, which begins where the land of the Ethiopians terminates (McCrindle 1897: 38). The Erythraean, in its wider sense, includes both the Arabian and Persian Gulf, besides the ocean between Africa and India, while Barbaria (= Eritrea/Somalia) is called the country that produces frankincense (ibid 1897: 38). Cosmas also indicates that he had made voyages for commercial purposes in three of these gulfs - the Roman, the Arabian and Persian, bound for 'Further India' or 'Inner India'. According to McCrindle (1897: 39), this term was sometimes generally applied to Southern Arabia and even to East Africa, and India as lying beyond these countries may be meant here. Cosmas also refers to the movement of peoples for example the Cushite settlements that have proved a fertile theme of discussion among the critics. Cush, as a country, is African in all passages of the Bible except Genesis, ii, 13, where the revised version has *Cush* instead of *Ethiopia.* It was supposed that the Greeks, after the conquests of Alexander had made them acquainted with India. It has been thought that there took place a later emigration of Cushites from the Nile to Western India, through Arabia, Babylon, and Persia (McCrindle 1897: 36).

In terms of references to India, clearly the Indus region remained an important centre of trade into Late Antiquity. Cosmas (Book XI) later states that “Sindu is on the frontier of India, for the river Indus… forms the boundary between Persia and India” and he then lists it as among the “most notable places of trade in India" (McCrindle 1897: 366-367). To the south, he explicitly identifies the Deccani port of Kaliana (near Bombay) as an exporter of “cloth for making dresses… it is also a great place

of business." Procopius (Byzantine soldier who penned *History of Wars* d. 554) further writes of the Persians buying up all the Indian silk, "since they inhabit the adjoining country," which is suggestive of the emporia of the Indus Delta or Kathiawar Peninsula. The historical context might, therefore, suggest the western and north-western coasts of the Sub-Continent as the principal sources for the cotton found at Berenike (Power 2010: 59).

According to Power (2010: 74-75), by Late Antiquity, the importance of traditional exports like ivory, gold and slaves was eclipsed by the 'India trade'now routed through the port of Adulis. As Cosmas Indicopleustes (Book II) suggests: "The inhabitants of Barbaria (= Eritrea / Somalia), being near at hand, go up into the interior (of the Indian Sub-Continent) and, engaging in traffic with the natives, bring back from them many kinds of spices, frankincense, cassia, sugar cane, and many other articles of merchandise, which they afterwards send by sea to Adulis, to the country of the Homerites, to Further India (= Inner Arabia?) and to Persia" (McCrindle 1897: 51). This seems to indicate that Adulis lay at the terminus of a chain of ports extending down the Horn ('Barbaria') (ibid 2010: 75). (Further) in this period it is evident that both Ethiopian and Yemeni merchants were active in the maritime trade with Egypt and Palestine, though the general impression is of Ethiopian pre-eminence as indicated that Cosmas first must travel to the Ethiopian port of Adulis in order to find a ship bound for India proper (Power 2010: 84-85).

Power (2010: 94-95) states that the rise of Sri Lanka is associated with the temporary eclipse of the Tamil kingdoms of the peninsular Sub-Continent caused by the southern migration of fierce Kalabhra highlanders between the third and sixth centuries. Sri Lanka was spared from Kalabhra devastation and assumed the commercial position hitherto enjoyed by the Tamilakam. To this island flocked merchants and missionaries from Alexandria to Chiang-h'ang. Concerning the Island of Taprobane, Cosmas states that: "The island (of Sri Lanka) being, as it is, in a central position, is much frequented by ships from all parts of India and from Persia and Ethiopia, and it likewise sends outmany of its own. And from the remotest countries, I mean Tzinista (= China) and other trading places, it receives silk, aloes, cloves, sandalwood and other products, and these again are passed on to marts on

this side, such as Male (i.e. Malabar coast), where pepper grows, and to Calliana (= Kalyana, near Bombay) which exports copper and sesame-logs, and cloth for making dresses, for it also is a great place of business… and to Sind also where musk and castor is procured and spikenard, and to Persia and the Himyarite country, and to Adulis. And the island receives imports from all these marts which we have mentioned and passes them on to the remoter ports, while, at the same time, exporting its own produce in both directions" (McCrindle 1897: 365-366).

Cosmas Indicopleustes' (wr. 525-50) account therefore represents not just the last Graeco-Roman description of India, but a snap-shot of the 'India trade' in its last phase, when such trade as remained was now funneled through Sri Lanka (Power 2010: 321)

1.1.3 Early Tamil texts: Sangam literature and evidence of external trade

Sangam literature consists of anthologies of bardic corpus with an accepted time span of 300 BC to AD 300 based on archaeological, epigraphical, numismatic and literary parameters. This literature is classified as *Ettuththokai* and *Paththuppaattu* (Champakalakshmi 1996: 175-180; Athiyaman 2011). The Ettuththokai is the eight different collections of small poems of threelines to more than 50 lines. The *Akananuru* and the *Purananuru*, which mention Muziris (Muchiri), are thought to be among the earliest, while the somewhat later *Pattinappalai* describes Kaveripattanam on the east coast (Tomber 2008: 26). The *Paththuppaattu* collection has the ten songs, each one of which has more than a few hundred lines, where the poet describes about a hero or a chief or a king and his country. In addition, the epics of post-Sangam literature namely *Silappadikaram* and *Manimekalai* of 4th-5th century AD are included as they also provide information on maritime activities (Athiyaman 2011: 2). These poems were authored by people of different social groups (princes, chieftains, peasants, merchants, potters, Brahmans, Jains, Buddhists etc.) at various points in time over a long span of about 600 years. Being bardic literature (i.e. oral poetry in praise of heroes and patrons), its concern with various aspects of society and economy were incidental (Champakalakshmi 1996: 175).

The interest of this thesis concerns the economic insights specifically on trade that

these important anthologies provide. The Tamil poems contain several references to so-called *Yavanas*. Seland (2007: 71) has counted c.50 references to trade and 10 to *Yavanas* in the 2000 poems comprising the Sangam literature corpus. The word *Yavana* is a back-formation from the Prakrit term *Yona* which in turn is derived from the old Persian form *Yauna* originally denoting the Ionian Greeks who were conquered by Cyrus in 519 BC (Ray 2005a: 76). The Sangam works make no distinction between the Greeks, Romans and West Asians, many of whom were involved in this trade. However in terms of material evidence, this can hardly be the case in South India as there were no Hellenistic Greek kingdoms or large Greek minorities there. The term has a broader meaning of 'stranger' or 'foreigner' in the Tamil areas of the south to include Egyptians and Romans, and in Medieval and later times it was used to describe Arabs (Seland 2007: 72). From around the 4th century, the Arabs and West Asians were subsumed within term (Tomber 2008: 27). Therefore it would not be erroneous to assume that at the mention of *Yavana* in post-Sangam literature of the 4th/5th century AD could also have meant Arab or West Asian settlers. The late reference in *Silappadikaram* could be one of the places where the term refers to foreigners in general, or it could refer to western visitors more likely to be present in Kaveripattinam in the 5th century than Romans, for instance Arabs, Persians or Aksumites (Seland 2007: 72). The more significant among the references to Yavanas are those on the settlements in important trading and commercial centres like Puhar and Muziris. The importance of the west coast, particularly Muziris as the main port of activity, is confirmed by the references in the *Akananuru* and *Purananuru*, which are considered to be the earliest poems. Subsequently, there was a gradual shift in importance to the Coromandel ports particularly Kaveripattinam or Puhar, the harbour claimed to be generally safe, even for bigger ships, as indicated by the *Pattinappalai* (Champakalakshmi 1996: 178-181). The Yavanas also seemed to have moved across important trade routes, as indicated by the distribution of Roman coins and pottery in areas like Pudukkottai and Coimbatore (ibid 1996: 178). The role of the Yavanas and the influence that they could exert (in the above mentioned sites) was determined by two factors: the efficiency and complexity of these local trade networks and, the use of Roman coinage in local transactions in the case of the east coast and further south (Ray

2005a: 86). However it should be mentioned here that the occupation of the *Yavanas* was not exclusively confined to trade as previously thought (Ray 2005a: 80-81) but as mentioned in Sangam literature that by the 2nd century AD included diverse occupations such as craftsmen (carpenters) and royal guards (Champakalakshmi 1996: 109). The position of Yavanas as guards in the kingdom of Madurai (capital of the Pandya kingdom) is mentioned in *Silappadikaram (XIV, 66-7)*. It is indicated that these Yavana royal guards were originally mercenaries and archers who accompanied the western merchants in order to defend their ships from pirates, who apparently decided to stay on in India at the courts of the Indian kings (De Romanis 2005a: 104).

An important insight into this trade is provided by the articles of trade (exports and imports), which passed through or was directly exported from Tamil ports en route to the Roman Empire, as mentioned in the Sangam texts (Champakalakshmi 1996: 181: 202). The Tamil sources refer to *pattu* (silk) from China (as indicated by Periplus) that entered the internal circuit of exchange through gifts by rulers to *pana* (bards) and a luxury item for the urban elite. In terms of textiles, the *Silappadikaram* (VI, 88) refers to thirty-two varieties of cotton fabric woven and Argaritic muslin in Tamilakam and was in great demand among the Romans. Tamilakam also imported two varieties of fine fabric (kalagam and kalingam) from Burma and Kalinga respectively as well as a variety of thin cloth from Egypt (*Purananuru* 41: 9; *Pattinappalai* I. 191; *Silappadikaram* XIV, 104-12). Two other major items of Tamilakam's trade with the west were undoubtedly pearls (*muttu*) and pepper (*kari*). South Indian pearls were rated among the best and highly valued in the ancient world (Champakalakshmi 1996: 184). The *Pattinappalai* (I. 186) refers to sacks of black pepper reaching the port of Kaveripattinam by carts, probably by the circumpeninsular route from the west coast. Nard (Nardus or spikenard) another item of export which resembled lemon grass was an important commodity (extracted for fragrant oil) in Roman Egypt for cosmetic purposes. In the 1st/2nd century AD, these spices were sent to the Tamil ports from the western hills of Kerala to be shipped on to the west. It appears that Roman coins came in large quantities in exchange for pepper and cotton fabrics and a concentration of these coins occurs in major trade routes in the Tamilakam region (ibid 1996: 181, 186-188). In terms of the Arab

world, *Pattinappalai* (I. 165, 185) refers to milk white steed imported into Puhar while the port of Nirpeyyar received horses in ships, imported mainly from the Arab countries (ibid: 189).

Another important aspect of trade as gleaned from ancient Tamil literature is nautical terms that refer to both small boats and seafaring ships used in southern Indian during the Sangam and post-Sangam periods. A thorough survey of the entire literature by Athiyaman (2011) reveals ten terms for watercrafts. They are *ambi, kalam, mithavai, naavaay, otam, pahri, punai, thimil, thoni* and *vangkam*. Among the small fishing or coastal boats comprised pahri (pattinappaalai 30), which was used to barter salt with paddy and also for exchange of paddy with fish (*puranaanuuru* 343). Ambi was used for bartering in the west coast and pahri in the east coast. *Thilmil* or fishing boat was used only in the context of the sea, but used only in shallow waters. These boats were owned by individuals who were not of single social group (*narrinai*331: 6-8). In terms of sea-going vessels, *kalam* is indicated as a container ship made of wood, earth or metal oras a sailing vessel (*puranaanuuru* 26:12; *puranaanuuru* 30:12; *puranaanuuru* 386:14; *kaliththokai* 5:6). According to Athiyaman (2011) these could be ships from the Red Sea region or yavana ships which brought wealth in terms of wine and gold (*akanaanuuru* 149:9; *puranaanuuru* 56:18; *puranaanuuru* 343:15) and in turn left with pepper. *Naavay* was a deep sea ship like *kalam* used by the Chera kings, their masts tied with flags, and they sailed in the Arabian Sea region and brought gold (*puranaanuuru* 126: 15). The final vessel *vangkam* means swiftly moving ship that travelled long distances and therefore was fairly large. The *vangkam* was curveshaped (*kaliththokai* 92:48). The people from Southeast Asia i.e. Java Island came to India in these vangkam type vessels (*manimeekalai* 1 4:73). Other nautical terms refer to lighthouses (*kalangkaraivilakka)* mentioned in *akanaanuuru* (255:1-6), *pattinappaalai* (111-112) and *cilappathikaaram* (6:141), a single reference to a stone anchor in *mathuraikkaanjci* (375-379) as well as references to ship builders (*kalamceykammiyar)* which is indirect evidence for ship building activity during this period. This important textual evidence alluding to nautical terms is further corroborated by the archaeological and iconographic evidence of sailing vessels from

the context of India, Arabia and the Red Sea and has been presented in detail in section 4 of this chapter.

1.1.4 Kautilya's Arthashastra and views on foreign trade

For the north, the document that has the most relevance to trade and economy is the Sanskrit *Arthashastra*. The original text is thought to be from the time of Chandragupta Maurya (early 4th century BC), but the present document belongs to around the third century AD (Tomber 2008: 27-28). Kautilya, the great Indian philosopher-statesman and contemporary of Aristotle, wrote this as a primer for good rule by the king proposing rules and practices by which the king will rule successfully. Kautilya explicitly recognises that international trade (trade among kingdoms) in goods and services is a major vehicle for increasing the sovereign's wealth as well as that of his subjects (Waldauer et al. 1996: 102). Unlike the mercantilists, Kautilya also explicitly recognises that imports represent a very important way in which the wealth of the realm can be increased, in that imports can provide the kingdom with products which are either not available domestically (e.g., natural resources and agricultural commodities) or can be obtained more cheaply from foreign sources through trade than through domestic production (ibid 1996: 102). This is explicitly stated in Book II of the Arthashastra, "The Duties of Government Superintendents" that 'the superintendent shall show favour to those who import foreign merchandise: mariners (*návika*) and merchants who import foreign merchandise shall be favoured with remission of the trade-taxes, so that they may derive some profit (*áyatikshamamparihäramdadyát*)' (Chapter XVI The Superintendent of Commerce) (Shamasastry 1956: 137). Kautilya especially supports bilateral trade arrangements in products and counsels against unilateral trade, where products are exported or imported for money (bullion) only. He stresses the need to exchange commodities for commodities so that both kingdoms may be mutually enriched (Sen 1967: 27 quoted by Waldauer et al. 1996: 103). This stress on two-way trade inproducts is based on the desire to raise tax revenues for the monarch through both export and import duties.

Book II, Chapter XXII on Regulation of Toll-Dues wherein "Merchandise, external (*báhyam*, *i.e.*, arriving from country parts), internal (*ábhyantaram*, *i.e.*, manufactured

inside forts), or foreign (*átithyani*, *i.e*., imported from foreign countries) shall all be liable to the payment of toll alike when exported (*nishkrámya*) and imported (*pravésyam*). Imported commodities shall pay 1/5th of their value as toll (Shamasastry 1956: 158). Based on the listing of toll-dues, the various trade commodities imported to and exported from India is presented: "Of flower, fruit, vegetables (*sáka*), roots (*múla*), bulbous roots (*kanda*), *pallikya* (?), seeds, dried fish, and dried meat, the superintendent shall receive 1/6th as toll. Of fibrous garments (*kshauma*), cotton cloths (*dukúla*), silk (*krimitána*), mail armour (*kankata*), sulphuret of arsenic (*haritála*), red arsenic (*manassilá*), vermilion (*hingulaka*), metals (*lóha*), and colouring ingredients (*varnadhátu*); of sandal, brown sandal (*agaru*), pungents (*katuka*), ferments (*kinva*), dress (*ávarana*), and the like; of wine, ivory, skins, raw materials used in making fibrous or cotton garments, carpets, curtains (*právarana*), and products yielded by worms (*krimijáta*); and of wool and other products yielded by goats and sheep, he shall receive 1/10th or 1/15th as toll. Of cloths (*vastra*), quadrupeds, bipeds, threads, cotton, scents, medicines, wood, bamboo, fibres (*valkala*), skins, and clay-pots; of grains, oils, sugar (*kshára*), salt, liquor (*madya*) cooked rice and the like, he shall receive 1/20th or 1/25th as toll. As regards conch-shells, diamonds, precious stones, pearls, corals, and necklaces, experts acquainted with the time, cost, and finish of the production of such articles shall fix the amount of toll (ibid: 158-159).

Kautilya also explains the selection of trade-routes (Chapter XII Agreement for undertaking a work) where he states that "...water route is liable to obstruction, not permanent, a source of imminent dangers, and incapable of defence, whereas a land-route is of reverse nature. Of water-routes, one along the shore and another in mid-ocean, the route along and close to the shore is better, as it touches at many trading port-towns; likewise river navigation is better, as it is uninterrupted and is of avoidable or endurable dangers (Shamasastry 1956: 418). In terms of inter-regional trade, he counsels that relationships with southern kingdoms (of India) are to be favored over those with northern kingdoms because the southern kingdoms possess greater mineral wealth. As he puts it "Possessing immense gold is better than a friend ruling over a vast population... for armies and other desired objects can be purchased with gold." (Sen 1967:10 quoted by Waldauer et al. 1996: 102). This is explained in

the selection of land-routes: "Of routes leading to the south, either that trade-route which traverses a large number of mines which is frequented by people, and which is less expensive or troublesome, or that route by taking which plenty of merchandise of various kinds can be obtained is better. Routes that can be traversed by asses or camels, irrespective of countries and seasons are also good" (Shamasastry 1956: 419). It is thus clear that Kautilya advocated the preference to the use of land-routes over sea-routes.

As regards the sale of the king's (state-owned) merchandise in foreign countries, Book II Chapter XVI states that: "Having ascertained the value of local produce as compared with that of foreign produce that can be obtained in barter, the superintendent will find out (by calculation) whether there is any margin left for profit after meeting the payments (to the foreign king) such as the toll (*sulka*), road-cess (*vartaní*), conveyance-cess (*átiváhika*), tax payable at military stations (*gulmadeya*), ferry-charges (*taradeya*), subsistence to the merchant and his followers (*bhakta*), and the portion of merchandise payable to the foreign king (*bhága*). If no profit can be realised by selling the local produce in foreign countries, he has to consider whether any local produce can be profitably bartered for any foreign produce. If he cannot reach the intended market, he may sell the merchandise (at any market) free from all dues (*sarvadeyavisuddham*). Or he may take his merchandise to other countries through rivers (*nadípath)*... Having gathered information as to the transactions in commercial towns along the banks of rivers, he shall transport his merchandise to profitable markets and avoid unprofitable ones" (Shamasastry 1956: 138) Thus, Kautilya recognised that trade based on the principle of comparative advantage would be to the material benefit of both exporting and importing nations (Waldauer et al. 1996: 103).

1.2 Ostraca evidence of 'India trade' in the Red Sea and Arabia

In a different category are non-literary texts found in the Eastern Desert of Egypt occurring both as Papyri and ostraca - writing on potsherds - that are concerned with trade within and beyond the region. Although rare elsewhere in the Roman Empire, ostraca are common in the Eastern Desert because of preservation conditions. Ostraca often provides information on who used the vessel and where, and in the

Eastern Desert they provide insights into their ethnicity (Tomber 2008: 24, 26). The ostraca remains from Roman Egypt provide evidence of the conduct of the Eastern trade business of the Red Sea region as well as caravan transport operations that reveal the regional networks of those involved in the Eastern trade.

Graffiti in Indian languages strongly imply that Indians were living at Red Sea sites. This evidence from ostraca indicating epigraphic remains of Indian traders in Egypt included three records from the Red Sea port of Quseir, one in Prakrit and two in Tamil Brahmi (Saloman 1991). The Tamil graffiti date to around the 1st century AD and provide links with the far south of India where old Tamil was both spoken (Mahadevan 1996: 207 quoted by Tomber 2008: 74). The Prakrit-Brahmi fragment dates from Quseir dates to the second or third century. At Berenike the graffiti was etched with the name 'korrapuman' on a Roman amphora of the Dressel 2-4 type suggesting that Indians had access to Roman pots (ibid 2008). More recently a fourth graffito was identified on an Indian storage jar rim at Quseir al-Qadim in Tamil (Mahadevan 2007; Tomber et al. 2011b: 8). Details of the graffito inscribed on these vessels will be discussed in turn:

The ostracon inscription in Prakrit is the largest Indian record from Quseir (5 in. high x 31/2 in. wide) with the graffito in black ink (Fig. 211: 1). The inscription involves several problems of interpretation due the poor condition of the potsherd that appears to be broken off at the upper right edge, and the entire right side is badly worn. Only the first half or less of most of the lines can be read with any certainty. Nevertheless the graffito detailed a list of goods or stores ('*telasa'* oil, '*mamasa*' meat, '*madhusa*' wine) belonging to three individuals (*janana*) (Halaka, Vinhudata or Visnudatta? and Nakada or Nagadatta?) who were very likely to be Indian merchants travelling or residing in Egypt. The references to these names reminiscent of a Satavahana king as well as the script that resembles in a general way the South Indian inscriptions at Nagarjunakonda and Amaravti from the 2nd-3rd centuries AD suggests that they were from the Deccan region (Saloman 1991: 731-733).

The two Tamil and Tamil-Brahmi inscriptions on pottery from Quseir point towards names or monograms indicating the owner of the vessel. The first reads *kanan* (Fig. 211: 2) and the second is probably *catan* or *cattan* (Fig. 211: 3) well attested in the

Tamil Brahmi cave inscriptions from India as well as evidence from the script especially the characteristically Tamil alveolar n (Mahadevan 1966 quoted by Saloman 1991: 734).

Finally the more recent evidence of the Indian storage jar with the double inscription on both sides of the rim reads *paanai oRi* meaning 'pot (suspended) in a rope net' (Mahadevan 2007). The writing is upside down, so the pot was inverted when it was inscribed suggesting either it was full but stoppered, or empty (Tomber 2008: 74). An alternative reading of 'PaanaiORi ' as a personal male name has been suggested in keeping with previous Tamil-Brahmi graffiti from Myos Hormos and Berenike that also provides male personal names (Selvakumar 2008 quoted by Tomber et al. 2011b). Other interpretations for 'ORi' include 'Uri' the coir-mesh in which the pot is kept with butter in India or 'Ori' the name for big ships with double masts (Mahadevan 2007). The vessel form comprises a narrow-necked storage jar with everted rim and sharp neck cordon, comprising two rims and one joining the body. The surface is red-brown and probably slipped and appears to be burnt in part inside and outside (Fig.211: 4). Based on stratigraphic evidence, this vessel dates from the second half of the 2nd century AD or later (ibid 2011b: 8).

Additional evidence of on a smaller jar, interpreted on the grounds of fabric and form as 'Indian', has a post-firing graffito of a South Arabian monograph (Tomber et al. 2011b Fig. 2.7, Tomber 2008 fig. 13) The monogram appears to be the ASA letter Q superimposed horizontally on the ASA letter Ḥ. This causes to speculate that South Arabian merchants too had access to Indian vessels or that this was inscribed by an Indian merchant in South Arabia by an Indian merchant? The jar with an over-turned rom and slight indentation inside also has evidence of finger wiping on the inner body wall. The surface is brown with residue or concretion with traces of red-brown slip (Fig. 211: 5). Heavy sooting indicates that these were used as cooking pots as well as transport containers (ibid et al. 2011b catalogue no. 8).

With reference to Tamil-Brahmi ostraca in South Arabia, a potsherd was found in the residential area of Sumhuram (Khor Rori) in Dhofar. 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 1st century

AD context or earlier. The ostraca is inscribed with 'nantaikiran', signifies a personal name with two components. The first part "[n] antai" is an honorific suffix to the name of an elderly person. For example, 'kulantai-campan','antaiasutan','korrantai' etc. found in Tamil-Brahmi inscriptions. The second component "Kiran" also stands for a personal name. More than 20 poets of the Tamil Sangam age (c. 3rd cent BC to 3rd cent. 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) (Fig. 211: 6).

1.3 Papyrus evidence of 'India trade' from Roman Egypt

As mentioned earlier, papyrus (plural papyri) constitutes an important non-literary category of textual evidence pertaining to army rosters, private letters, loan agreements, shipping/trade contracts etc. in Roman Egypt. Around 180 fragmentary papyri were found during the five seasons of archaeological excavations at Myos Hormos (Van Rengan 2011: 1). Of direct interest to this research however is a legal text known as the 'Muziris Papyrus' or 'Vienna Papyrus', its provenance unknown, but is considered to come from the metropolis of Oxyrhynchus in the Fayum, a site renowned for vast quantities of papyri (Rathbone 2001). The 'Muziris' papyrus contains two incomplete texts, one on its front and the other on its reverse/verso, written in different hands, both more or less contemporary, mid 2nd century AD and both deal with shipments of goods from India (Rathbone 2001: 39; Casson 1986: 730. The beginning and end are both missing which was suspected to be torn off in antiquity to use the blank ends remaining on the recto and verso for other texts (Rathbone 2001). Much information has been lost at the beginning including the names of the parties involved. On the recto, towards the end of a contract relates to a maritime loan for a trading voyage from Alexandria to Muziris (Malabar coast of south-west India) (Harrauer & Sijpesteijn 1985: 129 quoted by Rathbone 2001: 40). Casson (1986: 76) saw this text as part of a contract between a 'merchant' (Party A) and a 'financier' (Party B). He suggested that A had borrowed from B in order to purchase Indian goods to take home to Egypt and as was standard practice in maritime loans, he had pledged these goods as security. The text also provides evidence of other agents or representatives at Coptos and Alexandria utilising a

caravan route to deliver the goods inland to Coptos and downstream to the warehouse which received the one-fourth duty at Alexandria (Casson 1986: 75). Casson (1986) and Thur (1987 quoted by Rathbone 2001: 42) both saw the contract as a 'supplement' to a contract for a maritime loan taken out by a merchant on the security of the cargo he planned to buy, contrary to the original interpretation by Harrauer and Sijpesteijn in 1985 (quoted by Rathbone 2001), as an 'original' contract for a maritime loan taken out at Muziris for a trip to Alexandria by a shipowner who pledged his ship and quarter of the cargo as the security. Rathbone (2001: 42) believed that the maritime contract was drawn up for a trip to Muziris, and not drawn up at Muziris. Alexandria was therefore the base of the financier who could make such an enormous loan. Casson (1986: 78) is also in consensus that the loan agreement was drawn up in the Red Sea port at which the ship docked soon after arrival, but that the new agreement would have converted what had been a maritime loan, covering maritime risk, into an ordinary loan. The maturity date i.e. the date for repayment was one year from the date of the contract and the voyage to India could be made well within a year and the ship had no doubt arrived in advance (ibid 1986: 78).

On the reverse/verso of the document, there is a whole last column of an account of the value of the shipload of goods imported from India, probably from the same voyage. It comprised of three standard imports from India; Gangetic nard, ivory and textiles of a total value of 131 talents, which according to Casson (1992: 10) could have purchased almost 2,400 acres of Egypt's farmlands. According to Rathbone (2001: 49), the value of the Muziris cargo far outstrips previously known figures for similar mercantile activities, with a clear message that only the extremely wealthy could afford to invest in the eastern trade. Based on this evidence, Ray (2005b: 99) assesses the private control of maritime enterprise and the compact nature of the commodities involved. The total weight of the consignment was no more than 7190 pounds or three and a half tons, which Ray (2005b: 99) states was clear that merchants regularly brought space on sea-going vessels. The closing portion of the account (column 2) summarises that the shipment involved goods loaded aboard the vessel *Hermapollon* (Rathbone 2001: 45). This document therefore reveals the procedure followed when goods intended for Mediterranean destinations arrived at

the Red Sea ports as well as provides a rare glimpse of businessmen from Egypt in action in India.

1.4 Cave inscription evidence of Arabia-India trade

Significant evidence for rock inscriptions has been reported from the Eastern Desert, where travellers occasionally rested along the caravan routes at small rock shelters that offered temporary refuge from the glaring sun or sand-gritted winds. At many of these stopping points travellers carved their names into the rock-face, thus leaving a permanent record of their journeys across the desert and providing historians with fascinating information about the people who journeyed to Red Sea ports, then travelled onwards to destinations such as India (Sidebotham 2008: 192 quoted by McLaughlin 2010: 16). On the Arabian side, one of the most exciting discoveries in Indian epigraphy is the corpus of Brahmi inscriptions from the Hoq cave on the island of Socotra (Repulic of Yemen) (Strauch & Bukharin 2004). Its importance as a meeting point between the East and the West is demonstrated by text fragments that tell of East African, West Indian and South Arabian visitors during the Early Roman period (De Geest 2006: 19 quoted by Tomber 2008: 108), attested also in the Periplus (PME 30) where 'Arabs, Indians and even some Greeks' lived on the north side of the Island'. From that time onwards there is continuous evidence of the presence of Indians on the island who went there as traders and obviously even settled down for a certain period of time (Beyhl 1998: 69-70 quoted by Strauch & Bukharin 2004: 122). As early as the end of the 2nd century BC, the Ptolemaic officer Agatharchides of Cnidus explicitly mentions northwestern India as the homeland of the Indian sailors. This situation seems to have changed in the time of the Periplus when the Indians came from Barygaza (modern Broach) and South India linked to the introduction of direct trade routes across the Indian Ocean by using the monsoon winds (ibid 2004). Despite the recurring association of Socotra and India in literary sources, until now only few material traces of the presence of Indians on this island have been discovered (Dridi 2002: 591). The Belgian Speleological Mission directed by Peter de Geest first discovered these epigraphical remains in 2001 in Hoq cave on the northern side of the island, followed by the exploration of the cave in January 2002 by Prof. Christian Robin and his team from College de France, Paris

(Robin & Gorea 2002).

The cave that opens at a distance of 2 km from the northern seashore (37x19 m and 2 km deep) is located 350m above sea level. Amongst the various South Arabian, Ehiopian and Aramaic inscriptions, 43 Indian Brahmi inscriptions written by clay, chalk and coal on the walls of the cave were registered and half of them photographed. The epigraphs in the cave attest to a possible religious purpose with the presence of incense-burners and a Palmyrne tablet that mentions <<god stays here>> (Dridi & Gorea 2003 quoted by Strauch & Bukharin 2004: 124). Among the Indians were certainly Buddhists, Vaisnavas and Saivas, which could compare the cave to Indian religious sites like Kashmir Smast (Northern Pakistan), which draws worshippers of different religious affiliations. The position of the cave, high above the seashore and visible to passing vessels, makes this explanation reasonable (ibid 2004: 124). The dating of the epigraphs based on the scripsts used in Socotra is roughly dated into the late Kushana/early Gupta periods (2nd - 4th century AD). According to the palaeography the provenance of the Soctra scribes should be looked for in northern and western India, or in some cases a southern origin, which agrees with the data in the Periplus that mentions Barygaza (Broach) and Limyrike (Malabar coast) as homelands of the Indian traders. Additionally the proposed dating also corresponds with the date of the Palmyrene tablet found in Hoq cave (Strauch & Bukharin 2004: 135).

With regard to their contents the inscriptions may be divided into three groups: Type 1 gives only the name of a person, Type II which contains names of persons ending in *-putra*, together with the indication of their father's name and Type III - epigraphs that contains complete sentences e.g. 'X (son of Y) has come (Strauch & Bukharin 2004: 127-133).

Some examples of **Type I (Single Names)** include:

1. T 31 and T24: visnuda(tto) <<Visnudatta>> (Fig. 212: 1) a name well attested in Sanskrit literature and epigraphy and also one of the three persons mentioned in the Brahmiostraca from Berenike in Egypt (Saloman 1991: 732)

2. T 26: sail(a)ryo (Fig. 212: 2), with ligature *ryo* as found in Gupta epigraphs,

3. T 46: (?) varagh(o) sa(?) sa ta (?)(?) (Fig. 212: 3) Upper line could be restored as *pravaraghosa*, a typical North Indian Sanskrit name ending in *ghosa*

Type Ia (Single Names ending in *-putra*) include:

4. T 37, T 44-a, T 47: bhat(th)iputtro<<Bhatthiputra>> (Fig. 212: 4) *bhatta* connected with <<lord>> and final *i* well attested in literary Prakrit

5. T 44-c: <<Jakhapu(tra)…>> (SktYaksaputra) or <<Gha…, son of Jakha>>(Fig. 212: 5) *Jakha* may be explained as the Prakrit spelling of Sanskrit *yaksha.*

Type II ('X, son of Y') include:

6. T 36: khuddakapudara(ka) <<Daraka, son of Khuddaka (Sanskrit Ksudraka)(Fig. 212: 6)

7. T 23-b: Bodalaputro (co)lika(h) (Fig. 212: 7) <<Coloka, son of Bodala>>

8. T 25-b: aji(ta)sunoajita (Fig. 212: 8) <<(Of) Ajita, the son of Ajita>>

9. T 33: dharmmaputro (?)llya(?) (Fig. 212: 9), <<son of Dharma>>

Type III ('X has come'):

10. T 25-a: *samgharangiputoajitavarm(m)agataddharala(v)iyako(?)sa(ko)*(Fig.212: 10) meaning <<Ajitivarman, son of Samgharangin, has come>> If the reading of *sako* is accepted then it would be interesting evidence for the presence of a Scythian in Yemen.

Indian auspicious symbols including *purnaghatta*, trisula-parasu (trident) and *nandipada* or *nandyavarta* (Fig. 212) are some of the pictorial representations reported along with epigraphs of T 44 (Dridi 2002: 585). In addition to this, depictions of boats in the immediate neighbourhood of the inscriptions have been associated with pictures of ships from Ajanta and ship-motifs on the coins of the Satavahana ruler Gautami-putra Yajna Satakarni who ruled in the last half of the 2nd century (Shastri 1998: 77). These representations of ships typical for Indian and more Eastern regions will be discussed in section 4 of this chapter.

Chapter 8

2. Pre-Periplus trade: Evidence of Indian pottery from the Arabian context (3rd- 2nd cent. BC)

2.1 Introduction

The subject of Indian Ocean Trade has essentially been an analysis of the Red Sea and the Indian Ocean world, as it appears in the Periplus, and this has led to omissions (Seland 2010: 4). In this context, some of the more obvious relationships between Arabia and east Africa, and between Arabia and western India are seldom mentioned and therefore marginalised or underestimated. If this is the case in the Periplus, what then of evidence for the formative period of this trade before the Periplus? Most new research on the Indian Ocean in antiquity stems from archaeology (ibid 2010), more specifically from ceramics that provide tangible evidence of long distance trade. Greek amphorae and Parthian/Mesopotamian glazed vessels are strong ceramic indicators of pre-Periplus trade in the Indian Ocean and have been discovered at several 'Hellenistic' sites in the Arabian Peninsula. However until recently, scholars have had a tendency to overlook the importance of Indian pottery discovered in the Arabia from the early centuries BC levels as a reliable indicator of pre-Periplus contacts with the subcontinent and beyond. This archaeological void has been partly filled as a result of the last twenty years of research which include the backdating of several important Indian Ocean trading sites (to the 3rd century BC) in Egypt and the Red Sea region (Berenike and Quseir Al Qadim), Ethiopia (Adulis), India (Arikamedu), Sri Lanka (Tissamaharama, Anuradhapura and ancient Ruhuna) and South Arabia (Khor Rori) (Pavan & Schenk 2012). However in spite of the discovery and revised dating of these trade sites, justification for lack of archaeological data pertaining to trade between India and Arabia in the Hellenistic period was indicated by Salles (1996:296) who stated that - 'our knowledge of common potteries, especially the containers: jars, amphoras, pithoi or *zir*, etc. both in India and Arabia remains rather poor'.

Since the 1990s, the identification and sourcing of Indian pottery from various sites in the Indian Ocean world has been the subject of on-going research (see Chapter 1 sectioin 1.4). In addition to this, in-depth research on Indian ceramics dating to the

early centuries BC, tracing the formative period of the Peninsula's contact with the Indian subcontinent and Sri Lanka, has been initiated at the site of Khor Rori (Pavan & Schenk 2012). However studies so far tend to ignore the Arab-Persian Gulf extension of the Indian Ocean as a possible source of Indian pottery of the pre-Periplus era, so much so that Salles (1996: 295-296) laments in reference to Arab-Persian Gulf during the Hellenistic period that no recognisable Indian material was found on all sites explored and excavated in the Gulf belonging to the 4th - 1st century BC. A likely change in this situation is indicated with the recent discovery at the site of Mleiha (Sharjah, UAE) of a specific variety of Indian pottery from the 3rd – 2nd century BC context (PIR.A phase). Results of a preliminary X-ray Fluorescence (XRF) Spectrometry analysis of samples from this assemblage at Mleiha indicate an origin in Western India for this ware (Reddy et al. 2012; Chapter 6 of this thesis). These results coupled with typological parallels from published excavation reports from western Indian sites indicate a similarity in form and fabric with the Mleiha evidence.

2.2 Ceramic indicators of Pre-Periplus Trade in India

In the Indian context, aside from amphora fragments, regional pottery serves as major evidence for determining the chronology and nature of the earliest phase of trade contact, as demonstrated by Begley (1992) with regard to specific Indian ceramics: the mold-made ware found in the interior of the upper western, or Gujarat-Maharashtra coast, and the "rouletted" and other wares of southeastern coast and inland sites of Tamil Nadu, both of which show clear influence of classical ceramic techniques and styles (ibid 1992). Both varieties are considered regional products, while the technique of decoration is still presumed to be of classical origin, although with regard to Rouletted Wares Begley (1988) has demonstrated that the decoration of the Arikamedu rouletted wares was 'chattered' with sharp-pointed metal strips, instead of having been made with roulettes, based on the analogous techniques of potters of Bijnaur village in North India. RW has been recognised at numerous sites on the eastern coast of India from the delta of the Vaigai River to that of the Ganges, inland in the main river valleys, northwest Sri Lanka, and even in Indonesia (Begley 1992). However until the excavations at Pattanam, rouletted ware had not been

reported from the southwestern coast of India. Pattanam excavations have produced thelargest ever assemblage of the Indian rouletted ware (Cherian et al. 2011).

Mouldmade Ware (MW) of the Western Deccan is found at several sites including Nevasa, Ter, Kondapur and Kolhapur (Begley 1992: 157). The red MW is made from fine clay, possibly the same as used for red polished ware (ibid 1992: 157). However, since there is nothing like it in pre-Hellenistic times in India, one must turn to the west for parallels - Megarian bowls, believed to be copies of metallic fore-runners, based on the scheme of decoration and several individual motifs (Begley 1996: 166, 169). Moulded ware and stamped pottery of a probable Indian source havealso been discovered on the island of Failaka on the Arab-Persian Gulf (Salles 1996: 303).

In addition to the Indian wares, mention has to be made of foreign pottery imports into India in the pre-Periplus era to achieve an overall picture of the ceramic indicators of trade. Some examples of these include the amphora varieties: double-handled Koan amphorae, made primarily on the Greek island of Kos in the Aegean Sea, from as early as the 3rd century BC and imitations of Koan amphorae (Will type 12, Dressel forms 4 & 3 etc.) (Will 1992) as well as Rhodian and Knidian amphorae (Slane 1992) discovered at Arikamedu. Another indicator of pre-Periplus trade, discovered at the site of Pattanam (Kerala) Turquoise glazed pottery, is part of a broad tradition of alkaline glaze earthenware goes back to the Neo-Babylonian period (c. 626 BC – 539 BC) in Mesopotamia and continued well into the Islamic Period (Kennet 2009). Based on close analysis of the sherds from Pattanam, Kennet concludes the glazed wares most likely date from the 3rd/2nd century BC to 7th – 8th century AD. In addition to this the chronology at Pattanam can be dated from the 3rd century BC as indicated by ‘fish plates’ of the Parthian period (Cherian et al. 2011). The presence of these foreign imports from the Red Sea and Mesopotamia indicate some of the early exchange between West Asia and the Indian subcontinent.

2.3 Indian pottery and Pre-Periplus contacts in Arabia: An Overview

Discoveries of Indian pottery pre-dating the Periplus, in recent years, have laid the foundation of an early relationship between the Arabia and India, from the 3rd century BC onwards. Publications previously mention that occasionally sherds of

Indian Black-and-Red Ware (BRW) have been discovered in Khor Rori/Sumhurum and Failaka (Avanzini 2007: 30, Plate 2, Fig.1 & 2, Gupta 1997: 161) and the rare occurrence of Northern Black Polished Ware (NBPW) fragment on Failaka Island discovered in the Hellenistic levels (300 B.C) (Salles 1996: 296). New discoveries and continued research into the pottery assemblages of Khor Rori have revealed that besides the finding of BRW, the discovery of fragments of true Rouletted ware (RW), dating indisputably to the centuries BC, and as being the only evidence of this kind to be found in all the Arabian Peninsula (Pavan 2011; Pavan & Schenk 2012; see also Avanzini 2007: 30 Fig. 5 Plate II). In addition to this, Khor Rori is the only site where fragments of the hand-made Indian "paddle impressed" ware ceramic have been discovered in Arabia (Pavan 2011), with the distribution for these jars concentrated again at east coast sites in India and Sri Lanka (Tomber 2008). Pavan and Schenk (2012) took the study of these pre-Periplus wares one step further by comparing and finding analogies for the Khor Rori Indianpottery from the earliest occupation layers with assemblages from Arikamedu (South India) and Tissamaharama (Sri Lanka).

Research on pre-Periplus contacts in the Gulf arm of the Arabian Peninsula has never fully relied on the evidence of Indian pottery, partly owing to its paucity. Focus therefore has been primarily on the evidence of actual Hellenistic pottery and Hellenistic-inspired decorations/ motifs as well as Parthian/Mesopotamian glazed wares. At Qal'at al-Bahrain the ceramic evidence yielded Greek black-glazed pottery along with green-glazed pottery common in the Gulf (Salles 1996: 303). However, it was suggested that some items from Failaka's collections should be carefully balanced with Indian material: moulded pottery, stamped pottery (rosettes, leaves), black-washed pottery, etc. have become a key-reference to the interpretation of relations between Mesopotamia and India in the Hellenistic period (ibid 1996: 302). Moldmade ware and stamped pottery are widely distributed in Western Indian sites particularly at Ter and Kondapur in Maharashtra (Begley 1992). Gogte (1999) has also pointed out some other interesting connections between India and the Nabataeans in his article 'Petra, the Periplus and Ancient Indo-Arabian Maritime Trade'. Identical pottery, known as Mould Ware has been found at Petra, and also on several early historic Indian sites (100 BC - 200 AD). This mould ware is small,

ranging in size from 4 to 6.5 cm, and was produced by joining two vertical moulded pieces together. The vertical joint is clearly visible, running from the rim to the bottom. The ware has different shades of red, from bright red to brownish. Begley (1992) had previously classified this mould ware into four shapes: 1. Cup with out-turned rim, 2. Straight sided bowls, 3. Deep cups with two bulges and 4. Bottles with bulbous body and a long neck. The most common decoration is a series of long petals radiating from the bottom part of the pottery. Other motifs consist of beads, ovals, bead and reel, and rosettes that appear between the ridges on the upper body.

In southeastern Arabia, our key focus rests on the site of Mleiha (Emirate of Sharjah) whose ceramic indicators of contact before the Periplus were several fragments of Rhodian amphorae originating from the Eastern Mediterranean, found in the context of the graves dating from the 3rd – 1st cent. BC (Boucharlat & Mouton 1991, 1993). In addition to this, glazed vessels of Parthian and Mesopotamian origin appear from the Late Pre-Islamic A period onwards (Benoist et al. 2003). Indian ceramic indictors of pre-Periplus trade therefore appeared non-existent in the archaeological record of the Arabian Gulf until the recent discovery of specific 'high-necked' vessels from the Late 3rd – 2nd century BC (PIR.A) levels at Mleiha. The typological and petrographic study of these specific Indian wares at Mleiha and its relevance to the formative period of Indian Ocean Trade are discussed in detail below.

2.4 Evidence of the Indian 'high-necked' vessels from Mleihain the PIR.A levels

Long distance trade is confirmed at Mleiha from the beginning of the occupation in the 3rd century BC. The most significant and abundant evidence for this trade can be found in the pottery assemblage (Benoist et al. 2003: 66). Exchanges with north-eastern, central and southern Arabia, and as far as Mesopotamia and the Near East, occurred from the 3rd century BC onwards (ibid: 72). Mleiha's connections with the Indian subcontinent are however primarily concerned with the PIR.D phase (mid 2nd century AD – mid 3rd century AD) (Mouton et al. 2012). Material of Indian origin was considered almost absent in the periods before. But excavations at Mleiha undertaken between 1986 - 1995 by the French Archaeological Mission in Sharjah has unveiled small but crucial evidence pointing towardsa likely connect with the Indian subcontinent in the Late Pre-Islamic PIR.A phase (Late 3rd century BC - 2nd

century BC). The evidence is of diagnostic forms of a high-necked vessel variety with horizontal grooves along the neck, highly burnished with a red slip and well-levigated clay (Fig. 213), amounting to almost 870 sherds from these earlier excavations at the site. Some of the inventoried samples of this ware include: ML 90-L SM- 3269 (UF. 693- Sherd no.2280), ML 90 SM- 3271 (Sherd no.2394), Sherd no. 1347 and Sherd no. 1291.

Based on their form and fabric combination, typological parallels for this vessel type were derived from several sites in Western India, notably Nevasa (Sankalia et al. 1960: Type T46 fig. 118), Ter (Chapekar 1969: Types 2C & 2D fig. 4), Nasik (Sankalia & Deo 1955: Type T 3c fig. 9), Nagara (Mehta & Shah 1968: Type 308 fig. 35), Dhatva (Mehta & Chowdhary 1975: Type 112 fig. 16) and Timbarva (Mehta 1955: Type 54 fig. 8) (Fig. 214). The description of the vessels of the various Indian sites also corresponds with the Mleiha evidence:

- Nevasa Type T46 is referred to as 'High necked globular vessels with a red slip or wash' with a description - 'Fragment, high neck, fully red slipped and burnished on the outside and partially inside, out-turned beaded-out rim, shallow grooved exterior, core gritty'.
- Ter Type 2 is a 'High necked vessels – Red-slipped ware' and description 'Fragment with a beaded out rim and high neck bearing corrugations; slip on the outer surface only'.
- Nasik Type 3c 'Red ware (globular vessels?)' of 'Fragment, rim externally beaded and cut, with grooves around the neck, inside and outside. Dull red well burnished surfaces'.
- Nagara Type 308 belongs to 'Ghado (Pots) of gritty, burnished or un-burnished red ware' variety with 'a flared slightly rounded rim and neck with three shallow grooves on it'.
- Dhatva Type 112 described as ' globular pots having red slip, averted rim and grooved narrow vertical neck'.
- Timbarva Type 54 as an 'upper part of a pot burnished red with beaded rim, with shallow groove on the internal side below it and five similar grooves on the neck.'

The dating of the Mleiha examples also broadly coincides with the dating of these vessel parallels from the Early Historic Sites in Western India: Nevasa Period IV (c. 150 BC - 50 BC), Ter Period I (c. 200 BC - end of 1st century BC), Nasik Period IIA (300 BC - 200 BC), Timbarva Period I (400 BC - 0 AD), Nagara Period II (3rd century BC - O BC/AD) andDhatva Period II (5th/4th cent BC to 3rd/4th cent AD).

Looking beyond the typological parallels, petrological analysis of these wares can provide more precise indicators of the geographical origin. With this objective in mind, a sample of the high-necked vessel from Mleiha (Sherd no. ML2280) from PIR.A was submitted along with seven different 'Indian' samples collected from phase PIR.D from Mleiha and analysed with a total of 21 carefully selected sherds from various key sites in Western India (Reddy et al.. 2012; Chapter 6 of this thesis) (Fig. 215). The selection of the comparative samples from Western Indian was based on definitive form-fabric parallels with the Mleiha samples. Notably, sample ML2280 seemed to have the highest correlation values with 11 western Indian samples from sites in Maharashtra and Gujarat based on elemental concentrations and geo-chemical composition (Fig. 216). In the order of highest correlation levels, the comparable Western Indian samples were from the sites in Maharashtra: Junnar, Nevasa, Ter and Nasik, and Dwarka and Padri in Gujarat (ibid 2012: table 3). However these correlations recorded at present between the Mleihasample ML2280 and samples from Western India do not necessarily indicate the actual pottery production/manufacturing areas within India and therefore research based on further sampling from Indian sites will therefore help define or locate the Indian industries more precisely (ibid 2012).

2.5 Discussion

It is clear from the information gathered in the above passages, that ‘high-necked’ vessels of Indian origin were discovered nearly two decades agoi n excavations at Mleiha, and yet, until recently (Mouton 1992: fig. 17) were not recognised or documented as ceramic evidence pointing towards a likely connect between the Arabian Gulf and India in the early centuries BC. The reasons for this oversight could partly be adhered to the fact that similar vessels have not been reported from

other sites either in Arabia or the Red Sea region. This however does not indicate that these vessels were completely absent from the ceramic assemblages of Arabia, the Red Sea and beyond, but that they may have been overlooked as potential Indian products. Furthermore, Indian fine wares discovered at South Arabian and Red Sea ports like Khor Rori and Berenike have been the singular evidence up until now of pre-Periplus contacts with India. The presence of high-necked Indian vessels at Mleiha provides the first evidence of 'coarse wares' as possible ceramic indicators of early trade or contact with India.

With regard to the geographical parameters relating to the provenance of 'high necked' vessels in India, although preliminary XRF analysis has tentatively sourced these wares to Western India, it would be premature to reject the possibility of sourcing these wares to a wider geographic area in the northwest of India including the Sind and Pakistan, perhaps extending upto Baluchistan and the Makran.

A final question remains as to how these vessels were transported to the inland site of Mleiha. At present, the possible sea routes from India transporting this material is hypothesised through the two axes in Indian Ocean Trade, one through the Arab-Persian Gulf and the other through the Red Sea (Seland 2011). The Red Sea route presumably passed en-route through Khor Rori, as indicated by the evidence of Indian finewares (RW, BRW etc.) as products of pre-Periplus trade at Khor Rori. However the absence of Indian finewares at Mleiha comparable to Khor Rori, leads us to question whether the 'high-necked' vessels were imported to Mleiha through the Khor Rori harbour. On the other hand, the alternate route circumnavigating the Arab-Persian Gulf could also been used to transport these specific high-necked vessels. It is plausible that in addition to the high-necked jars, the molded ware and stamped pottery discovered on Failaka and overland at Petra, could have been transported from Western India (or Barkarikon in the Indus) as part of a single consignment via the Arab-Persian Gulf. The high-necked vessels were most likely imported to Mleiha through the caravan route from one of these coastal sites. The identification and documentation of these 'high-necked' jars from other sites in Arabia or the Red Sea region, therefore remains to the attested.

Chapter 8

3. Pots and contents

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 a vast number of imports and exports to and from Berenike. The trade items mentioned in both documents represent 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). These sources are corroborated by evidence of archaeobotanical 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.

3.1 Historical sources on items of trade from India

As distinct from pottery, natural products such as spices and aromatics were the driving force of Indian Ocean commerce, a majority of which have been itemised in the historical documents of this period (Tomber 2008: 54). Among these sources, the Periplus enumerates a vast number of import and export commodities, including 34 products of botanical origin from Berenike, of which 18 are reported as import items. The second source is the Alexandrian Tariff, issued by Marcus Aurelius (AD 176 and 180) that lists 54 items subject to import duty at Alexandria. Only half of the 20 different plant products itemised in this document are mentioned in the Periplus (Cappers 2006: 3). 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 nine 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. Furthermore there was evidently a difference in the luxury status of the imported items between food staples such as oil, grain and wine and exotic luxury products such as incense, aromatics and spices, the latter according to Pliny (Natural History 12.41.84) which was paid with cash money, for example the case with black pepper (ibid 2006: 5-6). Pliny's Natural History also discusses Eastern products and their uses in Roman society. He also gives prices for over 20 Eastern commodities that probably reflect retail values in Rome. Among the lower-priced Eastern goods were frankincense, sold at three denarii per pound, and pepper, which cost four denarii per pound. This would be several days' pay for an ordinary labourer, but these products would still have been affordable to a large section of the Roman population. For most people, the purchase of incense and the consumption of spices would be small scale and occasional. Yet the popularity of these products ensured that the accumulative effect of all these small-scale purchases created a vast international commerce (McLaughlin 2010: 143). The Periplus additionally documents the nature of trade objects from India to ports other than those in Roman Egypt (Casson 1989: 39-43). This probably includes the areas of the Persian coast, southern Arabia and East Africa. The list concerns items of textiles and clothing, lac dye and slaves as well a majority of food items (grain, rice, sesame oil, ghee and cane sugar). The latter comprises items that were probably transported in pottery containers (or sacks), which taking into account the ceramic evidence in Southern Arabia could explain the large number of Indian cooking vessels and storage jars (see discussion below in section 4.3). Finally, the historical sources comprise a rich deposit of pottery sherds with written texts (found in the 1st cent AD dump at Berenike) that comprise several archives of customs duties and commodities mentioned such as wine, olive oil, vinegar, onions, beets, barley etc. (Cappers 2006: 6).

The seaborne voyage from Berenike to Africa, Arabia and India is described in detail in the Periplus, which indicates that the trade route with India became more

important from the 1st century onwards, although the Greeks were already acquainted with monsoon winds at the end of the second century BC (Cappers 2006: 15). It has been suggested that the gradual shift of a littoral trade route with northwest India as a destination to a transoceanic voyage to southwest India was determined by a change in interest in new commodities rather than by a discovery of the monsoon in stages (De Romanis 2005a: 88-89). India's west coast was the prime trading area, with as main ports Barbarikon and Barygaza, located in the north and Muziris and Nelkynda in the south (Casson 1989: 22). The PME lists the types of goods that can be sold and purchased in these ports: "In this port of trade (Barygaza) there is a market for wine, principally Italian but also Laodicean and Arabian; copper, tin and lead; coral… Roman money, gold and silver, which commands an exchange at some profit against the local currency… This area exports: nard; costus; bdellium; ivory; onyx; agate (?); lykion; cotton cloth of all kinds…longpepper and items brought here from the (nearby) ports of trade" (PME 49; Casson 1989: 81). A similar list of merchandise is listed as exported from Minnagar (Barbarikon) including costus; nard; bdellium; Chinese pelts; Indian black etc. (PME 39; Casson 1989: 75). In terms of the commodities exported from the southwest 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. They offer a market for: mainly a great amount of money… multi-coloured textiles; sulphide of antimony; coral; raw glass; copper, tin, lead; wine… grain in sufficient amount for those involved with shipping, because the (local) merchants do not use it. They export pepper… Gangetic nard; malabathron…" (PME 56; Casson 1989: 85).

The route to India therefore 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: "Very big ships sail to these emporia on account of the weight and the volume of the pepper and malabathron" (De Romanis 2012a: 75). Based on this historical statement, it was possible to determine two very important questions pertaining to transportation of Eastern trade commodities; firstly, the carrying capacity of the 'very large ships' mentioned in the Periplus and secondly, the relative proportions between the two

principal items of trade carried by these two ships: pepper (which is dense and heavy) and malabathron (whose leaves tend to be bulky but light). According to de Romanis (2012a: 77), some fresh data could be gathered from a closer examination of the 'Muziris papyrus'. Unfortunately, because of the fragmentary status of the papyrus, the data for only three cargo items are easily legible. All three are of either certain Indian origin (i.e., Gangetic nard) or likely Indian origin (i.e., 'sound' ivory and schidai). There can be very little doubt that at least part of the remaining unidentified cargo on the *Hermapollon* (name of the shipping vessel) included black pepper and malabathron - a conclusion further supported by the assertion in the Periplus that these ships were 'very big' in order to transport these two trade items. For each of these items, the value was calculated by multiplying either the number of containers (for the Gangetic nard) or their recalculated weights (for the 'sound' ivory and the schidai) by their price per unit (4,500 drachmas per container of Gangetic nard, 100 drachmas per mina of 'sound' ivory, 70 drachmas per mina of schidai). Theoretically, black pepper could be measured either by some container unit (such as sacks) or by actual weight. Based on these calculations and from information pertaining to the value of the individual items as listed in the Muziris papyrus, De Romanis (2012a: 75-101) has calculated the total cargo value in price and quantity (20,500 talents of 95 Roman pounds each correspond to more than 625 tons, 544 of which (87%) was pepper and 80 containers of Gangetic nard), giving an idea of the scale of trade items in Rome's Eastern trade.

3.2 Archaeobotanical remains from Berenike and Quseir: the evidence of 'India trade'

The botanical remains from the two important Roman sites on the Red Sea coast of Egypt Quseir al-Qadim and Berenike shed light on two types of commodities from the East: a) Spices which were traded through the ports and b) which crops from the East were introduced into the local agricultural production in Egypt (Cappers 2006; van der Veen 2011a). Exotic foods and other plant parts-usually combined under the heading 'spices'-formed a major constituent of the Eastern trade. While today we tend to identify spices with products of tropical plants possessing strong flavours and used as seasonings, in antiquity spices included not just condiments, but also

aromatics (perfumes), medicines (especially antidotes against poison), and incense. What is more, many of these products were used in ritual/religious contexts rather than in cuisine. Certain fragrant woods, oils and resins, as well as plants now usually referred to, as herbs were included within the term spices. Many, but not all, were of tropical origin; frankincense and myrrh came from Southern Arabia and Somalia, but black pepper, cinnamon and ginger did, of course, come from further east. The most common eastern (Indian) imports are pepper, rice, coconut and cardamon (van der Veen et al. 2011b: 1). Commodities also include the 'introduced' crops (as against 'imported') where many of these became incorporated into the local agricultural economies of northern Africa and the Middle East. Of particular interest is the introduction of the so-called 'summer crops' from the Indian subcontinent (e.g. rice, sorghum, cotton, sugar cane, aubergine etc.), which opened up an entirely new season of agricultural production primarily in the Islamic period in a region which prior to that had relied primarily on winter crops (during the wet season in North Africa and the Middle East) (van der Veen 2011a: 4).

The archaeobotanical assemblage from Quseir al-Qadim includes eleven plants that can be classed as imports from the East. Of these, four are today frequently used as food flavourings (black pepper, cardamom, ginger and turmeric), three are better known for their medicinal properties (black myrobalan, belleric myrobalan and fagara), one is a stimulant (betelnut), one an oil crop (coconut) and two are nowadays staple foods (rice and mung bean) (van der Veen 2011a: 40-60; van der Veen et al. 2011b: 1-3). In addition to this, cultivated plants such as sugar cane, cotton, tamarind etc. were originally introduced from India (Cappers 2006: 49-138):

1. Pepper - Three kinds of pepper are mentioned in historical sources dealing with ancient trade: black pepper (*Piper nigrum* L.), long pepper (Piper longum L.) and white pepper. The first two indicate two different pepper species with black pepper native to the Malabar region of southwest India (Kerala) and long pepper cultivated chiefly in the northern parts of India. White pepper is obtained by harvesting spikes with ripe, red-coloured fruits (Cappers 2006: 111). Black pepper is numerically the most common spice recovered at Quseir al-Qadim, with 71 peppercorns from Roman deposits from secure contexts dating to the early 1st century AD (van der Veen

2011a: 41). Black pepper was also a common find at Berenike (Early and Late Roman preiods), mostly in buildings associated with trade or religious ceremonies (Cappers 2006: 111-119). A unique find here is an Indian dolium (storage jar) full of peppercorns (c. 7.5 kg worth) (Fig. 217), recovered from a late 1st cent BC or early 1st cent AD courtyard in the Serapis temple (ibid 2006: 114-115). Peppercorns formed an important and profitable article of commerce in Rome's sea trade with India and special spice warehouses (horrea piperataria) were constructed and maintained in Rome. Pepper was used chiefly as a culinary spice and quickly became an essential part of the everyday life of respectable households in Rome (van der Veen 2011a: 2). On the other hand long pepper is the only food product mentioned in written sources that has not been found so far and was presumably not one of the staple articles of Rome's trade with India (Cappers 2006: 117).

2. Cardamom - This species (*Ellettaria cardamomum*) is a dried fruit that is thought to originate in India and consists of a valved capsule (brown, green or white) with numerous highly aromatic dark brown seeds added to sweet and savoury dishes and in the Middle East to coffee. Medicinally it has carminative, aromatic and stimulant properties (van der Veen 2011a: 54). While the Romans were familiar with this spice, it has so far been found exclusively in the Islamic deposits (van der Veen et al. 2011b: 3). At Quseir, the fragments of 11 fruits and one seed have been found, all from the main Islamic deposits between AD 1050-1160. It is listed as *Antomum* in the Alexandrian Tariff and is thought to have been imported in small quantities possibly under the general name of spices or as 'miscellaneous cargo'. The Romans used it in perfumes, but rarely in cuisine. In contrast, in the Islamic period, it occurs as a regular item in the Geniza documents and traded in quantities of a hundred pounds or more and used in many of the recipes in Arabic cookbooks (ibid 2011a: 54-55). There is only one Indian record of cardamom, from the recent excavations of early historic Pattanam (300 BC - AD 500) based on identification by Mukund Kajale (pers. comm. quoted by van Der Veen 2011a: 55).

3. Myrobalans - Black and belleric myrobalans (*Terminalia chebula* Retz. and *Terminalia bellirica* Gaertn.) are found throughout India and have small, plum-sized fruits. Together and combined with *Phyllanthis emblica* (Indian gooseberry),

myrobalans are widely employed in Ayurvedic medicine. The dried fruits and bark are also used for tanning while seeds of belleric myrobalan are utilised for production of hair oil and soap (van der Veen 2011a: 50). The remains of belleric myrobalan at Quseir all consist of fruit stones: one Roman and four Islamic speciments and remains of black myrobalans (12 specimens in total) consist of complete, dried fruits and stones, eleven of which were found in the main Islamic deposits. Four records of belleric myrobalans were also found in the Indian context (Mukund Kajale pers. comm. quoted by ibid 2011a). Some classical writers mention *myrobalanum*, which may refer to either one of the *Terminalia* species. Myrobalans are also listed in the travelogue by Ibn al-Mujawir (early 13th cent AD) as one of the imports from India into Aden that was exempt from customs duties (ibid: 52).

4. Coconut - The coconut (*cocos nucifera* L.) is a palm value for both the fruit and seed it produces. The origin of the coconut is uncertain and is possibly from Southeast Asia and Melanesia whereas India is considered as a possible secondly source - either brought by people or transported by marine currents (coconuts are buoyant), but it arrived in India in prehistoric times (Cappers 2006: 74; van der Veen 2011a: 48). Coconut is moderately common in the archaeological deposits at Quseir al-Qadim with 27 fragments in the Roman period (ibid 2011: 49). At Berenike similar shell fragments and a few fibrous husks are derived from both the Early and Late Roman deposits (Cappers 2006: 78-79). Coconuts are not mentioned in the Periplus although the word *naupolis* is corrected by Schoff to mean *nargilos*, which in turn is related to the Sanskrit *narikela* or *narikera* and the Prakrit *nargil* meaning coconut (ibid 2006: 77). As far as the Indian subcontinent is concerned, it is very likely that the coconuts from Berenike would have been imported from ports along Malabar coast (ibid 2006: 79). It would appear that the Romans did not use coconut in their cooking and that fragments of the fruits found in Quseir may represent remnants of what was consumed on the journey back from India, rather than intentional imports (van der Veen 2011a: 49). Others uses of the coconut could have been in the production of coir made into rigging and cordage for ships and it is also used for caulking. Coconut oil was regularly used for oiling ropes used for sewing together planks of ships as it has the advantage of not rotting in saltwater (Ray 1995 quoted by Cappers 2006: 73).

5. Rice - Rice or *Oryza sativa* L. is a grain crop thought to have been cultivated in India since 2500 BC. At Quseir al-Qadim rice is surprisingly rare: only 22 specimens have been found in Roman deposits (Van der Veen 2011a: 47). However it is clear that by the Islamic period rice was probably grown in Egypt where 10th century textual evidence indicates that rice was grown in the oases, in Upper Egypt, and especially in the Fayyum (ibid 2011a: 80). At Berenike, similarly low quantities of rice were recovered from Early and Late Roman deposits makes it very likely that atleast for this cereal indirect trade with India did exist where rice could be obtained from harbours along the northern coast of Somalia and from the island of Socotra (Cappers 2006: 104-105). Rice is listed as a commodity in the first century AD Periplus, but not in the second century Alexandrian Tariff. Rice was not a common part of Roman cuisine and apparently, only occasionally used as a starch to thicken sauces and for medicinal use (Van der Veen 2011a: 47-48). Conversely perhaps the import of rice to Berenike indicates the presence of Indians or other South Asian residents who consumed it (Cappers 2006: 105).

6. Mung bean - Mung bean or green gram (*Vigna radiata* L) are grown mainly for their dried pulses. Mung bean was probably first domesticated in India as early as the 2nd millennium BC (Fuller et al. 2004 quoted by Van der Veen 2011a: 49). The beans are eaten boiled to a pulp flavoured with spices (dhal), as germinated sprouts and dried beans are made into flour used in bread. Only three specimens were found at Quseir al-Qadim, two from Roman deposits (ibid 2011a). However almost 70 mung beans have been unearthed from several loci in two trenches from Berenike. They were traded as whole seeds. Subfossil mung beans from India that coincide with the Roman trade have been recorded from Narhan (Uttar Pradesh), Taradih (Bihar) and Nevasa (Maharashtra) suggesting the import of mung from Barygaza. However if the prehistorical finds of the mung bean from Karnataka (Hallur and Sangakallu) are taken into account, this means that imports from more-southerly ports of Muziris and Nelkynda must come into consideration (Cappers 2006: 133).

The above-mentioned commodities represent only some of the botanical commodities that were imported or introduced from the Indian subcontinent. However the transport of these items over large distances obtained from Indian

harbours would require utilisation of proper storage and preservation techniques. As Cappers (2006: 147) states that "the storage life of products that reached Berenike either as commodities, provisions for ships, or food products meant for their inhabitants, must have been given special attention as most were imported over long distances and were exposed to high temperatures." Rice from India is well known for its good preservation conditions while wheat although susceptible to insect damage was easily obtained from the Nile valley, a short trip as such. Similarly pulses consumed or transshiped in Berenike would have been more problematic and one technique for their preservation included a method for treating lentils mentioned in Cato's (c. AD 4 - AD 70) De Re Rustica (116) where lentils are first soaked in silphium vinegar and then exposed to the sun, rubbed with oil and finally dried. Conversely, spices and condiments can be kept as long as they contain flavourings for example black pepper (*Piper nigrum*) are stored in a dry environment, they may be kept for many years without losing their quality, which could be the reason while the traders of Berenike chose to leave behind a large supply of pepper stored in a buried dolium (quoted by Cappers 2006: 148).

3.3 Culinary change and ceramic functionality: Indian pottery from Arabia

Given the lack of an extensive archaeobotanical 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).

In the Early Bronze Age, ceramics and patterns of exchange between south-eastern Arabia and the Indian subcontinent began in the second half of the 3rd millennium BC, around 2500 BC and can be traced until the fall of the Harappan Civilization around 2000 BC (Méry 1996: 167). Black-slipped jars (Fig. 218) which were specifically manufactured in the Indus Valley are the most frequent type of Indus (Harappan) pottery recovered in the UAE and Sultanate of Oman, both at coastal sites and in the interior. The jars and their contents were first intended for the internal Indus market and were certainly made to order, to meet the requirements of transport

and trade of their contents (Méry 2007: 199-200). According to Mery (Méry 1996: 170-171), there is no clue as to the contents, nor is it known where these jars were designed to transport a single kind of merchandise. But due to their wide distribution in southeastern Arabia and Oman, it is possible that these jars were re-used for circulating local goods, or they were the only available containers sufficiently tight to enable the circulation of an (unknown) merchandise; in this perspective, the jars became a 'symbol of quality'. Pickled vegetables or fruit, clarified butter, wine, honey, or even indigo - a tentative list of such Indus products which could have been transported has been proposed by J.M Kenoyer, which contrasts with P. Gouin's suggestion of a specialised trade in dairy produce (Méry 2007: 201). These vessels characterised by a dense paste and a waterproof slip, could have most probably been used to transport water/liquid-based commodities. Other Indus pottery types included those strictly associated with settlements: very large storage jars, pedestalled dishes, perforated vases, dishes and round-bottomed pots with a ridge at the juncture of neck and upper body (Fig. 218). Pedestalled dishes were sometimes copied (locally produced) at Hili (Al Ain, UAE) for instance (Méry 1996: 171). A few other Harappan types are most exclusively associated with funerary contexts of the last centuries of the 3rd millennium BC: small painted bottles and various miniature pots with complex naturalistic and/or geometric black found at Hili North Tomb A and funerary pit-grave of Hili N (Fig. 218) (Méry 2007: 201). According to mineral and chemical analyses, these vessels were not copies made by Umm an-Nar potters, as copied foreign wares deposited in graves are quite rare and indicates the high value given to such imported products in Arabian peninsula in the late Umm-an-Nar period (Méry & Cleuziou 2002: 298). Finally, in his functional interpretation of Harappan pottery in relation to dairy products and according to ethnographical analogies, P. Gouin suggests that perforated vessels are cheese-drainers, and pedestalled dishes graters used for the consumption of dry cheese (ibid 2002). Numerous functional interpretations have also been offered for perforated bowls/vessels in the Indian context: incense braziers, steam coking, colanders, or for the preparation of a 'macaroni-like' dish of 'milk-tubes', actually a sorghum flour paste boiled in milk (Fuller 2005: 768).

Chapter 8

The Late Pre-Islamic/Early Roman period (incorporating the Sasanian period) represents the next phase of exchange between India and Arabia, demonstrated by the quantities of coarse and fine ware pottery from the subcontinent in the various sites of the eastern Arabian seaboard. The presence of coarse utilitarian and fine tableware in varied contexts (including cooking, storage as well as transportation/trade etc.) also signifies drastic changes in the usage and functionality of ceramic forms from the preceding period. For example, evidence suggests that the Indus-produced black slipped vessels were the main containers for transportation of liquids/soft solids during the Bronze Age. This was followed by a shift in the Early Roman period to Mesopotamian torpedo jars and amphorae of Roman, Egyptian, South Arabian and African origin. The torpedo jar is well-known throughout Mesopotamia and the Gulf and many sites in India (Junnar, Nevasa, Bet Dwarka, Alagankulam etc.) and occurs in the assemblages of the late Parthian (c. AD 0-224) or early Sasanian (AD 224-379) (Kennet 2004: 63) and are characterised by a bead-rim, a neckless and cylindrical shape and a tall, hollow base with small diameter and a complete lack of handles that distinguishes them from their Roman counterpart (Tomber 2007: 974). In terms of their contents, the internal coating (presumed to be bitumen available in Mesopotamia) indicates that the vessel walls were sealed for the storage of a liquid. In the Roman world sealants are consistently associated with vessels used for the transportation of wine (ibid 2007: 976). Similarly amphorae were widely traded during the Roman period, and used primarily to carry wine, oil and garum (fish sauce produced from salt and decomposed fish), all of which were mainstays in the Roman way of life. In terms of the Indian palate, it appears that Indians had a taste for wines based on the presence of Koan and Koan imitation amphorae (Campanian Dressel 2-4s) from sites like Arikamedu (Tomber 2009: 47). Amphorae for *garum* and oil are much less common than for wine, and as yet Arikamedu is the only site from which the entire range has been recovered for the early Roman period (Will 1996 quoted by Tomber 2009: 48). With reference to amphorae found in the Arabian contexts, local (South Arabian) productions were recently identified at both Qana and Khor Rori (Alexia Pavan pers. comm.)

Returning to the aspect of culinary preferences in the Arabian Gulf during the Late Pre-Islamic period, the question put forth here is in determining the imported

botanical commodities and those that were introduced into the local agricultural production. In terms of cultivated plants, preliminary study of the archaeobotanical remains from Mleiha was possible by the exceptional preservation, by carbonization, of numerous organic items most of which are rarely found on archaeological sites, by the fire at the site that destroyed Building H (Mouton et al. 2012: 213). In several rooms and in the courtyard, the concentrations of carbonized grain most probably resulted from the storage of food, in bags or baskets. Large quantities of hulled barley (*Hordeum vulgare*) and free-threshing wheat of the bread wheat type (*Triticum aestivum*) were recovered. Besides cereals, pulses seem to have played an important role in the diet with the presence of broad beans (*Viciafaba*), lentils (*Lens culinaris*), and grass peas (*Lathyrussativus*). Additionally fruit and nut remains were discovered in several parts of the building. The fleshy part (pericarp) of grapes (*Vitisvinifera*) and pomegranates (*Punicagranatum*) had been preserved by charring, indicating that these fruits were stored in a fresh state. Dates, also identified from several contexts, may have been stored fresh as well, or in a more or less dry state. The above-mentioned cereals, pulses and fruit species are likely to have been cultivated locally in the al-Madam plain (ibid 2012: 214).

It is evident that food items from India (grain, rice, ghee, sesame oil etc.) also formed an important part of the imports into the eastern Arabian seaboard as indicated in the Periplus. 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 collection rice from these ports (van der Veen 2011a: 47). The import of rice (to Socotra and probably further into South Arabia) 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. A similar inference was made by Casson (1989: 25) with regard to the Periplus' mention of import of grain (presumably wheat) into Muziris and Nelkynda (PME 56; ibid 1989: 85) as evidence for the presence of westerners at these ports who preferred to eat wheat, in contrast to local merchants who would eat rice. Interestingly, the archaeobotanical evidence from Mleiha includes free-threshing wheat (*Triticum aestivum*) recovered from the

site, indicating that this grain was being cultivated and consumed by the local population in Arabia during the Early Roman period. Additionally rice is well known for its good preservation conditions and could be easily transported or transshipped over long distances. Whether the local population in Arabia consumed rice is still questionable, although it is clear that by the Islamic period it was being cultivated locally in Egypt and was a well inducted into the Arab cuisine. 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. However if we take into account that these commodities were meant for the Indian traders at these sites, then it quite likely that these items were consumed relatively quickly, even probably while on board the ships, and not necessarily stored for long periods.

Distinct forms of Indian pottery vessels entered the archaeological record of the Arabia in the Late Pre-Islamic and well into the Islamic 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 that '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'. As the quantitative analysis in Chapter 5 has shown, cooking vessels occur in the Indian pottery assemblage in all of the Arabian sites included in this study: including Mleiha (handi = 20.8%; cooking pots = 12%), Ed-Dur (handi = 15.8%; cooking pots: 7.5%), Kush (handi = 22.2%; cooking pots: 29.6%) and Suhar (cooking pots = 16.4%). It is 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* (Cappers 2006: 105). Additionally, both these varieties of Indian cooking vessels along with the short-neck globular vessel category could also have served as storage containers owing to the easy grip afforded by the incurved rim while carrying/transporting as well as that these vessels could be stacked one on top of the other. Large Indian

storage jars recorded mainly from Mleiha (= 16.8%) probably served as transportation containers especially suitable for the inland camel caravan route, as similar vessel forms have been recorded from sites in South Arabia like Khor Rori and Qana. Also at Mleiha, the Indian ceramic evidence indicates large cooking pots, not recorded from any other site in the Arabian Gulf (with the exception Khor Rori in Oman) suggesting perhaps community cooking at the site as well as the availability of rich agricultural produce from the surrounding area. One example of the large Indian cooking pot from Mleiha presents evidence of residual remains on the inside of the vessel base as well as burning resulting from constant use over the fire (Fig. 219). Residual analysis of such vessel remains could help to understand the culinary diet of the residents at Mleiha.

Amongst the new liquid vessels, are present the high-neck globular vessels (majority recorded from Ed-Dur = 23.3%) and funnel-mouthed flasks from Mleiha. The high-neck vessels could also have been used to store grain and other produce, but they strongly resemble the later Islamic period Indian water jars from the site of Manda (East Africa). Moreover water was probably an important commodity especially along the coastal settlements and these earthenware containers also cooled the water by evaporation. This expanded range of jar forms suggests that there may have been a range of new liquid-related functions added to the culinary repertoire. Other new beverages might also be considered, such as fermented grain drinks – made all the more likely given the directional correlation with the selective uptake of wheat and barley at Mleiha (see Fuller 2005: 769 for example from India). Indian tableware (bowls, plates and dishes) comprises an important Indian vessel category at both Mleiha and Ed-Dur, although at Ed-Dur, bowls are predominant (=20.8%) and plates/dishes (=10.4%) at Mleiha. The percentage of large-sized bowls and dishes at these sites probably reflects the custom of communal meals, corroborated by evidence especially from Ed-Dur of rectangular platforms made of stone which could have served as a table or dining place, adjacent to circular cooking ovens. Moreover the carinated and other shallow or flat plates (resembling Indian *thalis*) could indicate that flat bread (derived from the bread wheat type of grain *Triticum aestivum*) could have formed part of the diet of the Indian population at Mleiha, suggesting culinary emulation of locally produced crops.

Finally, an explanation for the large numbers of Indian storage jars at Khor Rori was suggested by Gupta (2007: 114-121) as the 'aromatics for food' trade with reference to the site of Khor Rorihighlighting the contents of these vessels. Gupta proposed "it may have made sense for Roman shippers returning to Egypt from India to take advantage of the Indian food supply lines to the Gulf of Aden region. Liquid stock like sesame oil and perishables like grain/wheat/rice brought from western Indian to Khor Rori and Qana must have generated a high demand for container wares… The strategy for making cheap Indian essentials pay for frankincense supplies to lucrative markets in the Mediterranean must have seemed a ready and worthwhile solution " (ibid 2007: 116-119). This is but one example for a possible reason behind the large quantity of Indian vessels in Arabia. The circulation and supply of Indian vessels across the eastern seaboard of the Arabian Peninsula will be discussed in detail in section 5 of this chapter concerning Indo-Arab trade routes in the Indian Ocean.

4. Evidence of sailing vessels in the Indian Ocean from the Red Sea, Arabian Peninsula and India

4.1 Introduction

Much information has already been presented in this thesis concerning the context of Indo-Roman and Indo-Arab trade through the evidence of ceramics. The predominantly coastal distribution of sites implies that pottery was transported by sea from India to the various sites in the Red Sea and Arabia and vice-versa. As Blue (2009: 3) points out, the evidence for the vessels of transportation of this trade - the boats - is not so forthcoming. General assumptions have been made about the nature of vessels that were conducting trade in the Red Sea and Indian Ocean region that are assumed to have been similar in type, shape and building tradition to Mediterranean Roman merchant vessels, although not a single ship have been excavated to provide direct evidence for the types of vessels of this period and in general for all periods (across the Indian Ocean) (ibid 2009: 5). Consequently, evidence is gathered mostly from iconographic representations of sailing vessels as well as archaeological evidence of maritime artifacts, the latter particularly from the Red Sea context. This

section of Chapter 8 focuses on the collation of archaeological and iconographic data of sailing vessels in the Indian Ocean region from the Neolithic/Bronze age period onwards, with special emphasis on evidence from the Arabia and India in the Late Pre-Islamic/Early Historic period.

4.2 Depictions of sailing ships from Neolithic to Bronze Age

The system of maritime exchange in the Arabian Neolithic is evidenced by boat remains and representations of boats from archaeological excavations of site H3, As-Sabiyah (Kuwait) during the 6th/5th millennium BC, the earliest remains anywhere of sea-going boats (Carter 2006: 52). Boat-related finds consist of a 15 cm ceramic model of a reed-bundle boat in a coarse red ware associated with the central gulf (Fig. 220: 1); a painted disc (7 cm in diam.) depicting a sailing boat with bipod masts (Fig. 220: 2) and over 50 pieces of bituminous amalgam, mostly with reed-impressions and/or barnacle encrustations, which are interpreted as fragments of the waterproof coating of sea-going reed-bundle boats (Fig. 220: 3) (ibid 2006: 53-55). These finds from Kuwait can be dated to the Ubaid period (c.6000-4300 BC) in Mesopotamia which provides the first direct evidence for watercraft in the form of boat models, painted depictions and boat remains. Later Ubaid-period boat models that are similar to the As-Sabiyah finds are known from various sites in Mesopotamia (Eridu, Uruk, Tell Uqair, Al-Ubaid etc.) from Ubaid 3 to terminal Ubaid (Carter 2012b: 348-349). Following this, the re-occurrence of Mesopotamian boats abroad comes from the long distance maritime trade involving Dilmun, Magan and Meluhha in the Bronze age based on archaeological evidence of 300 bitumen slabs and lumps recovered from site RJ-2 at Ra's al-Junayz in eastern Oman scattered throughout the whole sequence of Period II in the second half of the third millennium BC. Some of these bitumen remains have impressions of reed bundles and possibly wooden planks lashed together by ropes that suggest composite boasts with reed hulls were common visitors to the ports of the region (Cleuziou & Tosi 1994). A small number of other similar reed-impressed bitumen slabs have been found in other port sites of the Arabian Gulf including Umm an-Nar (Abu Dhabi), Qalat al-Bahrain and Failaka Island (Kuwait) (Carter 2012b: 367). Glyptic evidence of Dilmun seals from Bahrain and Failaka, on the other hand, shows distinctive

design of boats absent from the Mesopotamian evidence (Fig. 221: 1). Several vessel types can be seen on these seals including boats with S-shaped ends (masted vessels) (Fig. 221: 2). This variety is wooden and masted and it is likely that these boats developed as Dilmun rose to prominence at the mid-end of the 3rd millennium when the wood needed for these vessels was sourced from the Harappan world in northwestern India (Carter 2012b: 368-369; Fig. 19.9). Finally, the bitumen evidence from Ra's al-Junayz provided new information on procedures for reed and wooden boat construction of the third millennium BC that led to the experimental reconstruction of a prototype reed boat. The Magan boat project focused on study and interpretation of the bitumen, development of a computer model construction of scale models and finally of the life-size prototype, constructed near Ravenna, Italy (Vosmer 2000, 2001) (Fig. 221: 3).

The earliest evidence from the Red Sea consists of innumerable prehistoric and predynastic petroglyphs of shops engraved on the rocks of the eastern desert of Egypt, between the Nile valley in the west, the Red Sea Hills in the east and between Qift and Quseir (through Wadi Hammamat) in the north (Hornell 1941: 234; Lankester 2012: 67). The area surveyed comprised 15 valleys (*wadis*) constituting 222 sites with a considerable number of boat motifs present at 75% of the sites. The boat corpus is reduced to 782 identifiable motifs (ibid 2012: 68-69). The boat petroglyphs were divided into five types: sickle, incurved sickle, square and incurved square in addition to a 'flared' category (Winkler 1938 quoted by Lankester 2012: 69; Fig. 5.2) (Fig. 222: 1) as well as boats with a central mast with a total of 39 examples. Hornell (1941: 237; Fig. 1) recorded a series of foreign boat petroglyphs from the Eastern Desert, which were likely to have arrived from the Arabian coast (Fig. 222: 2). The dating of the boat petroglyphs is still hotly debated but they most likely belong to the predynastic era (5000-3100 BC) as well as the Pharaonic period (Lankester 2012: 70-74). A regional survey of the immediate hinterland surrounding the site of Qusier al-Qadim/Myos Hormos revealed a large number of rock engravings recorded towards the western end of Wad iQuseir al-Qadim (Peacock 2006 quoted by Blue et al. 2011: 199) where six carvings of ships or boats were also discovered and recorded (ibid 2011: 199-202; Figs. 15.16-15.19). Out of these, four sailing vessels display basic features that might be expected of an Egyptian

watercraft from the Pharaonic period (Vessels One to Four) (Fig. 222: 3-6).

Depictions of boats in the Indian sub-continent have survived in the iconographic record from as early as Mesolithic rock art (Neumayer 1993 quoted by Tripathi 2006: 25). The earliest evidence however of the use of sails and maritime trade is datable to the Harappan period/Bronze age in India. Ship representations found on a Harappan seal, terracotta tablet and a graffito on a potsherd from Mohenjodaro, a terracotta boat model from Lothal and a seal from Kachchh are some of the direct evidence of their shipping and shipbuilding activities (ibid 2006: 26). The graffito from Mohenjodara represents the first sailing ship, suitable for river traffic and sea voyages with upturned prow and high mast with yard as well as the figure of a steersman (Fig. 223: 1). Another boat is depicted on a rectangular steatite sea from Mohenjodaro of a ship with a cabin and two masts, which suggests it was a sea-going ship (Fig. 223: 2). According to Tripathi (2006: 26; Fig. 4), the best representation of a Harrapan ship known so far is on a terracotta amulet of a boat with a flat bottom, raked stern and prow and two steering oars at the stern. In the middle of the boat is a cabin and at both ends of the ship a sea bird is depicted (Fig. 223: 3). In addition to a terracotta boat model (Fig. 223: 4), a painting on a potsherd found at Lothal was identified as three types of ships two of which had sails (Rao 1965: 35-36) (Figs. 223: 5). The Harappan ship representations were nearly always crude and sketchy and therefore it is difficult to make out the various parts of the ship. The presence of steering oars led most scholars to identify them as rowing boats used in near-shore waters and rivers as well as made of reed bundles. Detailed studies also indicate evidence of wooden ships for regular maritime trade with Magan and Dilmun (Tripathi 2006: 27).

4.3 Red Sea watercrafts from Roman Egypt

4.3.1 Ship graffito from Berenike and maritime rock art from Wadi Quseir al-Qadim

Following the possible Pre-Dynastic and Pharaonic rock art depictions in the Eastern Desert, particularly at Wadi Hammamat and Wadi Quseir al-Qadim, the

iconographic evidence from the Red Sea of sailing vessels of Roman - Post Medieval periods are represented by Vessels Five and Six from Wadi Quseir al-Qadim (Blue et al. 2011: 203-204; Figs. 15.20-15.21). Vessel Five (Fig. 224: 1) represents a type of ship not specifically associated with Egypt. The carving shows a sailing ship with two masts, both of which appear to be carrying triangular sails. This probably represents a ship with a lateen/settee sailing rig, which has a distinctive triangular shape, rather than the square-sail rig of earlier periods. The lateen/settee rig was probably invented in the Mediterranean, where it began to come to prominence from the 5th century AD and began to be used in the Red Sea and Indian Ocean at some time between the 5th century AD and the 10th century AD when Arab literary sources indicate the use of a lateen/settee rig (Whitewright 2009: 491-492). Given the abandonment of the site of Myos Hormos from the 3rd century AD and its reuse during the medieval Islamic period, it is this later period that provides the most likely date for the carving of Vessel Five. Vessel Six shows a three-masted ship towing a smaller vessel astern (Fig. 224: 2). Three-masted vessels are unknown in the Pharaonic period iconographic record and were not used in the Mediterranean until the mid-3rd century BC. Vessel Six certainly post-dates the 3rd century BC and is probably not a representation of a type of vessel indigenous to the Indian Ocean and Red Sea region. The depiction of such a vessel must thereforedate to the post-medieval period and might be associated with the often destructive visits of European warships to the region in this period (Blue et al. 2011: 204-205)

Iconographic evidence securely dated to the Roman period is a single graffito from a 1st century AD context in Berenike (Sidebotham 1996: 315 quoted by Blue 2009: 5) (Fig. 224: 3) with an inscription of a ship on two sherds. This was found in a rubbish deposit during the 1995 season of excavation at the Roman port of Berenike on the Egyptian Red Sea coast. Its principle significance is that it is one of the few clear iconographic depictions from the wider Indian Ocean region from a Roman context. Unlike many other depictions of vessels from the Eastern Desert, the deposit was securely dateable. Unfortunately the type of ceramic is not identified so it is unclear if the sherd is Indian Ocean or Mediterranean in origin. In any case the graffito could have been added at any point and place between the firing of the pot and its deposition at Berenike. The vessel has a main mast and it has been suggested that an

artemon was also present, but that the majority of it has been broken off. This may provide an explanation for the diagonal lines visible in the bow of the vessel. The horizontal inclination of the yard, the presence of braces at either end of it and the use of lifts to support it mean that the vessel was rigged with a square sail. None of these features would be expected to be present on a lateen or spritsail. The side of the vessel, just below the gunwale is pierced with eight or nine holes, which may be oar ports or crossbeams (Sidebotham 1996 quoted by Whitewright 2008: 267).

4.3.2 Archaeological evidence of maritime remains

With regard to the archaeological evidence, excellent organic preservation in the Red Sea region has permitted the recovery of maritime finds to supplement the meager historical accounts and iconographic data (Blue et al. 2011: 179). The list of maritime finds recorded by Whitcomb and Johnson (1979) from the port site of Quseir al-Qadim (Myos Hormos) including metal nails, fishing hooks, sail maker awls and needles indicating ship building activities has been substantially supplemented by the Southampton excavations between 1999-2003 (Peacock & Blue ed. 2011a), through the recovery of maritime finds including hull planking, wooden and horn brail rings, sail fragments, a deadeye etc.

4.3.2.1 Roman hull remains

Hull remains, although extremely rare finds in the Red Sea, have been recovered from this region and provide limited detailed accounts of vessel construction. The evidence is represented by two pieces (one fragmentary and the other relatively complete) of wooden planking excavated during the 2002 season (Fig. 225: 1). The dimensions and shapes of the planks have been altered due to reuse and degradation and both display mortise and tenon joints with a number of pegs (tree nails) that would have secured the tenons. The remains of mortise and tenon along the plank edges are typical of the shell-first tradition of shipbuilding that was common in the Mediterranean until the late antiquity. The remains of planking from Myos Hormos and comparable reused planks from Berenike may indicate that at least some of the shipping engaged in the trade between the Red Sea and the wider Indian Ocean was constructed according to the Mediterranean shipbuilding tradition of the time (Blue et al. 2011: 179-180).

4.3.2.2 Rigging components: evidence of brail rings, sailcloth, deadeye, ringing block sheaves, wooden toggles

Recent excavations and research have also greatly increased the physical record of ships rigging (Blue et al. 2011; Whitewright 2007). The Mediterranean square-sail rig of the Roman Imperial period was a sophisticated and highly developed sailing rig. By the first century AD, the Mediterranean square-rig consisted of all the component parts required to sail on all points of sailing. The system used for shortening sail, known as brails, allowed ancient mariners to reduce the size of their sail at a moment's notice. Brails also allowed sailors to change the overall shape of the sail depending on the course being sailed and in doing so to sail a vessel in the most efficient manner for a given course (Whitewright 2007: 83-84) Over 160 brail rings, both wooden and horn (Fig. 225: 2-3), have been recorded from late 1st and early 2nd century contexts. Brail rings were attached to square sails and served as a guide to ropes that ran up the face of the sail in order to facilitate the furling of the sail. All the complete examples of brail rings that have been recovered have one, and in some cases two, pairs of small holes pierced through their edges for the purpose of attaching them to the sail (Blue 2009: 6).

One brail ring discovered in 2003 was able to provide further clues as to the nature of the rig, as uniquely it had a piece of cotton sail cloth still attached (Blue 2009: 7) (Fig. 225: 4). Sewn to the sailcloth was a reinforcement strip of heavier material and it was to this that the ring was attached. It was possible to clearly distinguish this from other textiles because of the remains of a wooden brail ring was still attached. The small fragment of sail is dated to the late 1st - early 2nd century AD (Blue et al. 2011: 191). The earliest evidence for sails in the Mediterranean dates to c. 3100 BC and indicates that vessels were rigged with a square-sail. From this point until the late-antique period the square-sail remained the principal sailing rig of the Mediterranean (Whitewright 2008).

Besides the brail rigs, another component, the deadeye was excavated in the 2001 season dated to the mid-late 2nd century AD from Quseir al-Qadim comprising an oval shaped piece of Blackwood (214mm long, 144mm wide, 55 mm thick) pierced

by three holes set alongside one another in the centre of the block (Fig. 225: 5). Deadeyes are usually rigged in pairs, providing lateral and longitudinal support to the mast (Lucy et al. 2011: 189).

Seven rigging block sheaves (flat circular discs of wood 46 mm-81 mm diam.) dating to the latter half of the 2nd century AD were recovered from the 2001-2002 excavations at Quseir al Qadim (Blue et al. 2011: 190) (Fig. 225: 6). A sheave is the moving part of a pulley block and they are generally round in section. By rotating as rope is pulled through the block, they serve to reduce the friction on the rope and the amount of effort required to move the rope (ibid 2011).

Although not definitively maritime in function, toggles are a well-documented part of the Mediterranean sailing rig. Their function is usually to secure the end of one rope to a soft eye in another length of rope. A single wooden toggle (73 mm in length) (Fig. 225: 7) was excavated from a Roman deposit at Quseir dating to the late 2nd- early 3rd century AD (Lucy et al. 2011: 191)

The maritime finds from Quseir al-Qadim/Myos Hormos add to our knowledge of rigging and sails in the ancient world and especially in the Red Sea-Indian Ocean region. It seems very likely that both Roman and Indian Ocean sailing vessels were present at Myos Hormos. It is possible that the rigging components constructed from Indian materials may have originated on board Indian ships. Although circumstantial, the archaeological evidence may represent the first appearance of indigenous ancient Indian Ocean shipping in the region (Lucy et al. 2011: 197). While most of the maritime artefacts were made of non-native tree species, it is very difficult to be certain about the origin of the wood. Most of the brail rings and some of the sheaves were made of *Dalbergia* sp. (*Fabaceae – Faboideae*; also placed in *Papilionaceae*). This genus comprises species native to both tropical Africa and India. The only two items that give a definite connection with India are the pulley [W471 fromTr. 8A (8319)] and one of the sheaves [W454 from Tr. 8A(8193)]. Both are made of teak wood, *Tectonagrandis* (*Lamiaceae*; also placed in *Verbenaceae*). This tree is native to the Indian subcontinent. An additional possible link with India is one brail ring [W361 from Tr. 6H (4085)] provisionally identified as cf. Wrightia sp. (Apocynaceae) (Gale and Van der Veen 2011: 1-2).

4.4 Representations of sailings vessels from the eastern Arabian seaboard in the late Pre-Islamic period

Subsequent to the direct evidence of shipping vessels (boat models and painted disc of Ubaid /Neolithic period from site H3 Sabiyah) and maritime remains (bituminous samples from H3 Sabiyah and Ra's al-Junayz in the Bronze age) from the coastal sites of the Arabian Gulf, iconographic evidence of watercrafts is well-attested from drawings of ships from the Southern Arabian coast principally the Dhofar region of Oman. 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 (Fig. 226: 1), engaged in what appears to be whaling (Avanzini 2007: 27; Fig. 4). The depiction is similar to that of two-masted ships found stamped on coins minted by the Satavahana/Andhra dynasty sometime between the 2nd/1st century BC and the 2nd century AD. This graffito may well represent one of the vessels engaged in the India-Red Sea trade, but neither its size, methods nor the materials used in its construction can be determined. Although Khor Rori was founded in the 3rd century BC, the graffito likely dates from the period during the zenith of activity at the site i.e. from the 1st century AD - 3rd century AD (Sidebotham 2011: 203).

In addition to this single representation from Khor Rori, a number of the Dhofar hill sites depict ships. Nearly all are sailing ships, several of which could be sewn boats (Fig. 226: 2b). Their date is problematic but they could in part date to the Early Iron Age B (IAB) period i.e. 300 BC - 600 AD, based on the chronology proposed by Juris Zarins (Al-Shahri 1994: 185-192 quoted by Zarins 2001: 134; Fig. 64). Beginning in 1998, through a systematic survey of nearly all the caves in Dhofar located in the mountainous areas and those on the seaward overlooking the coast, Ali Al-Shahri recorded numerous painted inscriptions including depictions of ships (Al Shahri 1991: 175-183; Pl. VIa). These were comprised of different types of watercraft, some of a design no longer seen today and others that look quite modern (Fig. 226: 2a). All the ships are drawn in black pigment, but no inscriptions have been recorded alongside. Many seem to have a flag or pennant flying. There are single and double masted vessels and, and a few with sails. The boats come in all sizes and a number of different types of construction. Sometimes a row of small circles is shown along the side of the ship, as what appears to be oars. The ropes

leading from the mast to the deck are often clearly shown (ibid 1991: 183).

The Brahmi inscriptions from Hoq cave on the island of Socotra (Yemen) has already been discussed in this chapter (section 1.4) as compelling evidence pointing towards the presence of Indian sailors/traders in Arabia from the end of the 2nd - 4th century AD (Strauch & Bukharin 2004). The close relationship of the Indian visitors of the Hoq caves with the northern and western regions of India is also indicated by the depictions of boats in the immediate neighbourhood of the inscriptions (ibid 2004: 136). According to Sidebotham (2011: 203), the Hoq-cave ship graffito on Socotra has three sails and likely dates to the 3rd century AD. The association with pictures of ships from the Ajanta cave paintings of the 6th century AD is accepted, although more convincing evidence are the numerous ship-motifs on the coins of the Satavahana ruler Gautamiputra Yajna Satakarni who ruled in the last half of the 2nd century over a vast area from Andhra Pradesh and Karnataka to Maharashtra and Gujarat (Shastri 1998: 77 quoted by Strauch and Bukharin 2004: 136). The Hoq ship-motifs like the coins have two masts, a highly curved bow and stern and two paddles at the back (Fig. 226: 3-4). This type of ship was typical of India and more eastern regions and therefore the high probability that these drawings owe their origin to the Indian visitors of the Hoq cave (ibid 2004).

4.5 Evidence of ships from ancient Indian art and archaeologyin Early Historic-Medieval period

4.5.1 Archaeological remains of watercrafts from India

In India, the archaeological and maritime finds relating to shipping vessels are rare. In more recent times, extensive research on trade, navigation and boat-building has revealed material evidence of watercrafts in the Early Historic-Medieval periods in India. Excavations at the site of Pattanam (Muziris?) produced the lower portion of a dugout canoe (>6 m) (Fig. 227: 1), near a wharf with bollards of teak. The canoe similar to a modern *vanji*-type boat from Southern India is made of *Artocarpushirsutus* (anjiliy) wood used till today in modern dugouts. AMS dating places the date of the canoe in the 1st century BC/AD time period. With a carved frame at one end the canoe shows evidence of caulking and repair with a piece of

wood. The canoe perhaps was used for the transportation of goods and people along the rivers and backwaters. As Pliny (the Elder) states that Roman ships could not enter Muziris and that goods were transported to the port town in smaller crafts, the archaeological context therefore corroborates the textual evidence (Selvakumar 2013). Other evidences of watercraft remains from India, albeit from the medieval period was the discovery of an iron-fastened boat from the recent excavations at Kadakkarapally in Kerala, believed to predate the earliest known records for the use of iron in South Asian boat building and is tentatively placed with the 13th - 15th centuries AD (Fig. 227: 2). The use of locally available timber and the suitability of the design for use in the backwaters suggest that it was built and used in India (Tomalin et al. 2004).

4.5.2 Medieval Indo-Arabian type stone anchors

Other important maritime remains of the medieval period that signify Indo-Arab shipping include evidence of 109 Indo-Arabian type of stone anchors found on rock sea beds and in shallow waters in Indian coastal waters (Tripati et al. 2005). An Indo-Arabian stone anchor was recorded from Kannur half-buried in the ground located at the southeast corner of Hydross Pally Mosque near the beach. The anchor (exposed portion 0.89 m x 0.3 m; 2900 kg) made of granite stone had been trimmed neatly by chisel leaving prominent straight lines. It had two visible squares holes for wooden pegs, a hawser hole at the buried end and a thick coat of grey paint (Tripati et al. 2005: 134) (Fig. 227: 3). No Indo-Arabian anchors have so far been found either in a stratified context or from before the 8th-11th century AD. On the basis of historical evidences, Indo-Arabian stone anchors could be dated to the medieval period (ibid 2005). According to Vosmer (1999) the Indo-Arabian plinth stone anchor was common at least from early Islamic times until about the sixteenth century, by which time iron had superseded stone. Explorations along the coast of India have revealed triangular, Indo-Arabian, and ringstone anchors from Dwarka, Bet Dwarka, Somnath; triangular and Indo-Arabian stone anchors from Aramda, Sindhudurg Fort, Padmagad, Vijaydurg; and Indo-Arabian types from Goa, Minicoy Island and Tamil Nadu (ibid 2005). From Bet Dwarka, Gaur et al. (2006: 123; Fig. 17, Table 2) recorded 17 grapnel or Indo Arabian type stone anchors cut from a long rock with a square section. Often the anchor has a circular upper hole and the lower

two holes on either face are square or rectangular. Rope-marks are clearly noticeable (Fig. 227: 4).

An attempt to synthesise the evidence of Indo-Arabian type stone anchors from the Arabian side was undertaken by Tom Vosmer from discoveries of stone anchors in Dhofar region (Oman), Dibba (Sharjah) as well as south of Qalhat (Oman) (Vosmer 1999: 248-263). Three basic types of stone anchors from the western Indian Ocean and Arabian Sea were identified. The 2nd type comprising 79 Indo-Arabian type anchors of the plinth type with a round hole at the smaller end and two perpendicularly opposed rectangular holes at the larger end (Fig. 227:5), was recorded. The third type, which may be an anchor, is a ringstone (40-80 kg), a flattened spheroid or hemisphere with a large axial hole (Fig. 227: 6) found on both Indian and Arabian coasts (ibid 1999: 250-252). A further step was carried out as part of this study by Vosmer, which included a series of tests to ascertain the holding power of the Indo-Arabian type stone anchor and to ascertain the size of the ship. From the trials, the tonnage of ships that could be associated with the measured Indo-Arabian stone anchors was estimated (Vosmer 1999: 256-259; Fig. 12). Ancient Indian texts such as the *Tilakamanjari*, the *Samaraiccakaha* and the *Milindapanho* mention the use of stone anchors by Indian sailors. It is generally agreed that Arab mariners brought the 'Indo-Arabian' type of stone anchor to India, and Indian mariners subsequently adopted it. This type of stone anchor was widely used in the Indian Ocean region till the introduction of iron anchor from Europe, though stone anchors almost certainly continued in use for centuries afterwards (Tripati et al. 2005).

4.5.3 Sailing vessels from the iconographic record in India

During early historic period a good number of boats are found represented in various mediums of art. From the 2nd century BC onwards, elaborate depictions of boats have been recorded as reliefs on religious buildings including the sculptural panels on the stupas of Bharut, Sanchi and Amaravati. Two boats are carved on the pillars of eastern and western toranas of the Sanchistupa (Tripathi 2006: Fig. 7; Sonawane 2011: Fig.1) (Fig. 228: 1-2). One of them is a big sea-going ship with a wooden superstructure carved on the southern face of the northern pillar of the western

gateway (Fig. 228: 2). The decorations, parasol and chauri (whisk) on board suggest it was a royal ship. The size and construction of the ship suggest that such ships might have been used for overseas trade and transport (ibid 2006: 27).

Ships are also depicted in the 4th–6th century Ajanta caves. The ships are found on paintings in Cave No. 1, 2 and 17, and sculptures in cave No. 26. They depict a variety of watercrafts that include sea-going sailing ships, pleasure boats, naval ships as well as small canoes. The various activities depicted here are transporting an army, a ship loaded with cargo, a shipwreck, a pleasure ride, retrieval of corals from the deep sea, etc. An episode from Purna-Avadana Jataka is painted in cave No. 2. The ship has three masts with rectangular or oblong sails, bowsprit and a jib sail, suggesting it is sailing in the sea (Chandra 1977) (Fig. 228: 3).

Two sailing ships of the historical period have been found painted in a rock shelter near the village of Chamardi in Bhavnagar district of Gujarat. According to Sonawane (2011: 503), the details of the ship painted here exhibit the acquaintance of the painter with sailing crafts. Two sailing boats with a single mast and a lateen sail are drawn in red pigment covering a 1.50 x 0.50 m area in one of the hollows in the rock (Fig. 228: 4). The bigger vessel represented has a rudder and a helmsman at the stern, that rises upwards with a flag shown aloft at the stem post. The mast is secured with stay and shrouds. The red chambers marked on the hull suggest its large carrying capacity and a warrior holding a shield and a sword stands at the prow. The second smaller ship has a single mast with a lateen sail and a triangular flag flying atop. A cross-shaped anchor is seen hanging at the prow. A warrior with a shield and sword is shown at the stem and helmsman at stern. These ships therefore have all the features of sea-going vessels used in maritime trade. Based on the circumstantial evidence of historical data, the boat rock paintings have been assigned to the Maitraka period - 6th/7th century AD (ibid 2011: 504-506).

Depictions of ships are represented on coins of the Pallava and Satavahana dynasties of the 2nd century AD. Rajasimha and Nandivarman Pallava of Kanchi issued coins having a ship motif on their reverse with two masts, the stem and the stern are upturned and raked and at the stern end a pair of steering oars is depicted (Fig. 228: 6). These coins throw light on contemporary ships with two masts that closely

resemble those represented on the Satavahana coins (Sonawane 2011: Fig. 2). The coins of Satavahana ruler Vashistaputra Sri Pulumavi II have a double-ended ship having two masts secured with a single rope on either side; the stern has a rudder. The coins of Satavahana Gautamiputra Yajna Sri Satakarni have a vessel with twin ropes on the exterior sides of the masts and single rope on the interior, for better compactness to the ship (Fig. 228: 5) (Selvakumar 2013: 5). The variety of sailing ships as depicted on the coins of the Satavahanas finds compelling parallels in the Arabian context from the evidence of ship graffito at Khor Rori (Sumhuram) carved into wall plaster depicting the whaling scene and the Hoq-cave ship graffito on Socotra, as discussed earlier.

Terracotta seals/sealings and potsherds provide important information especially concerning sailing vessels that have been inscribed on their surfaces. Excavations at Chandraketugarh have yielded a number of terracotta seals and sealings depicting ships of different types. One of them depicts a ship with a mast. Depictions of corn support their uses for transporting grains, and one shows horses. Many of these seals are also inscribed. Kharoshti- Bramhi legend on the seal makes it clear that these ships were trading vessels engaged in trade (Chandra 1977).

The Early Historic port of Alagankulam in southern Tamil Nadu has two graffito motifs of boats on pottery (Sridhar et al. 2005). The first specimen is of a graffito on a sherd of local coarse ware. Its significance lies in the depiction of the yards of the vessel as well as its mast, a feature usually missing in depictions from India at this time. The hull of the vessel is curved into a high end; one end of the vessel is damaged and missing. Three horizontal lines come from the surviving end, which terminate in ovoid shapes. These three objects may either represent steering oars or stone anchors. The latter is perhaps more likely given the fact that other depictions of Indian ships are shown with two steering oars and none are shown with three. Similarly, unlike other depictions of vessels from India, no stays are shown. Two horizontal lines thar cross the mast at its upper end may represent a square mainsail and square topsail. The use of topsails is paralleled in the Mediterranean, although there they are triangular in form. The area between the lower yard and the hull is filled with round objects that may represent the cargo of the vessel. A flag flies from

the masthead of the vessel (Whitewright 2008: 306; Vessel 44) (Fig. 228: 8). The graffito dated from 1st - 2nd century AD provides the details of a Roman trading vessel although details pertaining to the actual construction is absent (Sridhar et al. 2005: 67-73; Fig. 24). The second graffito is inscribed on a Rouletted Ware sherd. One mast is clearly visible that is supported by double fore and backstays. Two lines run from the foot of the mast forwards and upwards at an angle of 45°, these would seem to be the double backstay for another mast. The rigging of such a vessel with two masts, supported by double stays is consistent with the depiction of vessels on coins from southern India. Likewise, the presence of twin steering oars at the stern of the vessel (Whitewright 2008: 307; Vessel 45) (Fig. 228: 7). Although this vessel has been interpreted as a large three-masted Roman trading vessel (Sridhar et al. 2005: 67-73; Fig. 7 pl. 23), recent observation places the vessel within the existing corpus of Indian Ocean shipping (Whitewright 2008: 307).

5. Indo-Arab trade routes in the Indian Ocean during the late pre-Islamic period

This section of Chapter 8 examines the various sea and overland trade routes in the Indian Ocean network with particular emphasis on the journeys between India-Arabia and vice versa. For a reconstruction of these trade routes, evidence has been gathered from literary references to trade routes in classical texts like the Periplus and Natural History by Pliny (section 5.1). Section 5.2 examines the two sea major routes were available from the 1st century BC until 3rd century AD to merchants travelling from India and back: the Arabian Gulf-Syrian Desert and the Red Sea-Nile. The final section (5.3) discusses the types of Indian pottery in Arabia, their source from the subcontinent as well as their distribution and circulation within Arabia on the various trade routes that carried ceramics and other imports to the Gulf sites and to the South Arabian ports.

5.1 Periplus, Pliny and Arabia: Literary reference to trade routes in the Indian Ocean

The reference for this title is taken from a publication of the same name by Nigel

Groom, who had brought forward a chronological argument against the identification of Sumhuram with Moscha stating that the site was founded in the years that immediately followed the Periplus, based on the date of the site proposed by American archaeologists (Groom 1995). Avanzini (2002b: 18) was however in favour of the identification of Sumhuram with Moscha based on soundings indicating an occupation in the centuries BC as well as by the precise description that the author of the Periplus gives of Moscha. The Periplus author's first hand knowledge of South Arabia is also evident in his accurate description and distances to the four major South Arabian ports. (Robin 2005: 47-48) (See section 1.1.1 of this chapter). The importance of these South Arabian ports is evident from the preceding Ptolemaic era when most Greek merchants sailed only as far as the city port of Aden on the coast of southwest Arabia where they could acquire Indian goods from visiting Eastern traders. The Periplus reports that in earlier times Aden was once a full-fledged city. It was called "Prosperous" because vessels from India did not go to Egypt and ships from Egypt came only this far. Ships did not dare to sail to the places beyond Aden and for this reason the city used to receive cargoes from both [Egypt and India] (PME 26) (McLaughlin 2010: 25-26).

Although the Greeks were already acquainted with the monsoon winds as demonstrated by the journey of Eudoxus of Cyzicus, a sailor who pointed out the monsoonal route to northwest India at the end of the 2nd century BC, the trade route with India became more important from the 1st century AD onward by the Romans who intensified the trade network in the Indian Ocean (Cappers 2006: 15). Roman ships sailing to the distant East followed a strict seasonal timetable to exploit favourable weather conditions in the Red Sea and Indian Ocean. The Periplus reports that the proper time to leave Egypt for India was in July, and this allowed ships to sail through the Red Sea using northerly winds that blow steadily through this region during the summer months (PME 39). It was a distance of approximately 1,200 kilometres, a 30-day sailing, from Egypt to the Arabian port of Okelis (Sheikh Sai'd) near the entrance to the Red Sea (Natural History NH 6.26.104). The most advantageous way of sailing to India (according to Pliny NH 6.26.104) is to set out from Okelis. With the Hippalus wind blowing it is a 40-day sailing from there to Muziris, which is the first trading station reached in India (Tchernia 2005a: 251).

Pliny indicated that the best time to leave the Indian ports for the Red Sea was between the start of December and 13 January (NH 6.106). This would bring ships to southern Red Sea in time to catch the favourable south-east winds prevailing there from January to March. Initially however, on early Eastern voyages, ships from Egypt had followed the Arab and Persian coasts to reach India. But as trade contacts increased, Greek pilots soon realized that these voyages could be shortened in time and distance by direct passage across the ocean. These trade routes were adopted and developed as Greek pilots began to learn about the true shape and position of the Indian and Arabian coasts (McLaughlin 2010: 40-41).

It is generally believed that the sequence of the three routes to India described by Pliny (NH 6.100.101); the first route leading to Patale (Thatta at the mouth of the Indus), the second to port Sigerus (south of Barygaza?) and the last leading to Muziris was the result of consecutive stages of progress in navigational techniques. Atleast in one case with the deviation of trade routes from Sigerus to Muziris, it was not the progress made in terms of navigational techniques, but in the importance of the ancient 'capitalist' economy, which lay at the heart of Pliny's interest (De Romanis 2005a: 85-86) According to Pliny therefore, new routes had been adopted to exploit increased trade opportunities in distant markets, or avoid stretches of coast that became subject either to piracy or threatening regional conflicts, as well as that these routes offered a faster passage that Pliny cynically remarks, 'the desire for gain brings India ever nearer'. The northern voyage covered a distance of more than 1,700 kilometres, while the southern sailing crossed over more than 2,600 kilometres of open ocean (McLaughlin 2010: 41). The Periplus also reported direct trade routes to India by Roman ships (between AD 49-52) that were crossing from Arabia and the Horn of Africa to sail straight to northwest India and southern Tamil lands (Tchernia 2005a: 252-253). According to PME 57 "Some [ships] leave directly from Qana and some go from Cape Guardafui. Those bound for the Malabar Coast hold out with the wind on the quarter for most of the way. Those bound for Barygaza and Scythia also set out . . . on the high seas and bypass the coastal bays" (Casson 1989: 87). In this way, Roman ships travelling to ports in northwest India could continue their voyages south to reach the distant Tamil territories (PME 51). Pliny (NH 6.21 quoted by McLaughlin 2010: 48) suggested that a voyage along this western coast of India

could take up to 40 days and nights, but the ships that visited Barygaza and Kalliena probably spent longer travelling the 2,000 kilometre stretch of coast from the Indus to the Tamil lands. Many Roman ships also sailed directly from the Gulf of Aden to southern India, thereby avoiding the shipping hazards and regional conflicts that afflicted the northern coasts. Distances between Arabia and India in the Hellenistic knowledge were thus indicated in Book VI of Pliny's Natural History (100-106) where not one but three routes to India is given and maritime distances were calculated in spatial terms i.e. in number of stadia (Roman miles) and in temporal terms i.e. number of days necessary for navigation e.g. Pliny's indication of 30 days from Berenike to Okelis and 40 days from Okelis to Muziris (Arnaud 1993 quoted by De Romanis 2005b: 205-206). The translation of a distance in stadia according to the ratio found in Pliny indicates that 1 Roman mile is equivalent to 7.5 stadia (ibid).

Literary references to the Arabian Trade routes indicate that the Arabs began exploiting the Red Sea as a communication-commercial thoroughfare long before the Romans arrived in the area. In Egypt Nabataeans and Palmyrenes, but also South Arabs including Sabaeans, Himyarites and Minaeans actively participated in caravan traffic for several centuries (Sidebotham 2005a: 162). Encouraged by market demand for valuable aromatics including frankincense and myrrh, the peoples of the Arabian Peninsula developed a thriving commerce that brought great quantities of these aromatic goods north into the Greek Mediterranean and the Parthian Realm (McLaughlin 2010: 61). Strabo (Geography 16.4.4) reports that Arab dhows took seventy days to carry merchandise from southern Arabia to a major Nabatean port called Aila near the head of the Red Sea (quoted by Crone 1987). From there it was only a short journey overland by caravan to Gaza and the Mediterranean coast. The location of the Nabateans territory between the Red Sea and the Mediterranean coast gave them an important position as intermediaries in the incense trade. By the Roman era, a more southerly Red Sea station named Leuke Kome (now identified as Aynunah, Saudi Arabia) had become the main Nabatean port (c. 26 BC). The Periplus describes the dangers of sailing from the Nabatean port of Leuke Kome south along the Arabian coast of the Red Sea. The author reports "It is risky to set a course along the coast of Arabia. This region lacks harbours and offers poor anchorage. It has many rocky stretches and the land cannot be entered because of

cliffs. It is fearsome in every respect" (PME 20; Casson 1989: 63). Roman vessels sailing to southern Arabia therefore set their course down the middle of the Red Sea and used all available sail to speed past the pirate coasts, and the first trade of port they encountered was Muza in the Homerite kingdom, crowded with Arabian ships which sailed as far as north west India. Of Muza, the Periplus reports "… busy with commercial activity because they carry on a trade with the 'Far-Side' (African) coast and with Barygaza, sending out their own ships to visit these places" (PME 21; Casson 1989: 63). From here, the voyage along the southern Yemen coast took Roman ships past the former city of Aden. Aden had once been a major commercial city receiving cargoes from both Egypt and India, but by the time of the Periplus it was little more than a village settlement offering passing ships supplies of fresh water (PME 26; Casson 1989: 65). Roman merchant ships sailing beyond Aden headed for the edge of the Hadramawt kingdom and the trade port of Qana. The Homerite kingdom controlled crops of myrrh, but the Hadramawt tribes of the Dhofar region governed the best frankincense producing territories of Arabia. The Periplus (PME 27; Casson 1989: 67) also records how Qana had developed from a government installation to a site where regional merchants came to make exchanges with visiting foreigners. The incense produced in the mountainous Dhofar region was brought overland to Qana along caravan routes, but also shipped by sea using small rafts constructed from inflated animal skins The Arabian traders operating from Qana were also dealing with Far-Side markets, trading with the Gulf ports, and visiting commercial centres in northwest India. The Periplus also describes the sailing beyond Qana along the coast of the Dhofar region to the Hadramawt station at Moscha. According to the Periplus (PME 32), Indian and Roman ships sometimes spent the winter at Khor Rori rather than Qana due to the lateness of the season (Tomber 2008: 106). The harbour at Moscha could accommodate foreign shipping and the Hadramaut king allowed Indian and Roman vessels to remain at the port until it were safe to resume their voyages. These merchants came to an agreement with the royal agents at Moscha and exchanged some of their Indian cargo for the incoming frankincense harvests, with Periplus (PME 32) reporting "Ships sailing from Barygaza or the Malabar Coast can pass the winter at Moscha if the season is late. They reach arrangement with the royal agents and take on a cargo of sachalite

frankincense in return for cotton cloth, grain and oil" (McLaughlin 2010: 69-76).

In the time of the Periplus, Roman merchants operating from Egypt did not sail onwards into the Persian Gulf. After finishing their dealings at Qana (and Khor Rori), most Roman ships specialising in Arabian trade returned to the Empire. It is reported that the merchants of Roman Egypt must have been indifferent to the trade of the Arab-Persian Gulf, for the author of the Periplus carries his readers right past the mouth of the gulf (PME 19). The reason why this subsidiary of the main route was badly known by the Roman merchants, and thence cursorily described in the Periplus, might be that they were held by non-Greek agents and sailors and rather tightly closed to 'non-authorised persons' (Salles 2005: 129). Sasanian maritime activity by the 1st century AD began making use of the monsoon winds, which allowed them to sail directly from the Arab-Persian Gulf to India and Sri Lanka. Two main terminals handled the merchandise that passed through the Gulf: From Gerrha on the Arabian coast caravans set out for the markets of Palestine as indicated by Strabo (Geography 16.4.19) and, from Charax at the head of the Gulf from where caravans travelled inland towards Palmyra, with evidence of two inscriptions that mention voyages from Scythia (i.e. north west India and Indus delta) (quoted by Whitehouse & Williamson 1973: 29-30). Most of our written information about Sasanian activity in the Gulf comes from medieval historians, such as Tabari, Tha'alibi and Hamza of Isfahan. The information is meagre and sometimes contradictory. Nevertheless, all the writers record that Ardashir I (the first Sasanian ruler who overthrew the last of the Parthians in 224 AD) made vigorous efforts to establish control on the Gulf (ibid 1973: 31).

Classical sources of Periplus and Pliny's Natural History provide evidence of trade routes in a most general way. Any reference to quantification of the evidence i.e. precise numbers of entrepreneurs, their 'nationalities', volume and cost of trade goods broken down by categories are few and of questionable value. Secondly, throughout the classical period of interest in the Red-Sea-Indian Ocean (i.e. from the campaigns of Alexander the Great at the end of the 4th cent BC until the Muslim Arab conquests of the Near East in the 7th cent AD) there was a tendency among classical authors to conflate one ethnic group with another, for example, for classical

authors to interchange the identities of Indians, Ethiopians and South Arabs (Sidebotham 2005a: 161). Thirdly, while distances were rightly estimated in most cases by the author of the Periplus, his lack of first-hand knowledge of the Arabia Gulf meant that distances calculated for any journey from the western end of the Straits of Hormuz to the port of Apologos at the head of the Gulf near modern Basra (PME 36) and, Omana on the Arabian side of the Gulf (PME 36-37) as well as geographical references to these places was vague and based on hearsay. The Arabian Gulf itself was described as "a vast expanse (and) spreads up to places deep within" (PME 35); no more information is provided. To sum up, the description of the mouth of the Arabian Gulf is too unreliable in the text of the Periplus (Salles 2005: 120-121). Casson (1989) warrants the looseness of these geographical descriptions by the lack of interest of the author of the Periplus in these sectors because they had no commercial value for him. Assuming that the Roman merchants were not interested in the trade of the subsidiary areas, Casson stresses that the author of the Periplus intended to give a total picture of the India Ocean trade in order to leave opportunity to any Roman skipper to visit these 'side' countries (ibid 2005: 129). The author of the Periplus, who knew these ports well, described information relating to maritime commerce and the prevailing political situation in great detail (Robin 2005: 48). This gives the idea that the Red Sea at the time of the Periplus became the main route of the Indian trade while the Arab-Persian Gulf vanished, thence being ignored by the Greek merchant of Berenike who wrote the Periplus. Salles (2005: 118) states that this demonstration is oversimplifying and partly erroneous and that a complete shift of trade patterns from the Arab-Persian Gulf to the Red Sea cannot be seriously argued. It is therefore acceptable that Roman trade with the Indian Ocean passed by way of two major axes: the Red Sea–Nile and the Persian Gulf–Syrian Desert, both of which were in operation at the same time and for a prolonged period as demonstrated by Seland (2011).

5.2 The Arabian Gulf and the Red Sea: Two axes in ancient Indian Ocean trade

A brief historical background to the opening of the Arabian Gulf and the Red Sea channels of trade indicates that during the Achaemenid and Seleucid periods, trade between India and the West used to sail through the Arabian Gulf, then cross the

deserts of the Arabian peninsula by caravans as the ones handled by Gerrhaean middlemen, or reach the Levantine coast via the Euphrates and a northern trans-Syrian land route (Potts 1990: 1-22 cf. Salles 2005: 116). The Red Sea, meanwhile was just being explored by the Ptolemies and the actual opening of Egypt and the Red Sea to the Indian trade was around 100 BC, although commercial exchanges remained at a low level during the 1st century BC as stated by Strabo (Geog. 2.5.12) "…under the Ptolemies, only a very few ventured to undertake the voyage and to carry on traffic in Indian merchandise" (quoted by Salles 2005: 116). At the same time, in the 2nd half of the 2nd century BC, the Seleucid authority over Babylonia and the Gulf was ousted by the Parthians who took over the areas at the northern end of the Gulf maritime land. A new owner, the Characenian kingdom with its Parthian suzerains emerged and maintained control over the east-oriented emporium known as Spasinou Charax (Shatt al-Arab) (Potts 1990: 145-149). It is supposed that the troubled relations between Rome and the Parthians closed the commercial exchanges between these two areas in the Arabian Gulf. Evidence on the contrary indicates that the emergence of Palmyra as a major caravan-station in the 1st cent AD during this period of Roman-Parthian hostility was a sign that overland trade was not abandoned either despite the political instability on the borders (Gawlikowski 1988 quoted by Salles 2005: 117). The lack of mention of the Arabian Gulf route in the Periplus could be attributed to this political situation wherein geographically the Periplus clearly states that 'Persia' (Parthia?) began beyond Moscha limen, somewhere near the Kuria Muria islands (PME 33; Casson 1989: 71). The Persian domination extended from Dhofar to the Shatt al Arab, where Apologos is located, while the other 'Persian-controlled' port of Omana is located on the Arabian coast of the Gulf. Following most of the classical sources, the Omani area never ceased being 'Persian' from the mid-first millennium BC. The Gulf is then wholly Persian, a fact which elucidates the mention of the Periplus according which Apologos and Omana used to trade with Arabia (Salles 2005: 130). Whether the Persian authority over the Gulf recorded in the Periplus should be explicated as Characenian control or not, there is no conclusive objection why the Apologos-Omana 'trade unit' defined by the Periplus could not rely on a political unity (ibid 2005: 131).

Two major routes were available from the 1st century BC until 3rd century AD to

merchants travelling from India and back: the Persian Gulf-Syrian Desert and the Red Sea-Nile (Fig. 229). According to an in-depth study of these seaward routes by Seland (2011: 398-399), for those leaving from the harbour of Barbarikon at the mouth of the Indus in October, would leave on ship for the Arab-Persian Gulf port of Forat (near modern Basra) and then proceed to Spasinou Charax. In Charax, goods would be loaded on camels and carried to Palmyra that involved a month-long journey across the Syrian Desert. From Palmyra goods were then transported to the Mediterranean for customs clearance and onwards to be distributed in the Roman Empire. Alternatively, the other sea route opportunity was afforded by the much longer sea journey out of Indian ports to Berenike and Myos Hormos in Egypt (Peacock & Blue 2006; Tomber 2008: 19-25, 44-56, 71-82). From there caravans conveyed goods across the desert to Coptos on the Nile, the latter then transferred the eastern commodities to Alexandria for customs, processing and marketing. The total distance along the Red Sea-Nile route is about a third longer than along the Arabian Gulf-Syrian alternative, but the overland distance to be covered between the Gulf and the Mediterranean is almost four times greater than that between Berenike and Coptos (Seland 2011: 399).

The advantage of the sea route along the India-Arabian Gulf leg was that concerning arrival times, there was no 'closing time' in the Persian Gulf like that constituted by the northerly winds prevailing in the Red Sea from April onwards. Moreover, Nile navigation was not easy and documents the high risk of grounding especially during the season of low Nile that lasted from February to June (Copper 2008 quoted by Seland 2011: 404). However the Red Sea-Nile routes were advantageous in terms of the overland routes, which were well served with protected wells, cisterns and road stations, while in the Syrian Desert there was no infrastructure comparable to that maintained by Roman authorities in the Eastern Desert of Egypt. However the ready availability of camels available near the Gulf ports and the close relationship between the city population in Palmyra and the nomads of the steppe (Michael Sommer 2005 quoted by Seland 2011: 403) were instrumental in furnishing the security needed for the journey and the organization of transport by the Palmyrenes without major investment in infrastructure.

In terms of the overland journey, the desert road to Coptos on the Nile is a 308 km distance or a 12-day journey as described by Pliny (NH 1.102). This would bring the Indian Ocean imports to the warehouses in early May at the latest or earlier in March. Results of the University of Delaware's archaeological survey of these roads and installations from 1990 to 1995 has located dozens of classical sites, ranging from major fortified installations to camping areas and other evidence of the ancient overland routes between the Red Sea port of Berenike and Coptos in the Eastern Desert (Sidebotham & Zitterkopf 1995). Some of the more noteworthy desert routes included the Berenike-Edfu road and the Qift road with 10 unfortified and fortified water stations (hydreumata) for travellers in operation in the approximately 365 kilometer distance between Qift and Berenike (ibid 1995: 42-48). On the other hand, the substantially longer journey across the Syrian Desert without permanent infrastructure meant that it is not to be expected that caravans spent more time on the road than necessary. So if Palmyrene merchants left Indian ports as soon as the monsoon allowed in November they could be home by February or March, while their colleagues who travelled to Berenike would be likely to be still engaged with formalities and transport on the Red Sea coast (Seland 2011: 403). Therefore according to Seland (2011: 406), The routes by way of the Persian Gulf and the Red Sea were in use during the same period. The reconstruction of passages from the mouth of the Indus to the Mediterranean shows that commodities transported by way of the Arabian Gulf and the Syrian Desert were likely to arrive at Antioch or another Mediterranean port by late spring, while goods going by way of Egypt would probably reach Alexandria in the early fall (Fig. 229). In other words, Palmyrene trade with India reached the Mediterranean at the start of the sailing season, Egyptian trade at the end, which seems to have been as strong incentive to keep up the route by way of the Syrian Desert. The main discrepancy however in Seland's reconstruction of the trade routes along the India-Arabian Gulf leg is that his analysis takes into account only the port of Barbarikon in northwest India (Seland 2011: Fig. 1), while there is no indication of important routes traversing western India (Barygaza), southwest India (Muziris) and South India (Arikamedu) or Sri Lanka that have also been mentioned in the Periplus or by Pliny, and corroborated by archaeological evidence. Seland does however mention links between Arabia and

Gujarat but only in the context of the Islamic period and British sources (ibid 2011: 401).

Archaeological remains and epigraphic evidence indicate that certain groups of Arabs participated in the commercial caravan traffic between the Red Sea coast of Egypt and the Nile. The Nabataeans by 312 BC appeared to have partially abandoned their nomadic ways for a settled mercantile life and from their capital at Petra they engaged in caravan trade with South Arabia and Gerrha on the Arabian Gulf (Potts 1990: 16-17, 56-57, 85-97). They had important emporiums based at Leuke Kome (Aynunah in Saudi Arabia) and Aila (Aqaba at the northern end of the Gulf), the latter that served as the terminus for a major highway and as a port in the Roman period (Sidebotham 2005a: 163). The Palmyrene Arabs with their caravan/trade-driven economy may not have dominated the Red Sea trade and seem to have been more involved in the organizational aspects of this commerce rather than the actual conveyance of commodities at least in Egypt. Their main interest lay in the routes between India, the northern end of the Arabian Gulf leading north along the Tigris-Euphrates and traversing thence westward, via Palmyra, to the Mediterranean coast. Their desert trading empire eventually disappeared in 273/274 AD after the conquest of Rome (ibid 2005a: 164-165). The participation of several other Arab groups (particularly from South Arabia) in the sea routes and overland trade in the Arabian Peninsula will be discussed in the section below.

5.3 Patterns of trade in the eastern Arabian seaboard

In light of the sea-routes involving the two axes of Indian Ocean trade, the maritime route involving Apologos-Omana in the Arabian Gulf is described only briefly in the Periplus. Periplus (PME 36) states that this route appears as a trade unit where mutual exchanges between the two emporia accept a single tributary: a direct navigation that brought frankincense from Qana to Omana which exported sewn boats to Arabia - most likely South Arabia (Salles 2005: 133). Omana, on the Arabian Gulf side is described as a place where goods were exchanged and Apologos (near modern Basra) was considered an ‘emporium nomimom’ where a political tax existed, imposed by a king in exchange of the security of foreign cargoes and merchants (Rouge 1987 quoted by Salles 2005: 131). Although *emporium nomimom*

might be accepted by some as a special arrangement with Rome, Salles (2005: 132) states that Romans were politically absent in the Gulf and legally absent from Apologos. The final destination of the Apologos-Omana route and its trade was Barygaza in the Gulf of Cambay. The Periplus describes the Apologos-Barygaza trade unit as an almost entirely autonomous segment in the Indian Ocean trade, without any Roman interference; however this warrants an explanation for the western and Indian imports in the archaeological sites of the Gulf (ibid 2005: 134-136). Salles has suggested that during the time of the Periplus Roman material in the Gulf, at sites such as Mleiha and Ed Dur (ancient Omana?), did not come directly from the Roman world but instead reached the Gulf via Broach or ancient Barygaza in India, from where they were re-exported to the Gulf; they had first reached the north Indian harbours on Roman ships from Alexandria through the Red Sea, and were cargoed from Barygaza and Barbarikon to the Gulf by Arab/Persian merchants and sailors (ibid 2005: 138-140. The question of how these imports especially the ceramics reached these sites is the next step of discussion.

Several other segments existing along the major route had purely local functions, for example in South Arabia. A network of trade routes had been established between the kingdoms for many centuries, carrying foods such as salt and wheat, wine, weapons, dates and animal skins from one fortified settlement to the next. These paths were the basis of the frankincense trade routes between the kingdoms of southern Arabia, and formed the starting point of the route north. Although Pliny talked about the 'high road' leading north, there was never simply one great 'Frankincense Route' as is popularly imagined, but rather a complete system of paths, with subsidiary tracks leading from the main roads to various stopping-off points (Singer 2007: 11). The kingdom of Ma'in in present-day northern Yemen was active in the overland caravan trade in the Arabian Peninsula by about 400 BC. By 1st century BC was absorbed by its southern neighbor the kingdom of Saba. The Sabaeans produced frankincense and myrrh much demanded in the Mediterranean world and controlled traded through their territory deriving income from tolls levied on passing caravan traffic and through their capital at Marib held sway over large portions of Southwestern Arabia until the early centuries AD (Sidebotham 2005a: 165). They were also active in some of the overland caravan traffic between the

Egyptians Red Sea ports and the Nile. Later, the kingdom of Himyar with its capital at Zafar dominated this trade until the rise of Aksum, while graffiti along the roads from Quseir indicates that the Himyarites too were involved in the overland caravan traffic between the Red Sea ports and the Nile (ibid 2005a: 166-167). Some of the possible overland routes as defined by Kennet (2007: 109) include: a. From the Thaj/Gerrha region towards Petra and southern Arabia and b. From Spasinou Charax at the head of the Gulf up the Euphrates and overland to Palmyra.

According to Pavan (2011: 104-105) it is probable that other trade routes existed that has not been recorded. This is seen from the relations that Sumhuram had for example with the sites of the Gulf (Mleiha and Ed-Dur etc.) that can be seen in the prestigious ceramic tableware, large storage vessels and also coins and artefacts. Besides several stone vessels, a few pellets of myrrh or frankincense, a number of coins minted in Qana' and/or Shabwa, we can now add a few Hadrami pottery recipients to the list of South Arabian objects recovered at Ed-Dur (Haerinck 2003: 205). The excavations of the South Arabian ports, on the other hand, have yielded vessels of southern Mesopotamian glazed ware and southeast Arabian black ware, most probably imported from Ed-Dur or Mleiha. These wares and other southern Mesopotamian and Iranian Early Namord ware have also been found at the Hadrami capital of Shabwa, several east African coastal sites, and the Roman-Egyptian ports on the Red Sea (Rutten 2007: 19). The wider diffusion of this Gulf material very probably occurred indirectly via Qana and Khor Rori (Sedov 1992: 126-127). Pavan (2011: 106) postulates that from its foundation Sumhuram would appear to have had relations with the Gulf as it had with India. These relations however must have been of lesser importance in the centuries BC at least consisting in sporadic trade, which might even have been overland. Previously Avanzini (2007: 27) proposed that we must rethink the contacts with the Gulf regions in the Seleucid period where in Mleiha many of these items similar to Hadrami were found. For the purpose of this study, this would include the numerous finds of Indian and western ceramicsby highlighting the routes for the distribution and exchange of this commodity in Arabia.

5.4 Circulation and supply of ceramics in the Indian Ocean trade

The reconstruction of Indian Ocean trade routes based on the circulation and supply of foreign pottery has been the subject of discussion in recent publications (e.g. Rutten 2007; Gupta 2007; Tomber 2007). With regard to the distribution and trade of Roman pottery in the Arabian Gulf, Rutten (2007: 17-10) suggests that the small quantities of Roman fine wares like Early Sigillata A (ESA) found at Ed-Dur, were distributed to this site via two trajectories: One by land and river through Parthian Mesopotamia and Characene realms and thence by ship down the Gulf, and another, by sea to Alexandria, via Koptos to the ports on the Egyptian coast, through the Red Sea to the South Arabian ports, and most likely along the South Arabian coast to Ed-Dur (Fig. 230). Secondly, the examples of Early Sigillata B1 (ESB1), Early Sigillata C (ESC), Italian Sigillata and lead-glazed ware from Ed-Dur probably arrived by way of a subsidiary link with the Alexandria-India route. These ceramic types have been recorded at sites on the coasts of South Arabia, East Africa and Southeast Asia (ibid 2007: 18). For the Roman glass at Ed-Dur, based on the large amounts of pottery and other artifacts from southern Mesopotamia at the site, Haerinck (1998: 292) favoured the Charax-India sea route through the Persian Gulf, rather than the Rome-India sea route and a possible re-distribution of the glass vessels via the northwest Indian ports of Barbarikon and Barygaza (see Salles 2005). However Rutten (2007: 18) suggests the South Arabian ports as the main purveyors of Roman glass to Ed-Dur. The small numbers of Roman fine wares at Ed-Dur were most probably transported by ship from southern Mesopotamia by Characenian tradesmen through the Arabian Gulf, while the remainder reached Ed-Dur through contact with Arabian and Indian seamen trading with the South Arabian ports of Qana and Sumhuram, which were connected to the Rome– India sea route through the Indian Ocean. The main issue with Rutten's reconstruction of trade networks is that none of the overland routes were considered as possible means of transporting the quantities of Roman wares across Arabia.

In a similar study for the distribution pattern of torpedo jars and Late Roman amphorae, Tomber (2007: 984) suggests three seaborne routes to India: directly from the Gulf (torpedo jars), via Qana (torpedoes and some Roman amphorae), and even directly from the Red Sea (Roman amphorae). Although it may seem that the Roman

and Mesopotamian vessels that arrived together in India were most likely to have been by way of an entrepôt namely Qana, Tomber (2007: 983) instead indicates that it is overly simplistic to look for a single place that would have acted as an entrepôt for this entire period and that sites in the Gulf, South Arabia and the Red Sea could have had a role in this process. It is notable that the majority of torpedo finds in North India lie within the territory, or the borders, of the Western Kshatrapas (under Parthian suzerainty), whose larger region encompassed Kutch, Saurashtra in Gujarat, the northerly reaches of the Konkan coast and Maharashtra. The presence of torpedo vessels near or in areas controlled by Mesopotamia therefore owes much to the overall cultural connections and shared histories within a wider economic context (ibid 2007: 982).

In terms of Indian pottery, this study attempts to reconstruct the trade routes from India to Arabia and the Red Sea, based on the evidence from specific vessel forms and fabric types that provide links to their source in the subcontinent. The ceramic data in this thesis points towards specific areas in India (northwest India including Sind and Pakistan, Western India in particular Gujarat and Maharashtra, the south-west coast including Pattanam, eastern coastal region, South India and even Sri Lanka) for the source of the Indian wares and its trade route connection to Arabia and Egypt. The questions discussed above concerning the geographic locations/regions as likely provenance areas and patterns of sea and overland trade based on the distribution of Indian pottery assemblages in Arabia will be discussed in Chapter 9 - conclusions.

CHAPTER 9

CONCLUSIONS

In the context of Indian Ocean studies on trade, the notion that the Roman expansion into the Red Sea region (1st century BC) gave the necessary impetus to trade and commerce in the Indian Ocean developed. Although the systematic exploitation of trade routes primarily for economic purposes began in 30 BC with the annexation of Egypt by Augustus (Tomber 2008: 18), the 'periphery' regions including the eastern Arabian seaboard progressively occupied a secondary role of an entrepôt in the main interaction sphere i.e. Indo Roman trade. The main contribution of this thesis has been the detailed study and collation of Indian pottery data from Arabia (Arabian Gulf and South Arabia), which indicates that direct Indo-Arab relations began prior to Roman involvement in the trade and continued for centuries during and after the collapse of the Roman Empire. Moreover the present research has taken the initiative to provide a reliable classification of Indian pottery fabrics that is unavailable from the excavation reports of Early Historic sites in India. This evidence from morphology and fabric analysis of Indian vessels allows to determine key source areas, identify actual imports from local imitations and reconstruct patterns of trade with India that summarises Indo-Arab trade in the Indian Ocean during the Late Pre-Islamic period.

Returning to the research objectives defined in Chapter 1:

9.1 The eastern Arabian seaboard- more than an intermediary of Indo-Roman trade

Most new research on the Indian Ocean in antiquity stems from archaeology and it is essentially an analysis of the Red Sea and Indian Ocean as it appears in the Periplus (Seland 2010: 4). Classical texts and documents have increasingly been relied upon for locating ancient sites and for descriptions of distances. In this respect, the Periplus has been enormously informative in locating sites such as Myos Hormos

and Adulis (Tomber 2008: 20-21). On the other hand, the ports and market towns of the Arabian Gulf are barely mentioned in the Periplus. This has led to research that has focused on Early-Late Roman 'India Trade' with emphasis on the role of the Red Sea, African and South Arabian ports. The Arabian Gulf extension has been either ignored or has been studied in isolation without including its role and participation in the overall Indian Ocean trading network. Secondly, although many scholars have noted the important place that South Arabia clearly occupies in the Periplus, the significance of this area in the trade network is mostly relegated to its position as an entrepôt wherein ships, which sailed from Egypt towards India had to halt in many of its ports in order to replenish their stock of food and water (e.g. see Robin 2005: 47). This thesis has shown that this notion of the eastern Arabian seaboard is changing slowly with new research indicating that Arabia was able to carry on a profitable trade in aromatics (and bulk goods) with both India and Egypt without acting as an intermediary between the two (Seland 2010: 20). Indian pottery documented in South Arabia and the Gulf, which scholars until recently have had the tendency to overlook, forms an essential part of the evidence to determine the role of the Eastern Arabian seaboard in the Indian Ocean networks of contact. 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. However Avanzini's latter statement that reflects Arabian sea-trade as a 'trait d 'union between the Indian Ocean, the Red Sea and the Mediterranean' again falls within the majority assessment of this region as a transitional or connecting port-of-call for ships on their way to the Red Sea and the Mediterranean. This thesis challenges the above-mentioned view by demonstrating the unique features of Indian ceramics documented at these sites, which on

interpretation can aid in determining the role of the Eastern Arabian seaboard as more than an intermediary of Indo-Roman trade.

The documentation and detailed ceramic study as part of this thesis in chapters 2 and 3 has revealed that the composition of the Indian pottery corpus at Mleiha, Ed-Dur etc. in the Arabian Gulf differs from the first century pottery assemblages of Qana or Khor Rori. It is apparent that the diversity of the Indian wares indicates firstly, that not all Indian vessels were transported directly or indirectly to the Arabian Gulf side via the South Arabian ports of Qana or Khor Rori; secondly, the existence of a possible direct Gulf-India sea route indicated in the Periplus (Apologos-Barygaza route) as an alternate almost entirely autonomous segment (independent of Rome's control) receives further corroboration; thirdly, the range and quantity of the Indian vessels in Arabia could be connected to the adoption of new food items from the subcontinent (e.g. rice, grains, ghee and sesame oil etc. as mentioned in the Periplus) or to the elaboration of ways of preparing those already present or cultivated locally. Finally, in addition to the large quantities of imported South Asian ceramics, the presence of local copies of Indian vessel forms (see chapter 7) could represent but a few examples of the local economy adapting on a small-scale to the needs of the Indian residents in Arabia, the latter indicating the position of Arabia as a destination and place of residence for several South Asian traders and sailors and not merely a transit point in the Indian Ocean network.

The above evidence of Indian ceramics in Arabia is corroborated by the archaeological and historical sources as discussed in Chapter 8. Literary references like Strabo (Geography 16.4.4) indicates that Arabs and the Greeks (under the Ptolemies) began exploiting the Red Sea as a communication-commercial thoroughfare long before the Romans arrived in the area. The market demand for valuable aromatics encouraged the peoples of the Eastern Arabian seaboard to develop a thriving commerce that brought great quantities of these aromatic goods north into the Greek Mediterranean and the Parthian Realm (Sidebotham 2005a: 162; McLaughlin 2010: 61). In the Ptolemaic era, most Greek merchants sailed only as far as Aden (southwest Arabia), where they could acquire Indian goods from visiting traders (ibid 2010: 25-26). In the time of the Periplus, Roman merchants operating

from Egypt did not sail onwards into the Arabian Gulf and after finishing their dealings at Qana or Moscha, most Roman ships specialising in Arabian trade returned to the Empire. Certain groups of Arabs like the Nabataeans, as early as 312 BC, were engaged in caravan traffic with South Arabia and Gerrha on the Arabian Gulf and had emporiums at Leuke Kome (Saudi Arabia) and Aila (at the northern end of the Gulf) (see Potts 1990). Their main interest in the Roman period lay in the routes between India, the northern end of the Arabian Gulf leading north along the Tigris-Euphrates and traversing thence westward, via Palmyra, to the Mediterranean coast. It is most likely this reason why this route was only cursorily described in the Periplus and in all probability was held by non-Roman agents. Therefore absence of direct Roman interest in the Arabian Gulf side did not in any way deter the position of this region along an important trade route for maritime activity with the East from at least the 1st century BC - 3rd century AD (see Seland 2011). In this context it is also important to mention the watercraft and navigation skills already developed in Arabia during the middle Holocene (Chapter 8 section 4) with evidence of sailing ships from the Neolithic to Bronze Age based on boat remains (reed-impressed bitumen), boat models and painted disc from As-Sabiyah, Kuwait and Dilmun seals (section 4.2). During the Late Pre-Islamic period, evidence of Arabian seafaring is well attested from iconographic evidence of watercrafts and sailings ships from the Southern Arabian coast principally the Dhofar region of Oman (i.e. ship graffito from Khor Rori, rock art from Dhofar hills and inscriptions from Hoq cave, Socotra Island) (chapter 8 section 4.4). Hourani (1963: 28) has previously mentioned that the ships of the Arabs sewn with stitches of coconut fibre were fair-weather crafts, which would fall apart in heavy seas. This would have led the Arabs to use the northeast monsoon to coast the Gulf along Arabia and Iran. The Greeks also used the Arabian Gulf route before the discovery of the southwest monsoon, and it is quite probable that they were following the Arab practice.

A close analysis of classical sources and archaeological data indicates that at least from the 2nd century BC a South Arabia- India route already existed. Discoveries of Indian pottery pre-dating the Periplus (Rouletted Ware, Black-and-Red Ware, Paddle Impressed pottery), in recent years at Khor Rori for example, has laid the foundation for an early relationship between the Eastern Arabian seaboard and India, indicating

that trade, albeit on a small scale, had taken place since the Ptolemaic era. At the same time, under the Achaemenid and Seleucids, trade between India and the West used to sail through the Arab-Persian Gulf, and then crossed the deserts of the Arabian Peninsula by caravans handled by Gerrhaean middlemen (Salles 2005: 116). On the Gulf side, Indian pottery evidence demonstrates distinctiveness from the types of Indian vessels transported to South Arabia. This could indicate that pre-Periplus trade in the Gulf side continued simultaneously albeit with different parts of the Indian subcontinent i.e. western and north-western India. On the other hand, the Indian pottery evidence from South Arabia suggests trade connections with the eastern and southern India, including Sri Lanka, indicating that the region around Muziris, rather than Barygaza, was the nexus point on the subcontinent for Indian Ocean trade at the time of RW or early centuries BC (see Pavan & Schenk 2012: 200). Until recently however, the role of the south-eastern Arabian sites in the pre-Periplus 'India trade' was almost unknown, until identification and recent scientific analysis of Indian high-necked vessels from Mleiha in the PIR.A levels (3rd cent BC - 2nd cent BC). Based on their form and fabric combination, typological parallels for this vessel type were derived from several sites in Western India, corroborated by scientific analysis (XRF) detailed in Chapter 6. The presence of high-necked Indian vessels at Mleiha provides the first evidence of 'coarse wares' as possible ceramic indicators of early trade or contact between the Arabian Gulf and India. Moreover, this evidence points towards a possible direct trade route between the Gulf and Peninsular India, much before the arrival of the Romans in the Indian Ocean trade scene.

9.2 Indian ceramics in Arabia: key provenance areas

In order to identify key source areas or the provenance of the Indian ceramic assemblages found in the Arabian sites mentioned in this thesis, vessel types were subject to both microscopic and macroscopic study. The microscopic study in this thesis involved the results from scientific or petrographic analyses (from previous publications and Chapter 6 of this thesis) as well as detailed visual examination of pottery fabric samples using a hand-held digital microscope (see Chapter 2 for

Mleiha, Ed-Dur and Kush and Chapter 3 for Khor Rori). The macroscopic study included the classification of Indian vessel forms and the identification of distinguishing features in morphology and manufacturing technique. From the available evidence of Indian/South Asian pottery, four key areas or zones were identified in this thesis 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 thesis as the two main sources for the Indian vessels regularly discovered in the assemblages of sites like Mleiha, Khor Rori and Qana and further at Red Sea sites like Berenike and Quseir. The Indian ceramic evidence for this key area includes the organic black ware or rice-tempered pottery that forms part of the coarse wares imported into the South Arabian ports of Khor Rori and Qana, atRas Hafun in East Africa as well as into Quseir and Berenike in the Red Sea region. Petrographic analysis of this ware from Berenike (Tomber et. al 2011a) and Khor Rori (Lippi et. al 2011) has revealed that in India this ware is found in the northwest, clustered in Gujarat from sites such as Kamrej. Primary microscopic study of samples of rice-tempered ware from Khor Rori also undertaken in this thesis (Chapter 3 section 2.6.1) has provided a first-hand summary of the elemental composition and origin of this ware. The second ware group, Coarse Red Slipped Wares or CRSW, which constitute an important group of coarse wares imported into Arabia and the Red Sea, are more difficult to provenance. However a particular variation of these wares like Indian Micaceous Ware (Fabric 2) from Mleiha is part of a long tradition of micaceous or mica-tempered 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 slip of the vessels similar to pottery traditions in parts of Western India. Further, an important contribution of this thesis is the X-Ray Fluorescence (XRF) analysis of select Indian pottery samples of CRSW from Mleiha (Sharjah) and sherd samples from various key sites in Western India which revealed results showing that the two samples from Mleiha have strong correlations of chemical composition with 13 sherd samples from sites in Maharashtra (Junnar, Nevasa, Ter

and Nasik) and Gujarat (Dwarka, Padri and Prabhas Patan), indicating more than a 90% probability that they are from the same environment (Chapter 6). Similarly Coarse red wares and CRSW found at Qana (BA-I period) were also previously subject to petrographic study by Davidde et al. (2004: 94-97) which suggested an origin in an area of sedimentary rocks, wherein parallels were derived in relation to similar coarse red vessels from the site of Amreli in Gujarat (Chapter 3 section 3.3 and Table 4).

Among the fine wares, Gujarat is generally accepted as the source for Red Polished Ware manufactured from between the first and fifth centuries AD, with a revision into the 8th century based on evidence from Kush (Kennet 2004). Genuine Red Polished Wares recorded from Khor Rori and Qana have direct parallels with Pinto-Orton's catalogue among from vessels from Amreli and Bhoji-Kadwar (Sedov & Benvenuti 2002: 188).

In the preceding period, which this thesis refers to as the 'pre-Periplus' era, the scientific analysis of a sample from a Indian high-necked vessels from Mleiha PIR.A phase (Chapter 6) period suggests evidence of early contact in the centuries BC between the Arabian Gulf sites and Western India. For this period, maritime connections can be based partly on the evidence of Indian ceramics found along with Hellenistic pottery in the Arabian Gulf: mouldmade and stamped pottery (rosettes, leaves) and black-washed pottery from Failaka Island sourced from Ter and Kondapur in Maharashtra and one fragment of Northern Black Polished Ware have become a key-reference to the interpretation of relations between Mesopotamia and Western India in the Hellenistic period.

Finally, the evidence from Kush (beginning from 5th/6th cent AD to the Islamic period) indicates the presence of Indian pottery including RPW and PAINT, which based on visual examination of fabric and surface treatment (including decoration) in this thesis can source these vessel groups to Gujarat (see Chapter 2 section 4.3.4 & 4.3.5). Similarly the SBBW at Kush based on the closest form and fabric parallels has been ascribed to sites in Western India (Gujarat and Maharashtra) up to the Sind region (North-Western India) (section 4.3.1) and for IRAB parallels are based on crude red and black ware, well-known in central and southern Gujarat in the early

historic to medieval periods (Chapter 2 section 4.3.2). Parallels are also drawn from Kush for a number of Indian vessels recorded at Suhar (Levels V & VI) (Chapter 2 section 4.5). The evidence of RPW and other Indian wares from Kush and Suhar indicate continuing trade and contact between Arabia and the regions of Western India, especially Gujarat in the Early Islamic to Islamic periods.

Key Area 2 (North-western Frontier) - The northwestern part of India as defined in this thesis includes the Indus region as well as the Pakistan-Baluchistan areas. Well-documented sites in these regions, dated to the first centuries A.D, are unfortunately non-existent or unpublished. Nevertheless, it is assumed that several Indian vessels found in Arabia were produced in northwestern India and /or adjoining regions. Amongst these is the Fine Red Ware at Khor Rori, where Sedov & Benvenuti (2002: 192) suggest that some these 'Indian style-table jars' were produced northwestern India based on a statement by Orton (1992: 46-47) that 'all forms of Indian RPW vessels can be found in the coarser associated wares of the Early Historical Period'. More convincingly however, examples of this Fine Indian Red Ware from Ed-Dur (Fine Red Slipped and Fine Reddish Brown and Grey Slipped), subject to thin-section petrography by De Paepe et al. (2003) revealed that the Ed-Dur fragments are most likely imitations of the finer Indian ware that originated to the west of the main production centres in Gujarat, in the Indus valley and/or possibly Pakistani Baluchistan (See Chapter 7 section 2.4). In this context, the visual examination in this thesis of Coarse Red Slipped (CRSW) samples from Ed-Dur (Chapter 2 section 2.6.4) revealed elemental compositions and types of inclusions that were very similar to the Fine Red Slipped ware indicating that even the CRSW from Ed-Dur was also most likely produced in northwestern part of the subcontinent. Among the black wares, Black-and-Grey wares from Mleiha and Ed-Dur (beginning in Period IIIA) were compared with similar vessels from sites in western India (e.g. Elephanta and Dwarka) by Gupta (1997), and from northwestern India for example Shaikhan Dheri in Pakistan (Mouton 1992) (Chapter 7 section 2.6). This origin was supported by petrographic analysis of samples of Black-and-Grey ware from Ed-Dur and Western India (see Gupta 1997). On the contrary, scientific thin-section analysis by De Paepe et al. has revealed a local source for these wares in the Oman Mountains (De Paepe et. al 2003: 223). Both sources for the black-and-grey wares require further work to

substantiate either conclusion.

Key Area 3 (South-Western coast) - Along southwestern 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& Begley 2000). Similar vessels were also documented in Arabia including at Khor Rori and Mleiha, the latter with evidence of a large cooking pot in micaceous red slipped ware that displays internal wiping marks (see Chapter 2 section 1.4.2 and Chapter 7 section 2.1). Another important evidence possibly connected to Pattanam is the 7.5 kg of black pepper from Kerala kept in an Indian storage vessel at Berenike (Cappers 2006). Secondly, the role of Pattanam as a transshipment centre is verified by the largest ever assemblage of the Indian rouletted ware (RW) found on the western coast of India (Cherian et. al 2011). The epicenter of RW production is Chandraketugarh-Tamuk region in West Bengal, located on the east coast. These vessels were probably brought to Pattanam from the east coast along alongside rivers such as Krishna, Godavari and Kaveri used as natural transportation routes as indicated by Schenk (2006) from where they were transported to the Arabia and Red Sea sites. Finally, evidence of Mesopotamian turquoise glazed pottery and Parthian 'fish plates' at Pattanam that can be dated from the 3rd century BC indicates evidence of early pre-Periplus exchange between West Asia and the Indian subcontinent.

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 and Paddle-impressed ware. As indicated above, a source in eastern India particularly West 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). RW must have arrived in Khor Rori prior to the first century BC and examples found at Khor Rori feature the parameters of the later variety of this pottery based on the typologies of Tissamaharama (Chapter 7 section 2.3). Recent research by Magee (2010) identified two distinct workshops for RW i.e. Group A produced somewhere in southeastern 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). In the context of imitation RW pottery (see details Chapter 7 section 2.3), the production of pottery in southern India and Sri Lanka was most probably decentralized and relied on clay from various sources and belongs to the South Asian variety of forms. Black-and-Red Ware technique was often employed in the manufacture of imitation RW with local production from all over southern Indian and Sri Lanka where BRW tradition existed. BRW occurs in the pottery of South Asian origin at Khor Rori from the earliest occupational layers comparable to the typical shapes from Phase c1 (2nd century BC) at Tissamaharama. Several other analogies were drawn between the pottery from the early occupation layers at Sumhuram and the forms established for Tissamaharama that allows the reconstruction of the range of South Asian pots that were brought to the coast of Oman towards the end of the second century BC through trade and other channels (Pavan & Schenk 2012).

For the second variety of Indian pottery, the specific technique of the 'paddle impressed' large vessels decorated by grooved paddles has a fairly restricted eastern distribution in India from the 1st century BC to the 3rd or 4th century AD with fabrics identified in Egypt indicating sources from both South India and the Chandraketugarh region (Tomber 2000a), This is further corroborated by Pavan (2011) that its use till today is limited to southern India and in particular to the area of Arikamedu where these vessels were manufactured and shipped from. Politically, Arikamedu was part of Tamilakam, along with the sites of Alangankulam and Pattanam (Tomber 2008: 132).

Based on the Wheeler's typology of pottery at Arikamedu, several parallels were identified and documented at Berenike and Quseir in the Red Sea and published subsequently (see Chapter 4). Among these, coarse wares like Wheeler Type 24 (*handi*), Wheeler Type 25 (casserole), Wheeler Types 28-29 (flanged casserole or lid) etc. are identified throughout the eastern seaboard of Arabia (including the Gulf side). Arikamedu fine wares, on the other hand, i.e. Wheeler Type 1 (Rouletted Ware), Wheeler Type 10 (bowls with stamped decoration) etc. are restricted mainly to the ports of Southern Arabia (particularly Khor Rori). These fine wares can be

sourced to definite locations in India, with a fairly eastern and southern distribution. Finally, evidence of Tamil graffiti on potsherds found on vessels from the Red Sea (Quseir) and most recently from South Arabia (Khor Rori) date to around the 1st century AD and provide links with the far south of India where old Tamil was both spoken (Chapter 8 section 1.2).

9.3'Actual' imports and local 'imitations'

The questions concerning the identification of actual imports from imitations of Indian vessels that indicate borrowed technique and/or counterfeiting have been discussed in detail in Chapter 7. The latter variety shows evidence beginning from the Bronze Age of close similarities between Omani ceramic vessels and pottery wares from southeastern Iran and southwestern Pakistan, that suggests a hypothetical transfer of technique, perhaps linked to the movement of people from Iran and/or Pakistan to Eastern Arabia (Méry 1996). The evidence from Late Pre-Islamic period involves the primary study in this thesis of specific Indian vessel forms and fabric to identify those wares that may have been re-produced or replicated. These imitation wares include three varieties: 1. Wares most likely produced in Arabia by adopting similar techniques as attested in the Indian subcontinent, but using local clays, 2. Indian wares imported into Arabia that are copies of genuine wares produced in different parts of the subcontinent, 3. Possible imports or pottery styles from Egypt or Arabia that were introduced into the Indian subcontinent.

In the first variety, the present research has visually examined and studied samples of shell-tempered ware (Fabric 3) from Mleiha (PIR.D levels), where a majority of typical Indian *handi*-type vessels were recorded in this fabric, and which has no known pottery traditions or fabric parallels in the Indian subcontinent (Chapter 2 section 1.4.3). On the other hand, shell-tempered ware is well attested as a local fabric from several sites in the Dhofar region, of which samples from Khor Rori and Al Balid examined in this thesis revealed a fabric rather similar to Mleiha Fabric 3 (see Chapter 7 section 2.5). It could be hypothesised that the significant number of shell-tempered *handi*-vessels in Mleiha could indicate that these handmade vessels were manufactured in the Dhofar region, baked in open bonfires (supporting the lack

of kiln evidence at Mleiha) and were sourced mainly for the Mleiha market, where the demand for Indian cooking vessels seems to have risen in the 2nd-3th century AD (PIR. D) Phase.

Another fabric type under this first category is the Fine Indian Red Ware (FIRE) or Imitation RPW found in the context of several sites in Arabia (e.g. Khor Rori, Qana, Ed-Dur and later periods at Kush and Suhar). Among these, samples from Ed-Dur have been attested as actual imports (De Paepe et. al 2003). Similarly from Kush some of the FIRE samples resembled so-called RPW fabric from sites in Western India like Nevasa (based on visual examination) and may indicate low quality imports from the subcontinent. Several variations noted in FIRE fabric (see Chapter 2) from Kush could also include local imitations from the Gulf as previously indicated by Kennet (2004). Further scientific analysis of the Kush RPW and FIRE samples are required to confirm this. At Khor Rori, the identification of imitation RPW was noted first by Yule and Kervran (1993: 93) from the evidence of a bowl fragment with rouletting, and 'dot-and-circle motif. It showed an Indian influence in the glossy burnished surface and chattered frieze, while the row of dotted circles is a purely local invention, defined as a local product merging Roman, Indian and native taste or a "local imitation of Indian RPW or Sigillata". It is therefore evident that the local potters in Arabia had mastered the technique of applying slip and burnishing the vessel surface akin to that of RPW. This is not surprising owing to the fact that slipped wares is part of a long tradition of pottery manufacture in Arabia from the Iron Age period onwards. Similarly, the evidence of chattered frieze or rouletting might indicate a technique adopted from India (i.e. Rouletted Ware). This technique is widespread in the ancient Dhofari pottery repertoire where decorations were made after burnishing the vessel using pointed tools and/or with a rouletting technique, the same technique used until today in modern Dhofari ceramic tradition (Pavan 2011: 86). In a similar context, visual examination of FIRE samples from Khor Rori in this thesis revealed a fabric quite distinct from the Kush FIRE (Chapter 3 section 2.6.4). These wares are nearly identical to vessels often identified as RPW, but for the sometime poor firing and weak treatment of the surfaces that could never achieve the glossy criterion. Moreover several examples of red earthenware with grit or mica temper (imitation RPW) from the Islamic period sites of Hairidj and Ghayda al-Kabir

(c. 9th/10th centuries AD) probably indicate a continued tradition of FIRE in the Islamic period using local clays. Moreover the fabric of imitation RPW from the Islamic sites in Yemen is nearly similar to the Khor Rori fabric examined in this thesis (with grit, vegetal and mica temper, grog/clay pellets), suggesting that both FIRE groups belonged to a similar local source (Chapter 7 section 2.4). Fine Red Ware as a manufacture technique surely is widespread in India and may be mistaken for actual RPW due to the shiny polished surfaces. Further work is required from the context of Indian sites to separate Fine red wares from true RPW, based on some of the inclusions and attributes defined in the fabric classification study in this thesis

In the second group of imitation ware that (copies of genuine wares manufactured in the subcontinent) includes examples of Rouletted Ware or Black-and-Red ware from Khor Rori that have been examined as part of this thesis. It has previously been stated that imitation RW and BRW reached the port of Khor Rori sourced from the aforementioned Key area 4 (Southern India and Sri Lanka). While a source in eastern India particularly West Bengal may be attributed to the original RW, the production of imitation RW in southern India and Sri Lanka was most probably decentralized and relied on clay from various sources.

In the third category, imitation wares comprise Arabian or Egyptian influenced vessel forms that could have been introduced to the Indian subcontinent. Among these, the 'oil lamp' (lamp or lid type) is well attested at sites in the Arabian Gulf and South Arabia namely Mleiha, Khor Rori and Qana. In India, the shape is commonly referred to as cup-and-saucer shaped lid or ink-pot type lid distributed particularly along the Western and Coromandel coasts (Bet Dwarka and Arikamedu) (for a detailed list of sites from India see Chapter 2 section 1.3.4) However the most numbers of this vessel form occur in the Early Christian sites in Egypt at Shabwa and along the Nile in Nubia could instead imply that this vessel form was developed and manufactured in and around southern Egypt and introduced in Arabia, while the pottery style was introduced further east. The Indian subcontinent as a primary provenance area is questionable, given that relatively fewer vessels have been recorded from early historic - medieval sites. The form may also have been inspired from Southeast Asia with evidence of these lid types from Thailand as early as the

4th - 2nd century BC and Vietnam beginning from 1st century BC that could also suggest an east-west expansion of this form (see discussions in Chapter 7 section 2.2). The second important attribute of the lamp or lid is that the form was modified and adapted to different functions/uses depending on the site (as oil lamps in Egypt and Arabia with evidence of wick nozzles and burning in the central concavity, probably reused as lids; as jar stoppers and lids with a central knob in the Indian and Southeast Asian contexts). Finally, although the fabrics of the Nubian type differ from Indian lamp-lid wares, visual examination of samples demonstrates some oil lamp forms of possible Indian production in the Arabian, African and Red Sea contexts. Lamp-lids in organic black or spongy ware (similar to the Kamrej fabric) were recorded from Berenike and Ras Hafun (Tomber 2000a). An oil lamp of possible Indian production (Inv. 35A) was recorded at Qana (similar to the Berenike example; see Davidde & Petriaggi 1998). Similarly the fabric sample from Khor Rori examined in this thesis (SUM11A US470, 45; See Chapter 7 Fig. 197) has similar tempering materials and clay texture as the Kamrej lamp-lid sample in coarse red (see chapter 7 Fig. 195).

The above evidence indicates but a few examples of imitation Indian wares in the Arabian context. Further study may reveal other so-called imports from the subcontinent that could instead represent locally produced copies. Also a further re-examination of the Indian wares from Arabia could indicate some actual Egyptian coarse ware forms (frequently slipped), which are often mistaken for Indian imports (see Ballet 2005; Chapter 7 section 2.1). Imitation Indian wares including local copies could be one explanation for the presence of a large number of Indian utilitarian pottery from the Arabian and Red Sea sites, not all of which were actual imports from the subcontinent. However this evidence cannot disregard the large quantities of Indian pottery that were sourced from the Indian subcontinent (from the previously indicated four key provenance areas). Kennet (2004: 96) has earlier suggested that communities of South Asians in the Gulf used Indian domestic wares particularly cooking vessels, perhaps for cultural reasons in spite of the availability of locally made cooking wares. Another explanation for the large number of Indian storage vessels was suggested by Gupta (2007) as part of the theory of 'aromatics for food trade' that generated a high demand for container wares. However their low

quality and fragile nature could indicate that these Indian vessels were probably worthy of transporting over long distances for their contents. Chapter 8 section 3 of this thesis discusses the botanical items of trade from India as mentioned in the historical sources, corroborated by archaeobotanical remains. The Periplus lists a majority of food items traded from India to Arabia. Given the lack of an extensive archaeobotanical record in the Arabian context, the aspect of culinary change (adoption of new food items and preparation techniques) is indicated in part by the Indian ceramic evidence and changes in the range of vessel forms from the Bronze Age to the Late Pre-Islamic period (Chapter 8 section 3.3). In this way it is important to acknowledge the significance of basic food items in the trade network from India to Arabia that focused on the transportation of basic necessities i.e. food (rice, grains, ghee and sesame oil) and raw material, essential for the subsistence of the local population (as a supplement to the local agricultural production) and the influx of South Asian traders/residents. These various interaction networks in the context of distribution of Indian pottery in Arabia will be discussed in the next section.

9.4 Indian pottery in Arabia and patterns of trade

Previous studies have based the reconstruction of Indian Ocean trade routes on the circulation and supply of foreign pottery e.g. Roman pottery in the Arabian Gulf (Rutten 2007) and the distribution pattern of torpedo jars and Late Roman amphorae in India (Tomber 2007). For the first time, this present research thesis has sought to reconstruct trade routes between India, Arabia and the Red Sea based on the evidence from the circulation and supply of Indian pottery. The distribution pattern for Indian vessels in Arabia (and Red Sea region) suggests the following seaborne routes from India:

Route A - India-South Arabia:

The distribution pattern of true Rouletted ware and related forms of pottery according to Pavan and Schenk (2012: 200) 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 (Schenk 2006: 130, fig. 3; Tomber 2008: 119). Therefore,

although RW originated somewhere in the Ganges valley, the pottery would have reached Sumhuram via the southern tip of India. It is possible that the paddle-impressed storage jars also formed part of this same consignment of vessels (including RW, BRW and Wheeler Type 24s) that were sourced from the regions along the eastern coast of India and in Sri Lanka and were transshipped either through the South Indian ports (Arikamedu, Alagankulam etc.) by way of Sri Lanka (Tissamaharama?) or via the port of Muziris to Khor Rori or directly to Berenike and Myos Hormos. By the time of the Periplus (1st cent AD) onwards, the new commercial trajectories seemed to be more oriented towards India's northwestern coast based on evidence from Khor Rori which includes Indian pottery (carinated pots, lids etc.) and coins (Kanishka I and Abhiraka, Satrap of Barygaza) (Pavan 2011: 103), indicating that along with coarse wares, fine pottery like RPW was also perhaps shipped directly from Gujarat to the Red Sea sites and South Arabia.

On the basis of Indian ceramic evidence it could be hypothesised that the rice-tempered wares, along with RPW, could have reached South Arabia directly from the Gujarat region. From here, the rice-tempered wares were shipped to the Red Sea port of Berenike. It is however, surprising that the RPW did not make its way to the Red Sea ports. It may be that there was no actual necessity for importing fine wares from the subcontinent. Also some of the CRSW and other Indian coarse red wares could have been shipped directly from western India or the Malabar Coast by way of South Arabia to the Red Sea.

Route B - India-Gulf:

For the second half of the 2nd century BC, molded ware and stamped pottery discovered on Failaka and overland at Petra, could have been transported from western India or northwestern India as part of a single consignment. It is possible that the mouldmade and other Indian wares first reached Gerrha or the other ports in eastern Arabia and then to Petra via the overland route.

For the Indian pottery found in the Gulf at sites such as Mleiha and Ed-Dur in the early centuries AD, it is possible that this material was cargoed via Barygaza or Barbarikon located in northwestern India to the Gulf along the India-Arabian Gulf leg as proposed by Seland (2011: 401). It is also possible that the Indian material first

reached the Suhar or Dibba harbour from where it was imported to Ed-Dur and Mleiha (Jasim 2006), the latter probably via an overland route. Alternatively, if Ed-Dur could be the likely contender for the port of Omana mentioned in the Periplus (PME 36), then it is also possible that the Indian material could have been re-exported from Apologos (near modern Basra) to Ed-Dur as both ports appear as a single trade unit where mutual exchanges took place (Salles 2005: 131). The involvement of other ports in northwestern India like Barbarikon is partly explained by the Indian cooking vessels from Ed-Dur represented in fine red slipped ware that were most likely sourced from west of the main production centres in Gujarat, in the Indus valley and/or possibly Pakistani Baluchistan (De Paepe et. al 2003: 214) and were probably transported to Ed-Dur via the India-Arabian Gulf route (Seland 2011).

Many of the common vessel forms of the 1st century AD suggests an indirect exchange between South Arabian ports and the Gulf, either overland or along local sea routes in the director of the Arabian Gulf (Rutten 2007). It is also plausible that some of the pottery reached the Arabian Gulf sites through contact with Arabian and Indian seamen trading with South Arabian ports of Qana and Sumhuram, which were connected to the Rome-India sea route through the Indian Ocean (Rutten 2007: 20).

Route C - Overland Arabia:

Frankincense routes (brief discussion in chapter 8 section 5.3) form a very important component of overland routes traversing the Arabian Peninsula. Kennet (2007: 109) indicates four possible overland routes: 1. South Arabia to Petra via Gerrha, carrying south Arabian incense, 2. South Arabia to Palymra, carrying south Arabian incense overland to Gerrha and then by sea and river, 3. Gerrha to Petra, carrying Indian goods brought to Gerrha by Sea and 4. South Arabia to Persia via Gerrha, carrying South Arabian incense.

According to Pavan (2011: 104-105) it is probable that other trade routes existed that has not been recorded. This is seen from the relations that Sumhuram had for example with the sites of the Gulf (Mleiha and Ed-Dur etc.) that can be seen in the exchange prestigious ceramic tableware, large storage vessels and also coins and artefacts. For the transportation of Indian vessels, for example imitation *handi* vessels in shell-tempered ware, it may be assumed that these vessels were produced

somewhere in South Arabia and transported overland along with other Hadrami material to Mleiha, where handi vessels in shelly fabric are prevalent. This is only a hypotheses and further work is required to ascertain the source of these shelly wares.

The above evidence encapsulates a few examples of possible trade routes from India from the perspective of Indian pottery distribution in Arabia. This evidence is in no means a full and detailed analysis of all possible seaborne and overland routes. It is probable that other trade routes existed that have not been recorded. Moreover the present researcher fully accepts that the transportation of Indian vessels and contents to Arabia does not necessarily entail direct trade routes from India, but could have been re-exported via several entrepôts; for example as suggested by Salles (2005) that Roman material in the Gulf did not come directly from the Roman world but instead reached the Gulf via Bharuch (Broach or ancient Barygaza) in India, from where they were re-exported to the Gulf. Similarly Gupta (2007) has hypothesised that Roman shippers reused the Roman amphorae and possibly Indian storage jars after selling their original contents in India by filling the vessels with Indian food essentials to be sold in the Arabian markets. Further detailed analysis of trade routes (both sea and overland) and possible entrepôts will have to be undertaken based on the study of the distribution of other foreign pottery in Arabia and the Red Sea.

Based on the existing data regarding Indian pottery distribution in Arabia, the present thesis has arrived at the following conclusions regarding trade patterns: 1. Routes by way of the Gulf and the Red Sea were in use during the same period through c. 1st century BC - 3rd century AD (see Seland 2011; Chapter 8 section 5.2). The pottery evidence from India also suggests that these two axes of Indian Ocean trade were in concurrent use. 2. The difference in the range of Indian vessels between the Gulf and the South Arabian ports indicates that while certain vessel groups (i.e. RW, Wheeler Type 10 etc.) probably reached the Red Sea ports via South Arabia, the absence of these ceramic types from the assemblages in the Gulf (which had its own diverse set of Indian vessels) suggests that not all Indian pottery or contents were meant for the Red Sea market.

From the Ptolemaic period onwards, the taste for luxury items from the East

particularly India was a major driver of the Indo-Roman trade. A shift in the 1st century AD was evident in a predominance of containers for transport and storage and utilitarian vessels against fewer pieces of tablewares. In the Gulf, with the exception of Ed-Dur where a majority of Indian bowls/dishes was recorded, at Mleiha, Suhar and possibly Dibba, domestic vessels (particularly for cooking and storage) were prevalent, a trend that continues into the Islamic period at Kush and Suhar. This could indicate that by the 1st century AD, the Bulk Goods Networks (BGNs) that involved the transportation of basic food essentials gained priority. This network existed in combination with PGNs primarily in South Arabia's aromatics trade with Roman Egypt and India.

Patterns of trade in the Indian Ocean can be reconstructed based on a 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.' The modern world-system, based on Immanuel Wallerstein's model (1974) is stratified by what is termed a core/periphery hierarchy in which core regions dominate and exploit peripheral regions. The general theory of Chase-Dunn and Hall differs from Wallerstein, and most other world-system specialists, in that their general account is a holistic structure of local, regional, national and global relations with greater emphasis on the role of intersocietal interactions in social change (Bledsoe 2000: 64). Moreover, while Wallerstein's modern world-system emerged in the in the sixteenth century in Europe and expanded to incorporate the whole globe by the early twentieth century, Chase-Dunn and Hall modified and redefined the modern system to make it applicable to prehistoric, ancient, classical and medieval systems (ibid 1997: 65). Accordingly, in most intersocietal 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 and 4. Bulk Goods Networks

(BGNs) - A network based on a division of labor in the production of basic everyday necessities such a food and raw materials.

The nature and scale of the various interactive systems in Arabia suggests several different networks. For example in the areas comprising the eastern Arabian seaboard, the Prestige Goods Network (PGN) moved locally and over great distances by means of both trade and indirect as well as possible direct procurement. While the Roman material in the Gulf was obtained by re-exporting from India (see Salles 2005), a large part of this material may have also been acquired directly via South Arabia. PGN trade also involved connections between the Arabian Gulf regions and the Characenian, Parthian and Sasanian kingdoms. This direct interest in a PGN merchant route to India, for example, led the Romans to seek to expand political and military control through the invasion of South Arabia by the Roman governor of Egypt Aelius Gallus in 26-25 BC (Sidebotham 1986). The failure of this Political/Military Network (PMN) was attributed in part by the overextension of supply lines from Egypt in the desert environment of Arabia. It is evident that the access to food networks was and is till today of paramount importance in the Arabian context, particularly in the desert regions. Food supply lines in the Eastern Arabian Seaboard were part of the Bulk Goods Network (BGN) comprising a local subsistence net that produced food for local consumption by means of fishing, hunting and horticulture. It appears that by the 1st century BC-AD, the local food production was supplemented by an influx of food items from the subcontinent (and Roman Egypt) to probably cater to the growing demands from the increased number of visiting traders as well as South Asian residents. Hall and Chase-Dunn (1999) refer to BGNs as 'the smallest networks based in the production of everyday necessities such as food and raw materials'. This concept takes on a new meaning in the Eastern Arabian Seaboard wherein bulk goods not only refer to small-scale local agricultural production, but in the larger-scale import of food items that sustained the growing number of visitors. It appears that while the Prestige Goods Networks (PGNs) dominated the Indo-Roman trade network, the interactions between India and Arabia were based mainly on the Bulk Goods Networks (BGNs). The significance of bulk goods in the form of basic food essentials and other commodities

to Arabia should not be therefore underestimated in the trade networks with India or Egypt and could in part reflect on the quantities of Indian cooking and storage vessels in Arabia. Further research will be able to uncover other such interactive networks in the Indian Ocean trade between Arabia and India.

9.5 Concluding statements

Recent studies have provided necessary impetus for a wider debate on trade and exchange in the Indian Ocean world. Roberta Tomber's book 'Indo-Roman Trade: From Pots to Pepper' has contextualised the evidence from throughout the Indian Ocean and not limited to one geographical area. The topical issues in this book are supported by new evidence, particularly from ceramics, texts and other objects while considering the changing scenes and forces involved in the evolution of the Roman Red Sea and lands to the East (Tomber 2008). In a similar approach, Eivind Heldaas Seland focused on the ports and political power in the Periplus and the organisation and impact of trade on complex societies along the coasts of Arabia, Africa and western/southern India (Seland 2010). On the other hand, Steven Sidebotham's (2011) and Timothy Power's (2010; 2012) respective research constitute regional case studies focused in the Red Sea region. Sidebotham's book 'Berenike and ancient maritime spice route' uncovers the role the city played in the regional, local, and "global" economies during the eight centuries of its existence, through the analysis of artifacts, botanical and faunal remains, and hundreds of the texts discovered during the various seasons of excavations at Berenike (Sidebotham 2011). Power's DPhil thesis and subsequent book (2012) titled 'The Red Sea from Byzantium to the Caliphate, AD 500-1000', examines the historical processes surrounding the demise of 'Classical' antiquity and formation of the Islamic world, through a careful analysis of excavation data and historical/Islamic documents. In this context of Indian Ocean trade studies, the present research based on detailed scientific analysis and recording of Indian ceramics is the first attempt to create a database of forms and fabrics for Indian Ocean trade ceramics, particularly on evidence from the Arabian context. This thesis fills in the necessary gaps and complements existing research on trade in the Indian Ocean world.

Chapter 9

From the perspective of the eastern Arabian seaboard, the 'India trade' of the Late Pre-Islamic period could almost be called a 'trade in ceramics', particularly Indian wares. Analysis of Indian pottery assemblages from the Gulf, Oman and South Arabia suggests that certain key areas in the Indian subcontinent were major participants in this trade. The Indian vessels were mostly transported for their contents of essential food items while specific forms including cooking vessels were clearly of preferred usage among the South Asian traders or residents. This also perhaps led to small-scale regional manufacturing of Indian vessel forms in Arabia using local clays. The presence of imports does not necessarily mean that South Asian merchants resided permanently during this period, although it is possible that foreign merchants did come periodically and settled for small periods of time. They brought with them not only material goods, but created Information Networks (INs) (Hall & Chase-Dunn 1999) and trends that might account for the variations in the socio-economic and cultural practices of Southeastern and South Arabia, including possibly pottery styles from the subcontinent, adoption and preparation of new food items etc. The eastern Arabian seaboard is a melting pot with people from all over the world and has attracted sailors and merchants from East Africa, the Red Sea, Iran, and the Indian subcontinent for centuries (e.g. Potts 2012: 63). While several cultural groups and their socio-cultural norms could have been assimilated into the mainstream/dominant society, the peoples of southeast and south Arabia were, and are still to this day, able to retain their ethnic identity while imbibing cultural and social influences from other regions in the Indian Ocean world.

LIST OF APPENDICES

APPENDIX 1.

List of Indian pottery forms recorded from Mleiha (PIR. D) period

1.3.1 Carinated Indian Vessels

(i) Handi vessels

1. ML10014; Sector: H; Locus: 5000; Description: Rim and neck portion of a carinated vessel. Grey to buff core applied with thick red slip externally (Fabric 2); Munsell Colour: Coarse grey core (7.5YR 6/1) with red slip varying from red (10R 4/8) to dusky red (10 R 3/4)

2. ML10084; Sector: H; Locus: 5008; Description: Everted rim with an inner groove and a ridged carination forming from the neck of the vessel. Clinky coarse red sandy fabric (Fabric 1); Munsell colour: Coarse reddish-orange core (7.5YR 6/8) and surface (7.5YR 6/6).

3. ML10150; Sector: H; Locus: 5029; Description: Carinated cooking vessel or handi with prominent flanged rim and a series of 4-5 horizontal incised ridges at the shoulder just above the point of carination and a rounded base. Coarse buff to grey fabric applied with red slip (Fabric 2). Evidence of soot stains seen on the exterior along the rim and neck of the vessel; Munsell Colour: Coarse grey fabric (2.5YR 5/1-6/1) with red slip (or red surface) (2.5YR 5/6).

4. ML10151; Sector: H; Locus: 5029; Description: Generally similar to ML10150. Variation distinguished in the form of the rounded everted rim and by the increased number of ridges at the shoulder (8-10 incised lines) just above the carination. Traces of soot on the exterior and interior surface of the vessel (Fabric 2). Portion of the rim, neck and shoulder is preserved; Munsell Colour: Surface varies from dark reddish gray (2.5YR 4/1) to red slipped surface (2.5YR 4/6-4/8) due to firing conditions.

5. ML10152; Sector: H; Locus: 5029; Description: Similar to ML10151. Coarse reddish grey fabric with micaceous temper and vestiges of red slip on the exterior (Fabric 2), ill-fired, 3 horizontal incised lines on the shoulder with traces of blackening on the outer wall; Munsell Colour: External surfaces range from yellowish red (5YR 5/6) to reddish grey (5YR 5/2) depending on firing conditions or contact with fire. Vestiges of discoloured red slip on the body (10R 4/4) and on the internal surface (10R 4/6).

6. ML10251; Sector: H; Locus: 5028; Description: Reddish-brown fabric with traces of red slip on the exterior and tempered with grey chalky inclusions (Fabric 1). Two deep horizontal incisions on the shoulder of the vessel above the point of carination. Munsell Colour: Similar fabric to 10250 but with slight variation in the colour of the clay and surface treatment; clay core (7.5YR 5/8), external surface (7.5 YR 6/6) & internal surface (7.5 YR 6/4)

7. ML10253; Sector: H; Locus: 5028; Description: Reddish-brown vessel similar to 10251 with traces of red slip and grey chalky inclusions in the temper (Fabric 1) and 3 deep ridge lines above the point of carination. Munsell Colour: Same as 10251

8. ML10255; Sector: H; Locus: 5028; Description: Coarse ill-fired dull brown ware (Fabric 1) with everted and rounded rim with groove above and on the upper part of the carination. Munsell Colour: Various hues of light brown to red; core (7.5YR 6/6) and surface (external and internal) (7.5YR 5/8)

9. ML10259; Sector: H; Locus: 5028; Description: Light orange ware (Fabric 1) with inward-turned rim with a groove line on the top edge of the rim and another just below the rim. 2 incised horizontal lines visible above the point of carination. Munsell Colour: Fabric similar to 10255 but with variations in hue; Core (7.5 YR 6/8) and Surface (7.5 YR 6/6)

10. ML10260; Sector: H; Locus: 5028; Description: Reddish brown ill-fired fabric (Fabric 2) with outward-everted rim. Traces of red slip on the exterior. Munsell

Colour: Same as 10251 and 10253.

11. ML10303; Sector: H; Locus: 5027; Description: Red clay covered with a dark red slip made with silty micaceous particles (Fabric 2). Everted rim with a prominent carination at the shoulder and 5 horizontal incision lines. Munsell Colour: Core (5YR 6/4) with red slip (5YR 5/8).

12. ML10250; Sector: H; Locus: 5028/5038; Description: Coarse reddish-brown clay with rounded rim. Ill-fired with traces of red slip on the exterior and tempered with grey shells (Fabric 3). Munsell Colour: Reddish-brown core (7.5YR 6/6) with a similar hue both on the external and internal surfaces (5YR 5/8)

13. M10252; Sector: H; Locus: 5028; Description: Coarse red ware with red slip on the exterior (Fabric 2). Only the rim and small portion of neck remaining (handi??). Munsell Colour: Core (5YR 6/8) with dark red slip on the external and internal surfaces (5YR 5/8).

14. ML10254; Sector: H; Locus: 5028; Description: Coarse red ware with an everted rim and with a groove above. Red slip visible on the exterior (Fabric 2). Munsell Colour: Same as 10252.

15. ML3593; Sector: CW; Description: Body fragment with carination visible at the shoulder with two incised lines above the point of carination. Shell-tempered ware (Fabric 3). No munsell colour available.

16. ML3470; Sector: DA; Locus: 1142; Description: body sherd with sharp carination forming a peripheral ridge similar to ML3593. Reddish-orange ware with white/grey temper (Fabric 1). No munsell colour available.

(ii) Ridge Carinated Vessels

17. ML10153; Sector: H; Locus: 5029; Description: Handi with out-turned flat rim and carinated body with no ridges at the shoulder. Brittle coarse red (organish-

brown) ware with a high concentration of eroded white shells and chalky grits or powdered limestone in temper (Fabric 3). Outer portion of the rim, neck and shoulder blackened possibly due to contact with fire; Munsell Colour: External surface in grey (7.5YR 6/1) and interior body surface in reddish yellow tones (7.5YR 6/6-6/8).

18. ML10154; Sector: H; Locus: 5029; Description: Handi or Indian cooking vessel with fabric similar to carinated vessel ML10153 – contains shell and chalky grits in the temper and signs of blackening on the inside (Fabric 3). With beaded ridged line above the point of carination, secondary ridge or rib at the shoulder and rounded base.

19. ML10156; Sector: H; Locus: 5029; Description: Nearly complete carinated vessel form with distinct secondary ledge and fabric of shelly temper (Fabric 3). Munsell Colour: The samples ML10154 - ML10156 generally share similar colour tones with slight variations. Coarse grey core (7.5YR 5/1-6/1) with light brown - reddish yellow/orange surface (7.5YR 6/4-6/6). The neck portion of the vessels ML10154 and ML10155 retains a darker shade of red (5YR 5/8). The fabric of ML10156 appears dull red with slightly whitened surfaces in part, probably from salt leaching.

20. ML10034; Sector: H; Locus: 5002/5008; Description: Coarse buff and grey ware with abundance of white shell in the temper (Fabric 3). Ridged carination at the elongated shoulder of the vessel. Two thin lines incised at the base of the neck, almost involuntarily. Munsell Colour: Light buff-grey (10YR 7/1) to grey (10YR 6/1 - 5/1)

21. ML10155; Sector: H; Locus: 5029; Description: Reddish-brown fabric blackened on the outside. Brittle with a high concentration of white shells in the temper (Fabric 3).

22. ML10156_4; Sector: H; Locus: 5029; Description: Carinated handi - part of the

rim and shoulder preserved. Variation of the chalky/shelly/gritty fabric (Fabric 3) and form, but with finger-tip decoration and pinching at the carination which gives a corrugated edge and a series of ridges above the carination. Heavily sooted below the carination; Munsell Colour: The ML10156_4 varies from the earlier 10156 sample with light buff - brown colour tone (2.5 Y 5/4-5/6) and vestiges of black soot on the decoration at the carination and below (2.5 Y 2.5/1 nearest).

(iii) Globular Vessels with Ridged Carination

23. ML10044; Sector: H; Locus: 5004; Description: Variation of type ML4158 with out-turned flat rim and ridged carination at the shoulder. Ridge line visible just below the rim of the vessel. Coarse red fabric with shelly particle inclusions (Fabric 3). Ill-fired or burnt core with shell grits. Munsell Colour: Buff to light red (10YR 6/4 - 6/6)

24. ML4158; Locus: CW; Description: Carinated globular vessel with out-turned rounded rim, ridged carination and ridged lines above the point of carination. Coarse red ware fabric similar to the above but with larger sized shell inclusions in the fabric (Fabric 3). Exterior is not slipped

25. ML4003; Locus: CW; Description: Globular vessel with beaded out rim, ridged carination at the shoulder and out-turned rounded edge. Coarse red ware with chalky grit and shelly inclusions (Fabric 3). No slip.

26. ML3010; Sector: CW; Locus: 1030; Description: Body fragment with a sharp protruding carination and globular base. No fabric description and munsell colour available.

1.3.2 Carinated Plates or Dishes

27. ML10035; Sector: H; Locus: 5002; Description: Carninated shallow plate/dish/pan with a prominent flanged rounded rim. Coarse greyish red fabric with mica content and sandy/gritty inclusions (Fabric 1), ill-fired, no slip; Munsell Colour: Grey (5YR 6/1) to reddish yellow (5YR 6/6).

28. ML3824; Sector: DA; Description: Shallow plate or basin with a flaring out-curved thick rim, carinated body and rounded base. Greyish-red coarse fabric with occasional orange coloured gritty inclusions or pellets in the core. Red slipped on the interior (Fabric 2). Other examples (without drawings) include:

- ML3990; Sector: CW; Locus: 1227; Description: Carinated plate with rounded rim (similar to ML3824). Brown ware with black core and sandy temper with thick red slip (Fabric 2).
- ML4130; Sector: CW; Locus: 1277; Description: Carinated plate with everted rim (Idem ML3824). Light buff ware with thin sandy temper and thick smooth red slip (Fabric 2).
- ML4237; Sector: CW; Locus: 1297; Description: Everted rim of carinated plate similar to ML3824. Buff ware with abundant white chalky temper and lustrous thick red slip (Fabric 1).
- ML3930; Sector: CW; Locus: 1216; Description: Deep carinated dish with an everted rim similar to ML3824. Red sandy ware with medium white/grey temper (Fabric 1).

29. ML2627; Sector: CW; Description: Discovered on the surface level of the fort in area CW. Nearly similar in form and fabric to ML3824 (Fabric 2).

30. ML4441; Sector: CW; Description: Thick everted squared rim with sharp carination at the shoulder and a ridge-line running along the middle of the vessel exterior at the point of carination. Coarse red ware fabric with red slip on the interior and a red wash on the exterior (Fabric 2). No munsell colour available.

31. ML3496; Sector: CW; Locus: 1097; Description: Example of a shallow dish with a long everted flat rim and a deep groove at the top of the lip with incised lines running along the exterior of the rim. Rounded base with curved sides but no carination at the shoulder. Reddish-orange ware with white/grey sandy temper (Fabric 1). No munsell colour available.

32. ML3894; Sector: CW; Locus: 1217; Description: Shallow dish with everted rounded rim and groove on top of the lip. Brown ware with white/grey sandy temper and mica particles (Fabric 1). No munsell colour available

33. ML2657; Sector: CW; Locus: 902; Description: Everted rounded and slightly flanged rim of a dish with a carinated shoulder. Buff ware with grey core and thick red slip (Fabric 2). No munsell colour available. Another example (without illustration) includes:

— ML2605; Sector: CW; Locus: 944; Description: Similar to ML2657. Buff ware with grey core and thick red slip (Fabric 2).

34. ML3724; Sector: DA; Locus: 1110; Description: Thin everted rim with prominent ridge lines below the neck and at the point of carination. Buff orange ware with white mineral temper and red slip (Fabric 1). No munsell colour available.

1.3.3 Bowls

35. ML2616; Sector: CW; Locus: 937; Description: Round thick incurved rim. Fine buff ware with grey core and red slip (Fabric 2).

36. ML2683; Sector: CW; Locus: 933; Description: Bowl with triangular rim with a flat top and slight carination at the shoulder. Brown ware with red slip (Fabric 2).

37. ML3376; Sector: CW; Locus: 1045; Description: Bowl with a triangular undercut rim with a tapering tip and a rounded base. Orange-brown ware with fine white grey grits (Fabric 1).

38. ML2555; Sector: CW; Locus: 906; Description: Wide v-shaped vessel with a triangular nearly bevelled rim. Buff ware with red slip partially burnished (Fabric 2). No munsell colour available.

39. ML3089; Sector: CW; Locus: 1010; Description: Incurved Rimless bowl with convex sides and spherical body. Red ware with red slip (Fabric 2). No munsell colour available.

40. ML2967; Sector: CW; Locus: 949; Description: Bowl with incurved rounded rim. Buff ware with sandy temper and red slip (Fabric 2).

41. ML4220; Sector: CW; Locus: 1290; Description: Triangular rounded rim of bowl with convex sides and spherical body. Buff ware with red slip (Fabric 2), Burnished.

42. ML3980; Sector: CW; Locus: 1249; Description: Bowl with everted rounded rim, vertical walls and a carination at the shoulder. Buff ware with vegetal temper and grits with a light red wash (Fabric 1). No munsell colour available.

43. ML3465; Sector: DA; Locus: 1120; Description: Vertical rounded rim of bowl with carination at the neck and 'finger-nail' impression or decorations at the point of carination. Slip visible on the exterior (probably blackened by fire).

44. ML3450; Sector: DA; Locus: 1132; Description: Single example of an unsual bowl probably reused as a oil lamp with a nozzle cut in the rim. Complete bowl/lamp with flaring sides and deep flat disc base. Form Parallels: Ter (Chapekar 1969: Type 11A; Fig.7). Fabric is reddish-orange ware with white/grey sandy temper and red slip (Fabric 1). No munsell colour available.

1.3.4 Lids or Lamps (Oil Lamps)

45. ML10031; Sector: H; Locus: 5002; Description: Lamp or lid with rounded or sagging base and thickened rim. Coarse buff yellow fabric with chalky white wash (Fabric 1) or salt leaching, ill-fired. Munsell Colour: Coarse ware (10YR 6/4) with grayish white surface (5YR 8/1; 2.5Y 7/1; I0YR 7/1 nearest).

46. ML10108; Sector: H; Locus: 5018; Description: Dull reddish- brown paste with concentration of white inclusions towards the outer lip or rim (Fabric 1). Only part of

rim portion; central cup/reservoir missing. Munsell Colour: Light grey (7.5YR 7/1) to dull brown (pinkish) surface (7.5 YR 7/3).

47. ML10109; Sector: H; Locus: 5018; Description: Lamp or lid with its roof lower than its base; ringed handle at the centre with a thick rim. Dull brown fabric (Fabric 1) with a blackened centre that includes the inside of the cup and the exterior side. Munsell Colour: Gray core (l0YR 4/1) with pale/dull brown (7.5YR 6/3-6/4) surfaces.

48. ML10142; Sector: H; Locus: 5029; Description: Lamp or lid a round bottom and small reservoir in the centre. Coarse buff yellow to red-brown ware with a chalky wash (Fabric 1) or salt leaching? visible on the outer side, no traces of firing visible. Munsell Colour: Varying from light yellowish brown (2.5Y 6/3) to brownish yellow (10 YR 6/8).

49. ML10143; Sector: H; Locus: 5029; Description: Lamp or lid with only thick rim portion preserved. Reddish orange fabric with occasional white grits in temper (Fabric 1), ill-fired. Munsell Colour: Coarse red ware surface (5YR 5/6-5/8)

50. ML10144; Sector: H; Locus: 5029; Description: Lamp or lid with a thick rim and shallow central cup. Reddish orange coarse fabric (Fabric 1), no visible traces of firing. Munsell Colour: Slightly duller tones of 10YR 5/4 - 5/8 with what appears to be vestiges of discoloured red slip (5YR 5/8)

51. ML10145; Sector: H; Locus: 5029; Description: Lamp or lid with slighly under-cut rim. Greyish red ware fabric (Fabric 1) with evidence of burning in the central cup. Munsell Colour: 10YR 5/4-5/6

52. ML10148; Sector: H; Locus: 5031; Description: Lamp or lid similar to ML10142 and ML10146. Coarse light orange medium fabric (Fabric 1) with traces of bitumen along the rim. Munsell Colour: 7.5YR 5/6-5/8

53. ML10241; Sector: H; Locus: 5028; Description: Nearly complete lid with an elongated base tapering towards a central cup. Traces of bitumen on the inner face (bottom). Munsell Colour: Dull pinkish grey to pinkish brown fabric (Fabric 1) (5 YR 7/3 - 7/4).

54. ML3381; Sector: CW; Description: Complete vessel with a thick sloping undercut rim and central reservoir in an reddish-orange ware with white or grey sandy temper (Fabric 1). No Munsell colour available.

55. ML3553; Sector: DA; Locus: 1112; Description: Fragment of thick rim with oblique wall and central cup missing. Medium buff orange ware (Fabric 1). No Munsell colour available.

56. ML3634; Sector: CW; Locus: 1049; Description: Oblique or sloping lid fragment with incised lines or ridge lines on the inner wall. Central cup missing. Reddish-orange fabric with white/grey sandy temper (Fabric 1). No munsell colour available.

57. ML3907; Sector: H; Locus: 1171; Description: Similar to 3553 in a buff to brown ware with a white/grey sandy temper (Fabric 1). No munsell colour available.

58. ML3978; Sector: CW; Locus: 1249; Description: Sloping or oblique rim with groove lines or ridgelines on the inner wall with a part of the central cup preserved. Reddish-orange ware with thin chalky white temper and red slip (Fabric 2) with traces of bitumen. No munsell colour available.

59. ML4442; Sector: CW; Description: Fragment of thick sloping rim. No fabric description or munsell colour available.

60. ML4524; Sector: CW; Description: Fragment of an oblique wall with a slightly undercut rim. Gritty ware (Fabric 1). No munsell colour available.

61. ML4586; Sector: CW; Description: Complete form of a lamp/lid thick undercut

rim and deep central reservoir with a deep groove in the inner wall. Brown ware (Fabric 1). No munsell colour available.

62. ML4224; Sector: CW; Description: Only central reservoir preserved in brown ware with thin white/chalky white inclusions and red slip (Fabric 2). No munsell colour available.

63. ML4587; Sector: CW; Description: Lamp or lid with only the central cup preserved. Ink-pot type with rounded base. Munsell Colour: No Munsell colour available.

64. ML4593; Sector: CW; Description: Lamp or lid with an under-cut rim of dull red ware and gritty temper (Fabric 1). Munsell Colour: Coarse surface of light yellowish brown fabric (10YR 6/4).

65. ML10009; Sector: H; Locus: 5000; Description: Wide-rimmed lamp/lid variety with central base or cup and most of the body missing/broken. Sandy or buff fabric with white inclusions (Fabric 1). Small blackened patches seen on the surface. Munsell Colour: Buff beige core (2.5Y 8/2) with a light grey surface (exterior and interior) (2.5Y 7/2)

66. ML10024; Sector: H; Locus: 5000; Description: Rim portion of lamp/lid variety. Coarse buff fabric with white inclusions (Fabric 1). Munsell Colour: Buff core (2.5Y 8/2 - 8/3) with brownish-grey internal surface (2.5Y 6/2) & greyish-brown exterior surface (2.5Y 5/2).

67. ML10043; Sector: H; Locus: 5002; Description: Lamp or lid with only central portion of the cup preserved. Coarse buff ware with chalky grits (Fabric 1). Munsell Colour: Inside of the shallow cup - greyish brown coarse ware varying from (10YR 5/2) to (10YR 4/2) on the external surface. Possibly caused due to ill-firing.

68. ML10146; Sector: H; Locus: 5029; Description: Lamp or lid with only the small

central reservoir preserved. Coarse reddish-orange fabric with occasional chalky (powdered limestone) grits (Fabric 1). Traces of fire (blackening) along the inside edge of the central cup indicate possible reuse as a lamp. There is also the presence of a small opening or nozzle on one side of the central cup to place a wick. Evidence of bitumen along the edges of the broken cup. Munsell Colour: 7.5YR 5/6-5/8

69. ML10147; Sector: H; Locus: 5031; Description: Lamp or lid in reddish orange to light red fabric (Fabric 1). Only thick rim portion preserved. Evidence of bitumen along the sides of the rim; probably from contact with bitumen-coated vessels from Mesopotamia or in the Gulf. Munsell Colour: 7.5YR 5/6-5/8

70. ML10315; Sector: H; Locus: 5027; Description: Central cup/reservoir preserved of bright orange fabric (Fabric 1) and no visible signs of firing. Munsell Colour: 7.5YR 5/6-5/8

71. ML10321; Sector: H; Locus 5039; Description: Rim portion of lid with a concave sloping edge. Sandy brown fabric with remnants of orange wash on the internal sloping edge of the rim (Fabric 1). Munsell Colour: Dull buff - grey fabric (2.5Y 7/2 - 7/3) with traces of orange wash (10YR 6/6).

72. ML10369; Sector: H; Locus: 5029; Description: Rim and part of the body of a lamp/lid type. Dull pinkish-brown fabric (Fabric 1), smoothened on the inside. Thick rim with a slightly tapering base with central cup missing. Munsell Colour: External surface - light grey to pinkish-grey/brown (5YR 7/1 - 7/3) due to firing conditions. Internal surface - Gray (5YR 6/1) to reddish-yellow (5YR 7/6)

73. ML10372; Sector: H; Locus: 5045; Description: Thick sloping rim and including portion of the body; reddish - orange fabric with chalky/gritty inclusions (Fabric 1). Munsell Colour: Pink - reddish yellow 7.5YR 7/4 - 7/6

74. ML10398; Sector: H; Locus: 5026; Description: Lid made from a blackish-grey fabric (colour variations at places probably due to firing). Evidence of striation

marks and presence of whitish gritty/chalky inclusions (Fabric 1). Munsell colour: Gray (7.5YR 6/1 - 5/1)

75. ML10400; Sector: H; Locus: 5026; Description: Lid with thick sloping rim; fabric varying from sandy brown to orange colour with white chalky inclusions (Fabric 1). Munsell Colour: Varies from 7.5 YR 7/1 to 7.5YR 7/4

76. ML10311; Sector: H; Locus: 5036; Description: Rim of thick burnt lamp/lid type.

1.3.5 Lids (Variation)

77. ML3403; Sector: CW; Description: Only base of the lid is preserved. Grey ware (burnt) with remains of red slip (Fabric 2). No Munsell colour available

78. ML3502; Sector: CW; Description: Lid-type with carination, thickened rim and concave profile above carination (see Wheeler et al. 1946: 66); similar fabric as ML3589 (Fabric 2).

79. ML3589; Sector: DA, Locus: 1112; Description: Lid or casserole with projected edge and higher base (convex lid); red or brown ware with sandy temper and red slip (Fabric 2). Munsell Colour: No Munsell colour available.

80. ML4387; Sector: CW; Description: Fragment of a convex lid with a portion of the rim similar to ML3589. No fabric or munsell colour available.

1.3.6 Flasks or funnel-mouthed vessels

81. ML10056; Sector: H; Locus: 5001; Description: Jar with funnel mouth, narrow neck and globular body. Vessel with flaring cut rim with an outward projection, short neck and bulbous body. Reddish-grey core treated with red slip and lightly burnished (Fabric 2). Medium fabric, ill-fired. Munsell Colour: Coarse light reddish-grey (2.5YR 7/1) with red slip of varying colour tones (2.5YR 6/3-6/4) and (2.5YR 6/6-6/8). Patches of dark gray on the exterior surface (5YR 4/1) due to contact to fire.

82. ML10090; Sector: H; Locus: 5009; Description: Miniature flask (votive vessel?). Coarse red ware treated with a red wash externally (Fabric 1). Narrow neck, rim missing. Probably also used as a wick (?) lamp as evidenced by heavy sooting on the upper part of the body and patched in the middle. Munsell Colour: Coarse light reddish-grey (2.5YR 7/1) with red slip of varying colour tones (2.5YR 6/3-6/4) and (2.5YR 6/6-6/8). Patches of dark gray to black on the exterior surface (5YR 4/1) especially near the neck due to contact to fire.

83. ML10104; Sector: H; Locus: 5020; Description: Portion of rim and neck of flask. Reddish-orange fabric, traces of red slip (Fabric 2), with vestiges of chalky wash around the neck. Identical in form to ML10056. Munsell Colour: Surface of dull orange or pink? (7.5YR 7/4) with red slip ranging from hues 5YR 7/6 - 5YR 6/8

84. ML4381; Sector: CW; Description: Vertical undercut rim of funnel-mouthed flask with narrow neck and globular body. Red slip on the exterior (Fabric 2). No fabric or munsell colour available.

1.37 Storage Jars and/or Cooking Pots:

85. ML10013; Sector: H; Locus: 5001; Description: Everted nail headed variety of rim squared in section. Very silty brown fabric well levigated and fired, with no visible temper. Smooth red slip with streak marks on exterior and interior of the vessel (Fabric 2). Munsell Colour: Light reddish brown core (2.5YR 7/3) with slip on the exterior of reddish yellow (7.5YR 6/8) and interior slip (7.5YR 5/8)

86. ML10068; Sector: H; Locus: 5008; Description: Rim portion of shell-tempered coarse buff ware interior with a red wash on the exterior and containing evidence of black stains resulting from firing (Fabric 3). Munsell Colour: Surface hues ranging from light grey to light brown with reddish tones (7.5YR 6/1 to 6/6)

87. ML10205; Sector: H; Locus: 5029; Description: Globular base/body made from light buff sandy fabric (Fabric 1). Core dark grey – black which shows signs of ill-firing of the vessel. Inner surface of the vessel shaped using uneven pressure, while

exterior is well smoothed and no slip. Munsell Colour: Dark reddish grey core (2.5YR 4/1) with a buff matte surface (2.5YR 7/3)

88. ML10209; Sector: H; Locus: 5029; Description: Only body of the vessel preserved; rim and neck portion are missing. Large vessel with cut at sharp angles at the base and shoulder of the vessel. Prominent grooves or ridge-lines visible in the interior of the vessel. Coarse micaceous red slipped ware with a blackened base (Fabric 2). Munsell Colour: Exterior surface/core (10YR 6/6) with a red slip on the exterior only (7.5 YR 5/8 & 7.5YR 5/8 & 7.5YR 4/6) and interior surface with a pale reddish grey surface and no slip (2.5YR 6/2)

89. ML10211; Sector: H; Locus: 5036; Description Globular vessels with a broad flaring mouth and a ridge below the constricted neck and bulbous/spherical body. Coarse red ware with a red slip on the exterior smoothed by streaking (Fabric 2). Munsell Colour: Core reddish grey (5YR5/2) with red slip on the exterior surface (5YR 5/6 to 5/8) interior surface reddish brown hue (5YR 6/4)

90. ML10242; Sector: H; Locus: 5028; Description: Special class of pinkish well-fired fabric. Distinguished by a beaded rim and a foot-ring base. Smooth red slip on the exterior of the vessel (Fabric 2). Unlike the Arikamedu examples, the Mleiha vessels do not have a carinated shoulder. Munsell Colour: pinkish red surface (5YR 7/4 to 7/6) with red slip (2.5 YR 5/8)

91. ML10243; Sector: H; Locus: 5028; Description: Fabric, form and munsell colour are same as ML10242

92. ML10256; Sector: H; Locus: 5028; Description: Coarse reddish-brown fabric with visible sandy/gritty inclusions (Fabric 1). Rounded and parallel curving rim and neck/shoulder portion of vessel. Munsell Colour: Pale reddish-yellow/brown surface (5YR 5/6).

93. ML10312; Sector: H; Locus: 5033; Description: Basin like vessel made from an

orange well-levigated clay. Traces of red slip on the interior and exterior (Fabric 2). Squared rim with no neck. Munsell colour: Reddish brown-orange core (7.5YR 6/8 to 5/8) with a red slip (2.5YR 5/8)

94. ML10317; Sector: H; Locus: 5039; Description: Fabric varying from light brown to red colour on the exterior of the vessel to black inside with chalky white powdered inclusions (shell?) (Fabric 3). Globular vessel with a thick downward sloping rim without a neck and carination. Munsell colour: Exterior hue ranging from 5YR 7/4 to 7/6 and interior surface of light grey (5YR 7/1) to dark grey (5YR 4/1)

95. ML3957; Sector: CW; Locus: 1252; Description: Rim sherd of a cooking pot with externally projecting rounded rim with an undercut. Shell tempered reddish ware with black core and red slip (Fabric 3). No Munsell colour available.

96. ML2486; Sector: CW; Locus: 901; Description: Externally projecting triangular rim. Red ware with shelly temper (Fabric 3). No Munsell colour available.

97. ML2509; Sector: CW; Locus: 901; Description: Everted rounded and undercut rim of narrow-necked vessel. No fabric or Munsell colour available.

98. ML2510; Sector: CW; Locus: 901; Description: Thick everted and tapering rim. Red ware with gritty temper (Fabric 1). No Munsell colour available.

99. ML2629; Sector: CW; Locus: 925; Description: Thick everted rounded rim. Reddish-orange ware with shelly temper and red slip (Fabric 3). No Munsell colour available.

100. ML2692; Sector: CW; Locus: 943; Description: Rim sherd of externally everted the rim. Reddish ware with abundant shelly temper and blackened by fire (Fabric 3). No Munsell colour available.

101. ML3125; Sector: CW; Locus: 948; Description: Thick externally projecting rim. Reddish-orange sandy ware (Fabric 1).

102. ML4200; Sector: CW; Locus: 1299; Description: Vessel with externally projecting and tapering rim with a groove through the middle of the lip. Brown ware with white chalky temper and red slip on the vessel interior and exterior (Fabric 1). No Munsell colour available.

103. ML4297; Sector: CW; Locus: 1295; Description: Everted cordoned rim of a jar with a narrow neck. Red ware well-levigated and well-fired with fine grey and white temper and a deep red slip (Fabric 2). No Munsell colour available.

104. ML4435; Sector: CW; Locus: ?; Description: Everted cordoned (bifid) rim of a jar with a narrow neck similar to ML4297. Brown ware with red slip (Fabric 2). No Munsell colour available.

105. ML4567; Sector: CW; Description: Complete vessel with short neck and globular body. Outer edge of the rim divided into two by a deep groove. Coarse red ware with traces of red slip on the surface (Fabric 2).

106. ML3425; Sector: DA; Description: Variation of form ML3644 with multiple grooves along the rim of the vessel. Brown gritty ware with white or grey sandy temper and red slip (Fabric 1).

107. ML4482; Sector: CW; Locus: ?; Description: Rim sherd of a pot with a constricted neck and everted square rim with a shallow groove on top. A series of 3 incised lines are visible on the shoulder of the vessel exterior. No fabric or Munsell colour available.

108. ML4457; Sector: CW; Description: Globular pot - spheroid body tapering to a rounded blunt base, without the neck and rim. Parallels are seen with pottery from Kerala. Coarse red ware with fine sandy inclusions and white and red mineral

inclusions in the fabric, slipped externally and no slip on the interior (Fabric 2). Evidence of soot marks visible in patches at the base. Heavily sooted in the interior base of the vessel probably resulting from constant cooking activity.

109. ML3992; Sector: CW; Locus: 1246; Description: Round base of a cooking pot (30 - 35 cm) similar to ML3942. Brown-buff ware, well levigated, handmade with red slip on the exterior and evidence of burnishing (Fabric 2). No Munsell colour available.

110. ML3292; Sector: CW; Locus: 1038; Description: Cooking pot with everted curved rim with sloping sides and a globular base. Ridge-line visible on the neck on the vessel. Reddish-grey ware with red slip (Fabric 2). No Munsell colour available.

111. ML3423; Sector: DA; Locus: 1132; Description: Everted rim with a flat top, inwardly curved neck and rounded sides/base. Smooth brown gritty fabric (Fabric 1). No Munsell colour available

112. ML3889; Sector: CW; Locus: 1236; Description: Large close necked cooking vessel with externally everted and beaked rim with a groove on top of the rim. Brown ware with black core and vegetal temper (Fabric 1). No Munsell colour available.

113. ML3905; Sector: H; Locus: 1171; Description: Cooking vessel with everted rim. Brown ware blackened by fire with gritty and white sandy temper (Fabric 1). No munsell colour available.

114. ML3644; Sector: CW; Description: Variation of Taxila Type 77 and Arikamedu Type 72. Heavy out-turned cordoned or collar-stepped rim, constricted neck and spheroid body (Ghosh 1948). Coarse reddish sandy fabric with burnt grey core, tempered with sparse chalky grits, and organic material, no slip (Fabric 1).

115. ML10015; Sector: H; Locus: 5000; Description: Flat rim sherd with a rounded

smooth top. Rim with white inclusions on a buff (matte) surface with traces of red wash on the surface (Fabric 1). Munsell colour: Core hues ranging from light reddish gray to buff (2.5 YR 7/1 – 7/1) with a surface hue (7.5YR 6/6)

116. ML10257; Sector: H; Locus: 5028; Description: Everted incurving and rounded rim. Coarse red micaceous well levigated fabric covered with a red slip that appears to have been eroded from the surface of the vessel (Fabric 2). Munsell Colour: Red core (2.5YR 5/6) with a deep red slip (2.5YR 4/8)

117. ML10258; Sector: H; Locus: 5028; Description: Coarse brown fabric with an abundance of gritty/stony temper (Fabric 1). Rounded rim positioned almost perpendicular to the neck of the vessel. Groove on the upper part of the body under the rim. Munsell Colour: Pale brown to buff core (10YR 7/4) with a brownish-yellow surface (10YR 6/6)

118. ML10309; Sector: H; Locus: 5027; Description: Form similar to ML10209. Reddish-orange fabric with white inclusions. And visible slip or wash on the surface (Fabric 2). Spherical body highlighted by carination. Visible striation lines and traces of red or pinkish slip. Munsell colour: Light reddish or orangish brown core (5YR 6/3 to 6/4) External surface varies from pinkish (5YR 7/4) to reddish yellow (5YR 7/6) and internal surface (5YR 7/4)

119. ML10319; Sector: H; Locus: 5039; Description: Reddish-brown fabric with traces of blackening on the interior wall of the vessel and abundant use of white shell for tempering (Fabric 3). Flat back rim with pointed end. No sign of carination among the many sherds/vessels of this type collected from this Locus/UF. Munsell colour: Surface hues ranging from light brown to reddish-yellow or brown (7.5YR 6/4 to 6/6)

120. ML3942; Sector: CW; Locus: 1224; Description: Cooking pot with externally projecting and undercut rim with ridge-line below the rim of the vessel. Reddish ware with black core (Fabric 1). No Munsell colour available.

APPENDIX 2.

List of Indian pottery forms recorded from Ed-Dur

2.5.1 Type 1 - Carinated Vessels

Type 1a - Carinated '*handi*'

1. BS3511; Sector: BS; Locus: 6627; Square: VI 2; Description: Body fragment with a sharp carinated shoulder with typical incised ridge-lines but with no rim; Fabric: coarse red slipped; Surface: medium and slipped; Munsell colour: core 10YR 411 (dark gray), 10YR 6/4 (light yellowish brown), slip 2.5YR 5/6 (red).

Type 1b - Vessels with short-neck, everted rim and globular body (handi-type)

2. BS306; Sector: BS; Locus: 6515; Square: III 3; Form: Rim sherd of a pot with constricted neck and external projecting everted squared rim; Fabric: coarse red slipped; Surface: matt, coarse and granular with holes; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 5/4-5/6.

3. AF63; Sector: AF; Locus: 2500; Square: II 2; Form: Rim sherd of a pot with flared and everted rounded rim, Fabric: coarse red slipped; Surface: matt, smooth and granular with holes; Munsell colour: core 2.5YR 6/6 (light red), exterior 2.5YR 5/6

4. BL275; Sector: BL; Locus: 5748; Square: I 2; Form: Rim sherd of vessel with constricted neck and external projecting triangular rim with groove on the inner lip; Surface: matt, smooth with soot marks; Munsell colour: core 5 YR 6/6 (reddish yellow), surface 2.5YR 5/4 (reddish brown).

5. AF216; Sector: AF; Locus: test trench; Form: Triangular everted rim of cooking vessel with slight carination; Fabric: coarse red slipped; Surface: matt, smooth with holes; Munsell colour: core 10YR 3/1-2/1 (very dark grey-black), 10YR 7/4 (very pale brown), slip 5YR 5/6 (yellowish red).

6. BR194; Sector: BR; Locus: 6010; Square: II 4; Form: Everted squared rim with constricted neck and beaded collar; Fabric: coarse red slipped; Surface: matt, coarse and fine granular; Munsell colour: core 5YR 6/6 (reddish yellow), 2.5YR 4/4 (reddish brown).

7. BS6171; Sector: BS; Locus: 6723; Square: X 5; Form: Rim sherd of a pot with a bilaterally projecting squared rim with an undercut and a deep groove on the internal projection and a beaded collar on the neck; Fabric: coarse red slipped; Surface: matt, smooth with holes; Munsell colour: core 10YR 5/3 (brown), 5YR 6/6 (reddish yellow), slip 2.5YR 5/4-4/4 (reddish brown).

8. BS6043; Sector: BS; Locus: 6762; Square: X 4; Form: Horizontally everted rounded rim with a groove on top of the lip; Fabric: coarse red slipped; Surface: matt, smooth with holes; Munsell colour: core 5YR 4/6 (reddish yellow), 7.5YR 4/4-4/2 (dark brown), slip 2.5YR 5/6 (red).

9. BQ1416; Sector: BQ; Locus: 5943; Square: B 4; Form: Bilaterally projecting rim with rounded internal projecting and a corrugation or fold on the neck of the vessel below the rim; Fabric: coarse red slipped; Surface: glossy and fine granular; Munsell colour: core 10YR 7/2 (light grey), slip 2.5YR 5/8 (red).

10. BQ1417; Sector: BQ; Locus: 5943; Square: B 4; Form: Bilaterally projecting rim with round internal projecting with a series of corrugations on the neck and shoulder of the vessel; Fabric: coarse red slipped; Surface: matt, smooth and fine granular; Munsell colour: core 10YR 6/3 (pale brown), slip 2.5YR 6/8-5/8 (light red-red).

11. BS2437; Sector: BS; Locus: 6625; Square: VI 2; Form: Externally projecting rounded rim with internal projection and corrugations on the neck and shoulder of the vessel; Fabric: coarse red slipped; Surface: matt, smooth, fine granular; Munsell colour: core 10YR 4/1 (dark grey), 7.5YR 7/4 (pink).

12. BS4254; Sector: BS; Locus: 6701, Square: VII 5; Form: Rim sherd of a pot with a thick rounded and everted projection; Fabric: coarse red slipped; Surface: glossy, smooth with holes; Munsell colour: core 5YR 5/4-4/4 (reddish brown), slip 10R 3/6 (dark red).

13. BS3347; Sector: BS; Locus: 6573; Square: IV 2; Form: Rim sherd of a pot with an extremely everted rounded rim with an internal projection; Fabric: coarse red slipped; Surface: matt, smooth and fine granular; Munsell colour: core 10YR 4/1 (dark grey), 7.5YR 6/6 (reddish yellow), slip 5YR 6/6 (reddish yellow).

14. BQ1701, Sector: BQ; Locus: 5978; Square: A 4; Form: Externally projecting rounded rim with round internal projection; Fabric: coarse red slipped; Surface: matt, smooth and fine granular; Munsell colour: core 2.5YR 3/0 (very dark grey), 5YR 7/6 (reddish yellow), slip 2.5YR 6/4 (light reddish brown).

15. AF158; Sector: AF; Locus: 2503; Square: II 1; Form: Extremely everted squared rim with projection on the tip; Fabric: coarse red slipped; Surface: matt, coarse and scaly; Munsell colour: core 7.5 R 5/4-4/4 (brown), slip 2.5YR 5/6 (red).

16. BS5602; Sector: BS; Locus: 6760; Square: IX 4; Form: Incurved rounded rim with a slight carination at the shoulder of the vessel; Fabric: coarse red slipped; Surface: matt, smooth, coarse granular with holes; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 5/6 (red).

17. BO258; Sector: BS; Locus: 5803; Square: III 3; Form: Rim sherd of a small handi with an externally projecting rounded rim; Fabric: coarse red slipped; Surface: matt, smooth with holes; Munsell colour: core 5YR 5/3 (reddish brown), slip 2.5YR 6/6-6/4 (light red-light reddish brown).

Type 1c - Short-neck globular vessel without handi form

18. BO616; Sector: BO; Locus: 5907; Square: I 3; Form: Horizontally everted squared rim; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 2.5YR 6/6 (light red), slip 2.5YR 5/4 (reddish brown).

19. BQ1896; Sector: BQ; Locus: 5951; Square: B 5a; Form: Horizontally everted rounded rim with slight groove or carination beginning at the shoulder of the vessel; Fabric: fine red slipped; Surface: matt, smooth, fine granular; Munsell colour: 2.5YR 6/6 (light red), slip 10R 4/6-4/4 (light red).

20. BS563; Sector: BS; Locus: 6504; Square: III 4; Form: Horizontally everted thick rounded rim with deep groove on the top of the lip; Fabric: fine red slipped; Surface: matt and smooth with traces of slip; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 5/6 (red).

21. BO443; Sector: BO; Locus: 5901; Square: II 2; Form: Horizontally everted round tapering rim with groove on top of the lip; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 10R 6/4 (pale red).

22. N197; Sector: N; Locus: 2415; Square: IV 6; Form: Horizontally everted squared rom with shallow groove on top of the lip; Fabric: fine red slipped; Surface: matt and smooth with traces of soot on vessel rim; Munsell colour: core 5YR 6/6 (reddish yellow), exterior 10 YR 4/1-4/2 (dark grey-dark reddish grey).

23. BO58; Sector: BO; Locus: 5802; Square: III 2; Form: Horizontally everted slightly round rim with a sloping tip; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 2.5YR 5/4 (reddish brown), slip 5YR 4/1-4/2 (dark grey-dark reddish grey).

24. BC51; Sector: BC; Locus: 5602; Form: Externally projecting rim with a beaked external projection and a groove on the top of the lip; Fabric: fine red slipped;

Surface: matt, smooth with holes and soot traces on exterior; Munsell colour: core 2.5YR 6/6 (light red), exterior/interior 10YR 4/1 (dark grey).

25. AV15; Sector: AV; Locus: 4265; Square: II 1; Form: Externally projecting rim with a deep groove running along the tip; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 5YR 7/4 (pink).

26. AH51; Sector: AH; Locus: 2462; Square: III 2; Form: Triangular rim with two shallow grooves at the top of the lip and tapering near the neck; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 5YR 6/8-6/6 (reddish yellow).

27. BS2656; Sector: BS; Locus: 6563; Square: IV 4; Form: Externally everted rim with a rounded projection on the tip and a deep internal groove. Wavy ridge line visible along the exterior of the rim; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 10YR 4/1-3/1 (dark grey-very dark grey), 5YR 4/4 (reddish brown).

28. BQ32; Sector: BQ; Locus: 1914; Square: I 1-2; Form: Horizontally everted round tapering rim and short neck; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 2.5 YR 5/6 (red), slip 10R 4/4 (weak red).

29. BQ1974; Sector: BQ; Locus: 5984; Square: A 5a; Form: Everted tapering rim with groove or ridge on top of the lip; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 2.5YR 6/6 (light red).

30. BS6170; Sector: BS; Locus: 6723; Square: X 5; Form: Horizontally everted tapering or beaked rim with shallow groove on top of the lip; Fabric: fine red slipped; Surface: matt and fine granular; Munsell colour: core 5YR 6/6 (reddish yellow).

31. BS103; Sector: BS; Locus: 6512; Square: II 3; Form: Beaked or tapering rim with a prominent ridge on the upper part of the lip and constricted neck; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 5YR 5/4-6/4 (light reddish brown-reddish brown), slip 10YR 3/1-4/1 (dark gray-grayish brown).

32. BS11; Sector: BS; Locus: 6511; Square: II 3; Form: Everted beaked or tapering rim with a ridge on the upper part of the lip and constricted neck; Fabric: fine red slipped; Surface: matt and smooth, traces of slip; Munsell colour: core 5YR 6/2 (pinkish grey), slip 10YR 4/1 (dark grey).

33. BQ1436; Sector: BQ; Locus: 5943; Square: B 4; Form: Globular vessel with short-neck, everted squared rim with a tapering tip and shallow groove on the internal lip; Fabric: fine red slipped; Surface: matt and smooth with traces of bitumen? on interior; Munsell colour: core 7.5YR 6/4 (light brown).

34. BS654; Sector: BS; Locus: 6506; Square: III 4; Form: Externally projecting squared rim with deep groove on the tip and a shallow groove on the top of the lip; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 5YR 6/6 (reddish yellow).

35. BO648; Sector: BO; Locus: 5911; Square: I 2; Form: Up-turned rim with a deep groove on top of the lip with constricted neck; Surface: matt and smooth with traces of soot on exterior; Munsell colour: core 5YR 6/6 (reddish yellow).

36. BR728; Sector: BR; Locus: 6058; Square: VI 3; Form: Up-turned flat-top rim with a constricted neck and a beaded collar around the neck in coarse red slipped ware similar to BO 648; Fabric: fine red slipped; Surface: matt, smooth and vesicular; Munsell colour: core 2.5YR 4/2 (weak red).

37. BS537; Sector: BS; Locus: 6058; Square: VI 3; Form: Extremely everted squared rim with an undercut; Fabric: coarse reddish brown; Surface: matt and coarse; Munsell colour: core 5YR 5/4 (reddish brown).

38. BQ1817; Sector: BS; Locus: 5987; Square: A 4; Form: Externally projecting square or quadrangular rim with an incurved round tip and groove on top of the lip; Fabric: coarse reddish brown; Surface: matt and coarse; Munsell colour: core 10YR 4/1-4/2 (dark grey-dark greyish brown), 10YR 6/3 (pale brown).

39. BS199; Sector: BS; Locus: 6504; Square: III 4; Form: Rim sherd of a short-necked pot with externally projecting squared rim with an undercut; Fabric: coarse reddish brown; Surface: matt and coarse; Munsell colour: core 5YR 5/6 (yellowish red).

40. BS32; Sector: BS; Locus: 6503; Square: III 4; Form: Short-necked globular pot with out-turned tapering round rim; Fabric: coarse reddish brown; Surface: matt and coarse; Munsell colour: core 2.5YR 5/6 (red)

Type 1d - Ridge Carinated Vessel

41. BS4365; Sector: BS; Locus: 6751; Square: VII 4; Form: Body fragment with prominent ridge visible at the shoulder of the vessel; Fabric: fine rd slipped; Surface: matt, smooth and fine granular; Munsell colour: core 2.5 YR 5/6-5YR 5/3-4/3 (red-reddish brown).

42. M198; Sector: M; Locus: 4302; Square: V 3; Form: comprises a series of 3 incised ridge-lines above the point of carination; Fabric: coarse brown slipped; Surface: matt and smooth; Munsell colour: core 7.5YR 5/4 (brown), slip 2.5YR 5/6 (red).

2.5.2 Type 2 - Cooking vessels without carination

Type 2a

43. ED49; Sector: ED; Locus: surface find; Form: Complete vessel with horizontally projecting triangular rounded rim; Fabric: coarse vegetal reddish-black; Surface:

matt, smooth, exterior has been repaired; Munsell colour: core 10YR 3/1 (very dark grey).

44. L8; Sector: L; Locus: 0500; Square: IX 7; Form: Rim sherd of externally projecting triangular squared rim; Fabric: coarse vegetal reddish-black; Surface: matt, smooth, friable; Munsell colour: core 10YR 3/1 (very dark grey), interior 2.5YR 5/4-5/6 (reddish brown-red).

45. L319; Sector: L; Locus: 0533; Square: IX 7; Form: Externally everted triangular round rim; Fabric: coarse vegetal reddish-black; Surface: matt, smooth, friable; Munsell colour: core 10YR 3/1 (very dark grey), interior 5YR 5/4 (reddish brown).

46. N251; Sector: N; Locus: 2415; Square: IV 6; Form: Externally projecting extremely everted rounded rim; Fabric: coarse vegetal reddish-black; Surface: matt, smooth, friable; Munsell colour: core 10YR 5/2-4/2 (greyish brown-dark greyish brown), 5YT 5/6 (yellowish red).

47. N250; Sector: N; Locus: 2415; Square: IV 6; Form: Externally projecting thick everted squared rim with deep groove on top of the lip; Fabric: coarse vegetal reddish-black; Surface: matt, smooth, friable; Munsell colour: core 10YR 2/1 (black); 5YR 4/3- 10YR 3/2 (reddish brown - very dark greyish brown).

Type 2b

48. N63; Sector: N; Locus: 0531; Square: V 5; Form: Rim sherd with everted triangular, tapering rim and rounded internal projection. Rim and neck are nearly perpendicular to the base of the vessel; Fabric: coarse vegetal reddish-black; Surface: matt, smooth, friable; Munsell colour: core 10YR 2/1 (black), 7.5 YR 4/4 (brown-dark brown).

49. L54; Sector: L; Locus: 0503; Square: IX 7; Form: Everted triangular rounded rim with slightly beaked internal projection; Fabric: coarse vegetal reddish-black; Munsell colour: core 10YR 2/1 (black), 7.5 YR 5/6 (strong brown).

50. BS2254; Sector: BS; Locus: 6527; Square: V 3; Form: Complete vessel with beaked or tapering rim and round internal projection; Fabric: coarse vegetal reddish-black; Surface: matt, smooth, friable; Munsell colour: 10YR 4/1-3/1 (dark grey-very dark grey), 5YR 5/6 (yellowish red).

51. BO186; Sector: BO; Locus: 5756; Square: II 3; Form: Rim sherd of a vessel with a rounded rim and curved sides beginning from the neck of the vessel; Fabric: coarse vegetal reddish-black; Surface: matt, smooth with holes and friable; Muunsell colour: 10YR 5/3 (brown), 5YR 5/6 (yellowish red).

2.5.3 Type 3 - Plates or Dishes

Type 3a

52. BQ1218; Sector: BQ; Locus: 5972; Square: B 3; Form: with a flared beaded rim; Fabric: coarse brown-slipped; Surface: matt and smooth; Munsellcolour: core 10YR 5/3 (brown), slip 2.5YR 5/4 (reddish brown).

Type 3b

53. BQ31; Sector: BQ; Locus: 5914; Square: I 1-2; Form: Incurved tapering and beveled rim with a beaked external projection; Fabric: fine reddish brown and grey slipped; Surface: matt, smooth, vesicular; Munsell colour: core 10 YR 3/1 (very dark grey).

54. ED48; Sector: ED; Locus: surface fine; Form: Horizontally everted beaded rim with a shallow groove on top of the lip; Fabric: fine reddish brown and grey slipped; Surface: matt, smooth, flaky with fine glimmer; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 5/6 (red).

55. BS1862; Sector: BS; Locus: 6559; Square: IV 3; Form: Horizontally everted rounded rim; Fabric: fine reddish brown and grey slipped; Surface: matt, smooth and flaky with fine glimmer; Munsell colour: core 10YR 5/3 (brown), slip 10YR 4/1-3/1 (dark grey-very dark grey).

Type 3c

56. AF210; Sector: AF; Locus: 2505; Square: II 2; Form: Horizontally projecting rounded tapering rim; Fabric: coarse vegetal reddish-black; Surface: matt, smooth, vesicular with holes and friable; Munsell colour: core 10YR 5/1 (grey), 4/4 (dark yellowish brown).

57. BP21; Sector: BP; Locus: 5816; Square: I-II 1; Form: Externally projecting rounded tapering rim; Fabric: coarse vegetal reddish-black; Surface: matt, smooth, vesicular with holes and friable; Munsell colour: core 10YR 2/1 (black).

2.5.4 Type 4 - Bowls

Type 4a

58. BS5011; Sector: BS; Locus: 6756; Square: VIII 4; Form: Rim sherd of rimless bowl with incurved beaked lip; Fabric: coarse vegetal reddish-black; Surface: High glossy and smooth, finely scraped surface with flaky slip; Munsell colour: cpre 10YR 6/1 (grey), 5YR 6/6 (reddish yellow), slip 5YR 6/6-5/6 (reddish yellow-yellowish red).

59. N352; Sector: N; Locus: 2433; Square: IV 6; Form: Rim sherd of rimless bowl with triangular incurved lip; Fabric: very fine greyish-red slipped; Surface: very glossy, smooth; Munsell colour: core 10YR 5/1 (grey), 5YR 5/5 (reddish yellow), slip 10YR 4/3- 5YR 6/6 (brown-reddish yellow).

60. BS6169; Sector: BS; Locus: 6723; Square: X 5; Form: Triangular incurved lip with a groove on the external lip; Fabric: very fine greyish-red slipped; Surface: very glossy and smooth; Munsell colour: core 7.5YR 7/6 (reddish yellow), slip 5YR 5/6 (yellowish red).

61. AZ71; Sector: AZ; Locus: 5540; Form: Rim sherd of rimless bowl with rounded incurved lip and two fine ridge lines on the interior of the vessel near the lip; Fabric:

very fine greyish-red slipped; Surface: slightly weather, very glossy; Munsell colour: core 7.5YR 6/4 (light brown), slip 2.5YR 5/6 (red).

Type 4b

62. L248; Sector: L; Locus: 0515; Square: IX 6; Form: Rim sherd with incurved beaked lip and a series of two corrugations or grooves on the sides of the vessel with a carination at the shoulder; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 5YR 6/6 (reddish yellow).

63. BO252; Sector: BO; Locus: 5803; Square: III 3; Form: Rim sherd with rounded incurved lip and two prominent groove lines visible on the exterior of the vessel separated by a corrugation near the neck with a carination at the shoulder; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 7.5YR 6/4 (light brown).

Type 4c

64. L236; Sector: L; Locus: 0610; Square: XII 6; Form: Rimless bowl with an incurved tapering lip and thick curved sides; Fabric: fine reddish brown and grey slipped; Surface: flaky at places, matt, with fine glimmer and smooth; Munsell colour: core 5yR 5/6 (Yellowish red), slip 5YR 4/4 (reddish brown).

65. BS2777; Sector: BS; Locus: 6565; Square: IV 4; Form: Incurved tapering lip of a convex-sided bowl; Fabric: fine reddish brown and grey slipped; Surface: medium glossy and smooth, vesicular and flaky at places; Munsell colour: core 2.5YR 6/6 (light red), slip 2.5YR 5/6 (red).

66. BS469; Sector: BS; Locus: 6516; Square: III 3; Form: Rimless bowl with incurved lip and shallow groove on top of the lip as well as a corrugation or groove on the internal projection; Fabric: fine reddish brown and grey slipped; Surface: medium glossy and smooth, flaky at places with fine glimmer; Munsell colour: core 2.5YR 6/4-6/6 (light reddish brown-light red), slip 2.5YR 4/6 (red).

67. L306; Sector: L; Locus: 0523; Square: IX 7; Form: Rimless bowl with internally beaked lip; Fabric: fine reddish brown and grey slipped; Surface: matt, smooth and vesicular with fine glimmer; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 5/6-4/6 (red).

68. BQ111; Sector: BQ; Locus: 5961; Square: I 1; Form: Convex-sided carinated bowl with a featureless lip tapering up and two ridge-lines on the exterior at the point of carination; Fabric: fine reddish brown and grey slipped; Surface: matt, smooth and vesicular; Munsell colour: core 5YR 7/4-7/6 (pink-reddish yellow), slip 2.5YR 5/6 (red).

69. BR0099; Sector: BR; Locus: 6004: Square: II 3; Form: Rimless shallow bowl with a straight-sided neck and sharp carination at the shoulder tapering to a base; Fabric: fine reddish brown and grey slipped; Surface: medium glossy, smooth and flaky at places; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 5/6-4/6 (red).

70. BS5122; Sector: BS; Locus: 6757; Square: VII 4; Form: Convex-sided bowl with thick groove running along the middle of the vessel at the point of carination; Fabric: fine reddish brown and grey slipped; Surface: matt, smooth, vesicular and weathered; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 5/6 (red), 10YR 3/1 (very dark grey).

Type 4d

71. BS5207; Sector: BS; Locus: 6712; Square: VII 5; Form: Rim sherd of a carinated bowl with a small inverted rounded rim; Fabric: fine reddish brown and grey slipped; Surface: matt, smooth and vesicular; Munsell colour: core 7.5YR 6/4-6/6 (reddish yellow), slip 2.5YR 5/6 (red).

72. BS1854; Sector: BS; Locus: 6557; Square: IV 3; Form: Rim sherd with an inverted beaded tapering rim externally and a slight carination at the shoulder;

Fabric: fine reddish brown and grey slipped; Surface: matt, smooth and fine granular; Munsell colour: core 5YR 5/6 (yellowish red), slip 2.5YR 4/6 (red).

73. BS4696; Sector: BS; Locus: 6705; Square: VIII 5; Form: Rim sherd of a slightly excurved beaded rim with a ledge at the shoulder of the vessel; Fabric: fine reddish brown and grey slipped; Surface: matt and smooth with fine glimmer; Munsell colour: core and slip 10YR 5/1 (grey).

74. BS1106; Sector: BS; Locus: 6521; Form: Everted squared rim with beaked tip and corrugation on the sides of the vessel; Fabric: fine reddish brown and grey slipped; Surface: matt and smooth, flaky slip; Munsell colour: core 10YR 6/3 (pale brown), slip 10YR 5/2 (greyish brown).

75. BQ24; Sector: BQ; Locus: 5914; Square: I 1-2; Form: Externally projecting rounded rim of a shallow carinated bowl; Fabric: fine reddish brown and grey slipped; Surface: matt and smooth with fine glimmer; Munsell colour: core 2.5YR 6/6 (light red), slip 2.5YR 5/6 (red).

Type 4e

76. BR375; Sector: BR; Locus: 6028; Square: IV 3; Form: Convex-sided sided bowl with incurved beaded incised rim with two ridge-lines at the lip and 4 ridge-lines at the shoulder on the exterior of the vessel; Fabric: coarse red slipped; Surface: matt and smooth, weathered with holes; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 5/4-5/6 (reddish brown-red).

77. BQ1177; Sector: BQ; Locus: 5972; Square: B3; Form: Convex-sided bowl with inverted rounded rim; Fabric: coarse red slipped; Surface: matt and smooth, weathered with holes; Munsell colour: core 2.5 YR 5/6 (red), slip 2.5YR 5/4 (reddish brown).

78. BS3512; Sector: BS; Locus: 6627; Square: VI 2; Form: Convex-sided bowl with small out-turned beaded rim; Fabric: coarse red slipped; Surface: matt, smooth,

weathered with holes; Munsell colour: core 2.5YR 5/6 (red), slip 2.5YR 3/4 (dark reddish brown).

79. BS2766; Sector: BS; Locus: 6564; Square: IV 4; Form: Convex-sided bowl with small out-turned rim with a sharp tapering tip; Fabric: coarse red slipped; Surface: matt, smooth, vesicular with holes; Munsell colour: core 2.5YR 5/6 (red), slip 2.5YR 3/4 (dark reddish brown).

Type 4f

80. AH17; Sector: AH; Locus: 2460; Square: III 1; Form: Fragment of a bowl or basin with out-turned squared and beveled rim with sloping sides; Fabric: fine red slipped; Surface: fine glossy and smooth; Munsell colour: 2.5YR 6/4 (light reddish brown), slip 2.5YR 5/4 (reddish brown).

81. BS5820; Sector: BS; Locus: 6719; Square: IX 5; Form: Rim sherd with out-turned squared collared or beveled rim with rounded internal projection; Fabric: coarse red slipped; Surface: matt and smooth; Munsell colour: 2.5YR 6/6 (light red), slip 2.5YR 4/4 (reddish brown).

82. BQ492; Sector: BQ; Locus: 5965; Square: I 2; Form: Externally projecting featureless rounded rim with slightly concave sides; Fabric: fine reddish brown and grey slipped; Surface: matt and smooth; weathered with fine glimmer; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 4/6 (red).

2.5.5 Type 5 - Lids

83. BS2225; Sector: BS; Locus: 6620; Square: VI 4; Form: Fragment of a lid with a projected roof-edge having a broad corrugation above in the coarse red slipped; Fabric: coarse red slipped; matt, smooth with holes; Munsell colour: core 2.5YR 3/6 (dark red).

84. BR168; Sector: BR; Locus: 6009; Square: III 3; Form: Fragment of a lid with a domical roof making an angle with a flat-topped edge; Fabric: coarse vegetal reddish-black; Surface: matt, smooth with holes; Munsell colour: core 2.5YR 5/6 (red), exterior 5YR 4/3-10YR 3/2 (reddish brown-very dark greyish brown).

85. BO580; Sector: BO; Locus: 5907; Square: I 3; Form: Nearly complete lid with a domical roof, ledged, hanging lip to fit the mouth of a container; Fabric: coarse vegetal reddish-black; Surface: matt and smooth with holes; Munsell colour: core 2.5YR 6/6 (light red).

2.5.6 Type 6 - Bases

Type 6a

86. BS2650; Sector: BS; Locus: 6563; Square: IV 4; Form: Vessels with a foot-ring similar to Wheeler Type 18 (Arikamedu); Fabric: fine reddish brown and grey slipped; Surface: medium glossy, smooth and flaky at places; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 5/6 (red).

87. BS562; Sector: BS; Locus: 6504; Square: IIII 4; Form: similar in form to BS2650; Fabric: fine reddish brown and grey slipped; Surface: very glossy, smooth and flaky at places; Munsell colour: 5YR 6/6 (reddish yellow), slip 2.5YR 5/6 (red).

Type 6b

88. BS3449; Sector: BS; Locus: 6627; Square: VI 2; Form: Sharp v-shaped sides tapering to a flat base in fine red slipped ware; Fabric: fine red slipped; Surface: matt and weathered; Munsell colour: core 5YR 6/6 (reddish yellow), 2.5 YR 6/4 (light reddish brown), slip 2.5YR 5/6 (red).

89. BS5867; Sector: BS; Locus: 6719; Square: IX 5; Form: Smooth curved or rounded sides with a squarish flattened base; Fabric: fine reddish-brown and grey slipped; Surface: medium glossy, smooth, vesicular and flaky; Munsell colour: core 2.5YR 5/6 (red); slip 2.5YR 4/6 (red).

Type 6c

90. BS404; Sector: BS; Locus: 6516; Square: III 3; Form: Tapering squared base with a round knob at the tip; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 5YR 6/6 (reddish yellow).

2.5.7 Type 7 - High-necked vessels with globular body

91. BS2911; Sector: BS; Locus: 2911; Square: V 2; Form: Out-turned rounded rim with pointed tip on the exterior projection and high-neck; Fabric: fine red slipped; surface: matt and smooth; Munsell colour: core 2.5YE 5/6 (red), slip 10R 4/4 (weak red).

92. BS565; Sector: BS; Locus: 6504; Square: III 4; Form: Externally projecting quadrangular rim with external projection below the neck; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 2.5YR 5/6 (red), slip 10R 4/4 (weak red).

93. BS3012; Sector: BS; Locus: 6641; Square: VIII 3; Form: Everted squared rim with deep groove in the middle of the rim tip; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 2.5YR 6/4 (light reddish brown).

94. BP10; Sector: BP; Locus: 5814; Square: I-II 1; Form: Everted rounded rim with groove in the tip of the rim along the middle; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 10R 6/4 (pale red), slip 10R 5/4 (weak red).

95. L4; Sector: L; Locus: 0500; Square: IX 7; Form: Rim sherd of a high-neck vessel with a beaded rim and shallow groove on the upper side of the lip; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 5YR 6/6 (reddish yellow).

96. L55; Sector: L; Locus: 0503; Square: IX 7; Form: High-neck pot/jar with a beaded rim and a series of 4 ridge-lines at the shoulder on the interior and one incised line on the exterior at the neck; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 7.5YR 7/6 (reddish yellow).

97. BO468; Sector: BO; Locus: 5901; Square: II 2; Form: Similar to BS565; Fabric: fine red slipped; Surface: matt and smooth; Surface: matt and smooth; Munsell colour: core 5YR 6/6 (reddish yellow).

98. BA11; Sector: BA; Form: Rim sherd of high-neck vessel with externally projecting rounded rim; Fabric: fine red slipped; Surface: matt and finely weathered; Munsell colour: core 2.5YR 5/2 (weak red), slip 2.5YR 4/2 (weak red).

99. N158; Sector: N; Locus: 2404; Square: IV 5; Form: Rim sherd with everted squared rim with undercut; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 5YR 6/4 (light reddish brown).

100. BQ930; Sector: BQ; Locus: 5970; Square: B 3; Form: Rim sherd of high-neck vessel with horizontally everted tapering rim; Fabric: fine red slipped; Surface: fine glossy and smooth; Munsell colour: core 10YR 4/2 (dark greyish brown), 2.5YR 6/6 (light red), slip 2.5YR 5/6-3/4 (red-dark grayish brown).

101. BS2652; Sector: BS; Locus: 6563; Square: IV 4; Form: Rim sherd with up-turned square rim and rounded projection at the external side; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 2.5YR 6/6 (light red), slip 2.5YR 5/6 (red).

102. BR125; Sector: BR; Locus: 6005; Square: II 2; Form: Everted rounded rim with a tapering or beaked tip and groove on the interior of the rim; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 2.5 YR 5/6 (red).

103. AV149; Sector: AV; Locus: 4269; Square: I 1-2; Form: Externally projecting rounded rim with a round projection at the exterior tip and a groove on the upper side of the lip; Fabric: fine red slipped; Surface: matt and smooth; Musnell colour: 2.5YR 5/6-6/6 (red-light red), slip 10 R 5/6 (red).

104. BO673; Sector: BO; Locus: 5817; Square: V a; Form: Externally projecting squared rim with a sharp beaked projection at the tip and a groove on the interior of the rim; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 2.5yR 6/6 (light red), slip 2.5YR 5/6 (light red).

105. BB112; Sector: BB; Locus: 5545; Form: Everted quadrangular rim with a groove along the middle of the rim; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 2.5YR 6/6 (light red).

106. BR70; Sector: BR; Locus: 6001; Square: II 2; Form: Externally projecting quadrangular rim with a rounded projection at the exterior tip; Fabric: fine red slipped; Surface: matt and weathered; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 3/4-3/6 (dark reddish brown-dark red).

107. BQ1470; Sector: BQ; Locus: 5943; Sqyare: B 4; Form: High neck with everted round rim tapering at the exterior tip and a sharp v-shaped groove on upper side of the lip; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 10YR 5/1 (grey), 7.5YR 5/4 (brown), slip 5YR 4/3 (reddish brown).

108. N153; Sector: N; Locus: 2404; Square: IV 5; Form: Rimless incurved high-neck bowl with convex sided shoulders and a deep ridge line on the neck of the vessel; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 5YR 6/4 (light reddish brown).

109. N156; Sector: N; Locus: 2404; Square: IV 5; Form: Rimless slightly everted high-neck vessel with sloping shoulders and a ridge line on the shoulder of the vessel; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 5YR 6/6 (reddish yellow).

110. N236; Sector: N; Locus: 2415; Square: IV 6; Form: Rim with a convex profile with corrugations on the rim edge; Fabric: fine red slipped; Surface: matt and smooth; Munsell colour: core 2.5YR 6/6 (light red).

111. L235; Sector: L; Locus: 0610; Square: XII 6; Form: Rim sherd of everted rounded rim and straight high-neck vessel; Fabric: fine reddish brown and grey slipped; Surface: matt, smooth and flaky; Munsell colour: core 10YR 3/1 (very dark grey), 10YR 5/2 (grayish brown).

112. BS1465; Sector: BS; Locus: 6526; Square: V 3; Form: Everted rounded rim and high neck with concave profile; Fabric: fine reddish brown and grey slipped; Munsell colour: core 10YR 6/3 (pale brown), slip 10YR 4/1-3/1 (dark grey-very dark grey).

113. BS564; Sector: BS; Locus: 6504; Square: III 4; Form: Everted rounded rim with a groove running along the middle of the lip on the exterior and concave high-neck; Fabric: fine reddish brown and grey slipped; Surface: medium glossy, smooth and flaky; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5 5/6 (red).

114. BQ493; Sector: BQ; Locus: 5965; Square: I 2; Form: Horizontally projecting rim with beaked or tapering tip and straight high-neck; Fabric: fine reddish brown and grey slipped; Surface: matt and smooth; Munsell colour: core 10YR 6/2 (light brownish grey), slip 5YR 6/6 (reddish yellow).

115. BL276; Sector: BL; Locus: 5748; Square: I 2; Form: Rim sherd of a high neck vessel with a bilateral projecting rounded rim; Fabric: fine reddish brown and grey slipped; Surface: medium glossy, smooth and vesicular; Munsell colour: core 2.5YR 5/6 (red), slip 2.5YR 4/6 (red).

116. BS6006; Sector: BS; Locus: 6762; Square: X 4; Form: High neck vessel with concave flanged neck and nail-headed rim with bilateral projection; Fabric: fine reddish brown and grey slipped; Surface: matt, smooth and vesicular; Munsell colour: core 2.5YR 6/6 (light red).

117. BQ255; Sector: BQ; Locus: 5921; Square: I 3; Form: Rim sherd with everted rounded rim and concave high-neck; Fabric: coarse red slipped; Surface: matt,

smooth, weathered, vesicular with holes; Munsell colour: core 2.5YR 5/6 (red), slip 2.5YR 4/4 (reddish brown).

2.5.8 Type 8 - Narrow high-necked vessels or spout/sprinkler type

118. BB114; Sector: BB; Locus: 5545; Form: High narrow and concave necked with a groove on the outer edge. Almost similar in form to the RPW spout/sprinkler type vessels from India; Fabric: fine reddish brown and grey slipped; Surface: matt, smooth, vesicular and weathered; Munsell colour: core 5YR 6/6 (reddish yellow), slip 2.5YR 5/6 (red)

2.5.9 Miscellaneous

119. BS2617; Sector: BS; Locus: 6563; Square: IV 4; Form: body sherd; Fabric: coarse orangish; Surface: matt, coarse and weathered with holes; Munsell colour: core 5YR 6/6 (reddish yellow).

120. BS143; Sector: BS; Locus: 6502; Square: II 4; Form: body sherd; Fabric: coarse orangish; Surface: matt, coarse and weathered with holes; Munsell colour: core 5YR 6/6 (reddish yellow), 7.5 YR 7/2-6/2 (pinkish grey).

APPENDIX 3.

List of Indian pottery forms from Kush

a. SBBW forms

1. K417: - Rim sherd of a carinated vessel ‘handi’ with a beaded everted rim with a rounded projecting tip and deep groove running along the tip.5-6 incised lines or corrugations visible on the shoulder of the vessel above the point of carination.
Context: 1435, Diameter: 21 cm.

2. K418: - Rim sherd of a wide-mouthed cooking vessel with external projecting everted rounded rim with a groove on the inner side of the lip.
Context: 1452; Diameter: 18 cm.

3. K1644: - Variation of K1642. Rim sherd of a high-necked pot with pointed triangular rim.
Context: 1824, Diameter: 20 cm

4. K4249: - Rim sherd of a pot with a rounded everted rim and groove on the upper side of the lip and a ridge-line on the inside of the vessel along the neck.
Context: 1867, Diameter: 17 cm

5. K4288: - Rim sherd of a pot with an external projecting everted round rim and a deep groove running along the middle of the lip.
Context: 1867, Diameter: 23 cm.

6. K694: Nearly rim-less almost straight-sided beaker with a thin groove near the lip.
Context: 1049, Diameter: 14 cm.

7. K4289: - Rim of a pot with external projecting everted round rim with a constricted neck. Two groove lines visible on the upper side of the lip.
Context: 1913, Diameter: 27 cm.

8. K3963: - Fragment of a wide-mouthed dish with an incurved rim with groove on top and three corrugations below on the neck of the vessel.
Context: 1857, Diameter: 28 cm.

9. K6394: - Rim of a small pot with everted projecting tapering tip and a groove on the upper side and a constricted neck with corrugations on the shoulder.
Context: 1191, Diameter: 14 cm.

10. K6825 and K6827: - Two fragments of the same carinated vessel ‘handi’ with a squared beaded rim with a projecting ledge and shallow grooves on top near the lip. A deep line runs along the tip of the rim on the exterior of the vessel. The neck and upper part of the shoulder up to the carination has a series of shallow ridge-lines. Corrugations are also visible along the rim on the inside the vessel.
Context: 2432 and 2438, Diameter: 24 cm.

11. K6784: - Fragment of a carinated Vessel ‘handi’ with deep incised line decoration on the shoulder and a band of triangular punctate marks or fingernails impressions above the point of carination.
Context: 1452.

12. K420: - Rim sherd of a pot with external projecting everted squared rim and a groove on the neck below the rim.
Context: 1435, Diameter: 18 cm.

13. K441: - Broad flaring mouth of globular (storage) vessel with squared everted rim and beveled ridge on the neck.
Context: 1346, Diameter: 14 cm.

14. K1525: - Rim of a pot with external projecting everted squared rim.
Context: 1719, Diameter: 22 cm.

15. K1642: - Rim sherd of high-necked vessel having a rounded rim with a rounded rim.
Context: 1607, Diameter: 20 cm.

16. K4285: - Rim sherd of a wide-mouthed potwith an external projecting rounded rim and groove on the upper side of the lip.
Context: 1913, Diameter: 18 cm.

17. K6396: - Rim of a straight-sided bowl with ledge on the upper side and a deep ridge-line below the groove on the external side.
Context: 1106, Diameter: 16 cm.

18. K6814: - Fragment of a shallow bowl or dish with a slightly excurved, flared rim with a carination below the rim. Shallow corrugation lines are visible on the inner side of the vessel along the rim section.
Context: 2497, Diameter: 26 cm.

19. No K. No: - Fragment of a pot with a beaded rim with a groove on the upper side of the lip and a projection from the tip of the rim. A deep groove also runs along the middle of the lip.

20. K2151: - Bands of fingernail impressions or punctate marks and two incised lines.
Context: 1766.

21. K4280: - Fragment of body sherd with neck and broken rim
Context: 1867.

22. K5032: - Rim of a pot with an everted rounded rim and a groove projecting from the top of the rim on the upper side of the lip.
Context: 2280, Diameter: not available.

23. K6177: - Variation of form K5032 with a constricted neck.
Context: 1004, Diameter: not available.

b. IRAB forms

24. K421: - Rim sherd of a pot with external projecting everted rounded rim with a groove running immediately below the lip.
Context: 1128, Diameter: 32 cm.

25. K423: - Rim sherd of a wide-mouthed pot with everted squared rim and two grooves or ledges on the upper side of the rim/lip. Corrugations or ridge-lines are visible on the exterior immediately below the beveled rim.
Context: 1123, Diameter: 31 cm.

26. K1670: - Rim sherd of a pot with a flat everted rim with a ledge on the upper side of the lip and a line on the neck of the vessel below the rim.
Context: 1808, Diameter: 24 cm.

27. K4299: - Rim sherd fragment of a pot with a constricted neck and triangular excurved rim with grooves on the neck and rim.
Context: 1991, Diameter: 15 cm.

28. K4300: - High-necked pot with a prominent beaded rim and ledge or deep groove on top of the lip.
Context: 1857, Diameter: 16 cm

29. K4301: -Grooved and collared/bevelled rim of a v-shaped or v-necked vessel with a deep groove or along the middle of the mouth and a line below the rim of the vessel.
Context: 1867, Diameter: 12 cm

30. K4401: - Rim sherd of a wide-mouthed pot having a constricted neck with an external projecting rim and an internal projection. A deep groove line runs along the length of the rim.
Context: 2042, Diameter: 24 cm

31. K4402: - Rim sherd of a large cooking pot with an upward evertedrim with a pair of incised lines running along the middle of and below the lip.
Context: 2042, Diameter: 32 cm

32. K4403: - Vessel with a sharply flared rim and a thin groove running through the middle of the lip.

Context: 2042, Diameter: 26 cm.

33. K4413: -V-necked or v-shaped vessel with an excurved flared rim and grooves in the section.
Context: 1929, Diameter: 19 cm.

34. K4423: - Decorated body fragment most likely part of the carinated shoulder of a vessel. Decoration comprises two rows of impressed short vertical triangles at intervals with a pair of incised lines in-between the rows and a series of 6 incised lines below.
Context: 1867

35. K4440: - Flared excurved rim with a projecting ridge on the neck of the vessel.
Context: 2030, Diameter: 13 cm

36. K5028: - Rim sherd of a small high-necked vessel with a beaked rim and groove on the upper lip with a beveled ledgeat the orifice.
Context: 2194, Diameter: 10 cm

37. K5041: - Rim sherd of a large storage vessel with an elongated rounded projecting rim with grooves on the upper lip on the inner side of the vessel.
Context: 2164, Diameter: 29 cm.

38. K5039: -Rim fragment of a wide-mouthed pot with constricted neck. The rim is external projecting, extremely everted with a deep groove through the tip of the rim.
Context: 2222, Diameter: 24 cm

39. K424: - Rim sherd of a small pot with external projecting triangular tapering rim and groove on the upper side of the lip.
Context: 1435, Diameter: 14 cm

40. K1274: - Large fragment of a storage vessel with external projecting quadrangular rim. The neck and shoulder of the vessels has a series of shallow ridges and grooves.
Context: 1535, Diameter: 28 cm

41. K4404: - Rim sherd of a pot with external projecting everted rounded rim.
Context: 1918, Diameter: 20 cm

42. K6359: - Rim sherd of a high-necked vessel with a beaked rim and a groove along the length of the external lip.
Context: 1267, Diameter: 18 cm

43. K6360: - Rim sherd of a miniature vessel with everted rounded rim.
Context: 1450, Diameter: 10 cm

44. K6451: - Rim sherd of a small vessel rounded everted rim and traces of red slip.
Context: 1450, Diameter: 10 cm

45. K419: - Rim sherd of a pot with an external projecting triangular rim with a deep groove along the exterior of the lip.
Context: 1331, Diameter: not available

46. K422: - Rim sherd of a vessel with an external projecting beaked rim with a deep groove along the tip exterior and a groove on the upper side of the lip.
Context: 1452, Diameter: not available

47. K425: - Rim sherd of a vessel with an external projecting beaked rim with a deep groove along the tip exterior and a groove on top of the lip. Variation of K422
Context: 1452, Diameter: not available

48. K4406: - Rim sherd of a vessel with external projecting everted squared rim. Traces of black on the exterior until the top or tip of the rim. Red slipped on the interior of the rim.
Context: 2060

49. K4410: - Large fragment of a carinated vessel with red slip and two projecting ridge-lines or ledge at the neck? (rim broken)
Context: 1929
50. K5044: - Fragmentary ring base. Traces of blackening visible and the bottom nearly eroded and at the base.
Context: 231

c. FIRE forms

51. K4375: - Fragmented rim of a vessel with an everted neck.
Context: 1870

52. K2233: -Similar to K4375
Context: 1800

d. FGRW forms

53. K2221: - Unique rim (Unidentifiable)
Cotext: 1824

54. K4251: - Fragment of an everted rim
Context: 2030

e. INDIA forms

55. K1677: -Rim sherd of a straight-sided basin having a triangular rim which protrudes slightly on the exterior.

Context: 1824, Diameter: 17 cm

56. K6385: -Vessel with a sloping broad collared/bevelled rim with a concave bulge at the neck and globular body.
Context: 1218, Diameter: 10 cm

57. K6395: - INDIA? IRAB? Rim sherd of a large storage vessel with external projecting or flared triangular rim.
Context: 1260, Diameter: 29 cm

58. K6677: - Carinated vessel (handi) with a slightly elongated flared and beaded rim with a secondary ledge or ridge on the shoulder of the vessel at the point of carination. Decorated on the shoulder with four pairs of incised lines.
Context: No context, Diameter: 17 cm

59. K6397: - Carinated vessel (handi) with an everted beaded rim and a secondary ledge or ridge on the shoulder of the vessel at the point of carination.
Context: 1433, Diameter: 10 cm

60. No. K. No. Rim sherd of carinatedhandi with external projecting triangular rim and series of shallow incised lines above the point of carination.

f. PAINT forms

61. K2218: Vessel with triangular beaded upward everted rim and groove on the neck.
Context: 1824, Diameter: 21 cm

62. K5078: - Painted vessel with upward everted rounded rim.
Context: 2307, Diameter: 21 cm

63. K4306: - Sloping beaked and collared/beveled rim with painted black line decoration immediately below the rim of the vessel.
Context: 2030, Diameter: not available

64. K2219: - Sherd with black painted decoration over red slip - thick wavy line with bands of horizontal painted lines below.
Context: 1824

65. K4361: - Sherd with black painting over red slip - Four black horizontal bands. Between the thicker bands four and five are wavy or triangular line also in black.
Context: 2030

66. K6642: - Body fragment of a round vessel with unique decoration of a wavy line between a series of horizontal lines. Another decoration emerges from the beginning of the wavy line: A course of multiple loops connected together in a single vertical line.
Context: 1250

67. K5080: - Body fragment of carinated vessel with a prominent pointed ledge at the point of carination, with painting on the shoulder and a thick black line just above the carinated ridge.
Context: 2292

68. K5081: -Fragment of a painted vessel with a prominent ledge or handle? along the middle of the sherd and two horizontal black lines below the protrusion.
Context: 2124

69. K5083: -Vessel with everted (nearly broken) rim and a beaked internal projection. Fabric is more similar to IRAB than PAINT.
Context: 2318, Diameter: not available.

70. K6635: - Similar to form K5081 but with a series of horizontal black lines above the ledge or protrusion. Context: 2124

71. K5082: - Body sherd with traces of dark red paint and lighter shades of red slip on the exterior.
Context: 2122

72. K4302: - Two thick vertical bands of black or chocolate paint over red slip.
Context: 1917

73. K4303 and K4305: - Body sherds with red slip and traces of thick bands of chocolate paint. Similar to K4302.
Context: 1917 and 2041

74. K6637: - Sherd with traces of three vertical bands in black or chocolate paint over red slip on the exterior.
Context: 1500

75. K6629: - Unique decoration of white and black painting over red slip. Two thick white bands superimposed by black lines and oblique strokes. There are two flower or astral designs in white immediately above the white bands.
Context: 1603

76. K6630: - Unique decoration of darker red paint over red slip. Body sherd with a thick red band and a series of unequal vertical lines in red
Context: 1867

77. K6631: - Unique decoration of black design over red slip with three hatched ladder-like motifs (series of horizontal lines between two oblique lines) bordered by an edge of black paint.Context: 1382

Appendices 1-4

g. IRPW forms

78. K3462: - Vessel with downward sloping sharply incurved and collared rim with a concave neck.
Context: 1892, Diameter: 12 cm.

79. K3466: - Body sherdof globular vessel with prominent groove in the mid-section.
Context: 2004

80. K5069: - Body sherd of round vessel with a slight carination at the shoulder and a series of 3 incised lines at the point of carination.
Context: 2108

81. K5079: -Small fragment of a vessel with a grooved rim.
Context: 2379

APPENDIX 4.

List of Indian pottery vessels from Suhar (after Kervran 1996, 2004)

4.4.1 Indian pottery from Level 0

1) 704.4 - Large basin with medium coarse pinkish fabric and traces of whitish slip on exterior
2) 704.5 - Base of basin with coarse pink fabric with particles of mica and large sand inclusions
3) 713.3 - Rim of pot consisting of red fabric with mica
4) 717.17 - Rim of cooking pot with coarse blackish fabric and mica
5) 704.1 - Lid with coarse reddish fabric with mica and large sand inclusions.

4.4.2 Indian pottery from Level I

6) 716 - Fine pink fabric with wide horizontal ridges

7) 710 - same as 716

8) 693.2 - Polished rim of pot in coarse blackish fabric with mica

9) 693.1 - Rim of pot with medium coarse blackish fabric and mica.

10) 1547.2 - Rim of jar with red coarse ware

11) P.F. 1975 - Rim of pot with very fine orange-red ware and burnished surface

12) Same as P.F 1975

13) Same as P.F 1975

14) 1543.1 - Rim and neck of pot medium coarse red ware

15) 1547 - Rim of goblet with medium coarse pinkish ware and red-brown striped painting on beige slip

16) 704 - Lid in coarse micaceous red ware

17) 693.1 - Rim and neck of pot with medium coarse blackish ware and burnished surface

18) 1547.1 - Rim and neck of pot with medium coarse sandy grey ware and burnished surface

4.4.3 Indian pottery from Level II

19) 690.7 - Rim of a jar or pedestal in coarse greenish to pinkish fabric with straw particles of mica and red slip.

20) 686.2 - Rim of pot in medium coarse blackish fabric with smoothing outside

21) 690.4 - Rim of pot in medium coarse pinkish fabric

22) 690.3 - Body of pot in medium coarse red fabric with mica and red slip with black designs

23) 708.1 - Fragment of medium coarse red fabric with black stripes

24) 690.2 - Spout with medium coarse red fabric with lot of mica (Cf. 690.3)

25) 708.2 - Fragment of medium coarse red fabric with a lot of mica

26) 686.1 - Lid with medium coarse pinkish fabric with mica

27) 682.2 - Lid with medium coarse reddish fabric with mica and red painting on rim and exterior

28) 1543 - Nearly complete globular pot in very fine red ware with burnished outer surface

29) P.F.1975 - Shoulder of jar in very fine dark-red ware and burnished red slip on the outer surface

30) P.F. 1975 - Fragment of shoulder of jar similar to 29 in very fine orange-red ware with burnished surface

31) 686.2 - Everted rim of jar in medium coarse red ware with white particles and mica

32) 584.1 - Everted rim of jar in very fine orange-red ware with burnished surface

33) 1542 - Neck of a pot with medium coarse grey ware and burnished surface

34) Fragment of very fine red ware with black painted decoration

4.4.4 Indian pottery from Level III

35) 651.2 - Shoulder of jar in medium coarse pinkish fabric with red slip on the interior and red and purple lines on the exterior

36) 678.6 - Shoulder of pot with coarse blackish-pink fabric with mica and red slip

37) 664.7 - Shoulder with handle of pot in medium coarse pinkish fabric

38) 670.3 - Body of pot in coarse blackish fabric with polished surface

39) 665.1 - Body of pot with coarse fabric, red on the exterior polished and black on the interior

40) 678.2 - Rim of cooking pot in very fine orange fabric with mica and exterior surface polished

41) 678.9 - Shoulder of pot in very fine orange fabric with mica and exterior polished

42) 664.3 - Lid in medium coarse pinkish fabric with mica

43) 678.7 - Lid in rather coarse pinkish fabric with mica

44) 678.5 - Lid. Same fabric as 678.7

45) 1524.4 - Everted rim of jar in fine brown red ware with black painted strip on red slip

46) 2213 - Lower part of a pot in rather coarse red ware with traces of red slip

47) 678.9 - Shoulder of a jar in very fine orange-red ware with burnished surface

48) 690.4 - Rim and neck of a pot in medium coarse pinkish ware

Appendices 1-4

4.4.5 Indian pottery from Suhar Moat I (Levels II/III)

49) 1519.1 - Rim of pot with very fine orange fabric burnished on the exterior and inside the rim

50) 1524.5 - Rim of pot in medium fine reddish orange fabric with mica with dark red slip outside

51) 1524 - Rim of pot with rather fine red fabric and dark red and black painted decoration

52) 1524.1 - Rim of pot with rather coarse black fabric and polished surface

4.4.6 Indian pottery from Suhar Moat IV (Level III)

53) 1546 - Fragment of medium fine black fabric with many particles of mica and incised pattern

54) 1534.1 - Rim of pot with very fine orange fabric and burnished surface

55) 1543 - Pot with very fine orange fabric with particles of mica and burnished on both sides

56) 1547.1 - Rim of pot with rather coarse dark grey fabric and particles of mica

4.4.7 Indian pottery from Level IV

57) 636.7 - Shoulder of pot. Same fabric as 647.2

58) 646.6 - Body of cooking. Same fabric as 636.7

59) 644.2 - Rim of pot with coarse red fabric with mica and black on the exterior. Polished surface

60) 644.7 - Rim of cooking pot with coarse grey fabric with mica and polished surface

61) 647.2 - Rim of pot with medium coarse red fabric with mica and slip. Polished surface

62) 644.6 - Cooking pot with rather coarse bright grey fabric with mica and polished surface

63) P.F 1975 - Fragment of sherd in medium coarse red ware with moulded and painted decoration

64) P.F 1975 - Fragment in medium coarse black-grey ware with moulded burnished decoration

65) 1540.2 - Everted rim of jar in medium coarse red ware with red slip

66) 651.2 - Shoulder of jar in medium coarse pinkish ware with brown-red painted strips on red slip

67) 1519 - Rim of pot in very fine orange-red ware with burnished surface

68) 1534.1 - Rim of pot in very fine orange-red ware with burnished surface

4.4.8 Indian pottery from Levels V-VI (Later Islamic levels at Suhar)

69) 1521/1522 - Fragment with painted and incised decoration in rather fine red fabric with mica

70) 1522.4 - Pot in medium fine blackish-brown fabric

71) 1523.3 - Pot in fine pinkish fabric with mica and barbotine ring

72) 1522.2 - Pot in fine pinkish fabric with mica and barbotine ring

73) 713.3 - Rim of cooking pot in rather fine brown fabric with holes and mica. Carefully polished rim and external surface

74) 634.2 - Rim of cooking pot in rather coarse blackish fabric with mica and polishing of rim and exterior

75) 630.1 - Rim of cooking pot with medium blackish fabric with mica. Polishing of rim and exterior

76) 630.2 - Rim of cooking pot in rather coarse blackish fabric with mica and polishing of rim and exterior

77) 624.1 - Rim of cooking pot in medium red fabric with blackened exterior and particles of mica

78) 624.1 0 Rim of cooking pot in medium red fabric with mica and blacked exterior

79) 622.1 - Body of jar with medium coarse red fabric and mica. Red and black painting on exterior

80) 614.3 - Body of cooking pot in medium brick red fabric with mica and polished on exterior

81) 606.1 - Raised rim and shoulder of cooking pot with handle in medium brick red fabric with mica and polished rim

82) 712.1 - Rim of cooking pot in rather coarse blackish fabric with mica and polishing on exterior and upper part of rim

83) 624.2 - Rim and neck of a pot with medium coarse reddish ware

84) 713.1 - Upper part of pot in medium coarse pinkish ware and burnished outer lip
85) 624.3 - Neck of a pot with rather coarse grey ware and burnished outer surface
86) 1061.11 - Neck and shoulder of jar in pinkish beige fine fabric, well-fired with two handles and polished on exterior
87) 1061.14 - Neck of jar in medium coarse red fabric with mica and guilloche decoration inside lip
88) 2001 - Neck of jar or pedestal with coarse bright orange fabric and black slip on exterior
89) 2186 - Rim of cooking pot with medium fabric and big siliceous inclusions and mica. Red slip
90) 2001 - Rim of pot in fine red fabric with mica
91) 1172.1 - Rim of pot with pinkish fabric and mica. Polishing on exterior and guilloche pattern
92) 1172.2 - Rim of pot with fine brick pinkish fabric with mica and black painted decoration
93) 2003.2 - Carinated pot with coarse dark grey fabric with mica and black slip
94) 1169.4 - Cooking pot in pink fabric with mica. Polished red slip and ridge with guilloches
95) 1172.6 - Fragment of cooking pot with fine brick red fabric with mica. Red slip and black painted decoration on exterior
96) 2204.3 - Rim of pot in fine red fabric with mica and red slip
97) 2197.2 - Rim of basin/jar in medium fine pink fabric with mica
98) 2197.1 - Rim of basin/jar in medium fine pink fabric with mica. Triangular punctuate design on exterior
99) 2063.2 - Rim of jar with very coarse black fabric with mica. Rim and neck polished on exterior
100) 2070.1 - Rim of pot in fine red fabric with mica. Red, black and grey painting on creamy slip
101) 2072.1 - Pot in fine pinkish-buff fabric with mica. Painted red and black decoration on shoulder
102) 1142.11 - Cooking pot with coarse grey fabric and mica
103) 1142.9 - Cooking pot with coarse grey pinkish fabric, mica and polished orange

slip on exterior

104) 1142.12 - Cooking pot with coarse pinkish-blackish fabric with mica and polished red slip on exterior

105) 1142.10 - Cooking pot with coarse pinkish-blackish fabric with mica and polished red slip on exterior

106) 1142.8 - Cooking pot with coarse red fabric, mica and polished red slip outside. Guilloche handle around the shoulder

107) 2061.2 - Rim of pot with rather coarse grey fabric and mica. Burnished

108) 2079.4 - Rim of pot with coarse bright grey fabric with mica. Burnished

109) 2095.4 - Body of jar in fine red fabric with mica. Bright red, creamy and blackish-grey geometric painted design on exterior

110) 2046.3 - Rim and shoulder of a pot in medium pinkish fabric with mica and white slip with red painted designs

111) 2078.15 - Cooking pot in medium beige pinkish fabric with sand inclusions and some mica. Red slip

112) 2080.1 - Cooking pot in medium greyish-red fabric with mica and traces of heating on exterior. Rim burnished on outside

113) 606.1 - Upper part of pot in medium coarse red ware and red polished slip

114) 1142.9 - Neck of pot with coarse micaceous pinkish ware and polished

115) 1142.10 - Neck of pot medium coarse red ware and polished

116) 2004.1 - Neck of pot in coarse sandy red ware and red slip

117) 614.2 - Middle of pot with medium coarse red ware and polished

118) 2079.2 - Middle of pot with medium coarse micaceous red ware and black painted strips on red slip

119) 2204.2 - Fragment of very fine red ware with red and black painted decoration on buff slip

120) 639.2 - Fragment of fine micaceous red ware with red and black painted decoration on pinkish buff slip

121) 622.1 - Fragment of shoulder of fine pinkish ware with black and red painted decoration on pinkish buff slip

122) 1521 - Fragment of pot in medium coarse micaceous pinkish ware and dark red painted decoration on red slip

123) 2203 - Neck of jar in medium coarse dark red ware and dark-red slip

124) 2204.1 - Fragment of medium coarse dark red ware and dark red slip (interior and exterior)

125) 2079.4 - Neck of pot in coarse dark-grey ware and polished

126) 1522.4 - Neck of pot in medium coarse sandy and micaceous ware. Polished

127) 2061 - Neck of pot in coarse dark-grey ware and polished

128) 1142.12 - Neck of pot in coarse grey ware and black polished slip

129) 1142.11 - Neck of pot in coarse grey ware and black polished slip

130) 606.2 - Neck of pot in medium coarse red-grey ware and black polished slip

131) 1333.1 - Neck of pot in medium coarse grey ware

132) 712.1 - Neck of pot in coarse black ware and black polished slip

4.4.9 Indian pottery from Levels VII-VIII (Later Islamic levels at Suhar)

133) 535 - Neck of jar in coarse reddish ware with black painted decoration on red slip

134) 199.5 - Neck of pot in coarse dark-grey ware and polished

135) 535.7 - Neck of pot in coarse grey ware and red polished slip

136) 2194 - Fragment of bowl in fine red ware with incised decoration

137) 699.4 - Neck of pot in medium coarse reddish-grey fabric with red slip

138) 695 - Neck of pot in fine grey ware and black polished slip

139) 2110 - Fragment of bowl in medium fine micaceous red ware and moulded decoration

140) 514.24 - Neck of pot in rather coarse reddish ware and red slop

141) 535.19 - Neck of pot in coarse reddish ware and red slip

142) 514.29 - Neck of pot in coarse reddish ware

143) 525.15 - neck of pot in coarse reddish ware and red slip

144) 554.4 - Neck of pot in medium coarse reddish ware and black painted decoration on red slip

145) 514.22 - Neck of pot in coarse reddish ware

146) 1036 - Neck of pot in medium coarse micaceous red ware with moulded decoration

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