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Joanne Shoebridge

Abstract:

**Revisiting Rouletted Ware and Arikamedu Type 10:
Towards a spatial and temporal reconstruction of Indian Ocean
networks in the Early Historic**

The aim of this thesis is the reconstruction of Early Historic networks in South Asia and beyond. The methodology engaged focusses on image analysis techniques being applied to two South Asian ceramics, Arikamedu Type 1 (also referred to as Rouletted Ware) and Arikamedu Type 10. The secondary aim of this thesis is to identify and investigate stylistic variances across these ceramics within the spatial and temporal boundaries of this research.

The two ceramics in this study were initially recorded at Arikamedu, South India in the excavations led by Sir Mortimer Wheeler (Wheeler *et al.* 1946). The majority of the previous research has focused on the physical aspects of the ceramics in an attempt to provenance the types, for example thin section analysis by Krishnan & Coningham (1997) and chemical analysis by Ford *et al.* (2005), however, confirmation of the provenance has not been achieved.

This thesis focuses on the decorative features of the ceramics for analysis and interpretation. The data extracted will, on interpretation, aim to demonstrate the spatial and temporal variances within Rouletted Ware and Arikamedu Type 10, and allow the proposal of networks in the Indian Ocean and beyond, during the South Asian Early Historic period.

**Revisiting Rouletted Ware and Arikamedu Type 10:
Towards a spatial and temporal reconstruction of Indian
Ocean networks in the Early Historic**

Joanne Ellen Shoebridge

Volume One of Two

Submitted in accordance with the requirements for the degree of PhD

Department of Archaeology
Durham University

2017

Volume One

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List of Abbreviations

ASI = Archaeological Survey of India

ASW = Anuradhapura Salgaha Watta

DOA = Department of Archaeology

IAR = Indian Archaeology: A Review

KCHR = Kerala Centre for Historical Research

UCL = University College, London

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Chapter One

Introduction

“I would also argue that virtually all new data on this trade are likely to come from archaeology, which has barely started to research the problem, rather than literary and historical sources which seem to be finite and mostly known”.

Glover (1996: 368)

1.1 Introduction

The South Asian ceramics Arikamedu Type 1 and Arikamedu Type 10, demonstrate the potential to provide a wealth of data which, on interpretation, can lead to the reconstruction of ‘lost’ networks of communication across Early Historic South Asia and beyond. At present, the Indian Ocean is defined by the Central Intelligence Agency World Fact Book (Map 1.1) as having boundaries stretching from coastal East Africa, across the Arabian Sea and the Bay of Bengal, to the coast of Western Australia and Northern Antarctica. Part of this expansive area, the westerly side, will be investigated, and the proposal of routes of transportation across relevant areas will form a theme that will be investigated as part of this study. The ceramics in this research fall into the period in South Asia referred to as the Early Historic period, for which a variety of dates have been proposed, for example Smith (2002: 139) proposes third century BC to fourth century AD, while Abraham presents a “*late Iron Age - Early Historic Period*” of 300 BC to AD 300 (Abraham 2003: 207). Rajan (2008) discusses the issues of setting the period within parameters in his paper “*Early Historic Times in Tamil Nadu*”. It is the Early Historic period, along with the geographical

setting of the Indian Ocean and its neighbouring seas, that will form the chronological and spatial parameters of this study.

Research into Indian Ocean networks will be discussed at various points throughout this thesis, which spans extensive chronological and geographical parameters reaching as far as Egypt in the west, and Vietnam in the east. The Indian Ocean has been used as a means of transport from the Indus period through to the colonial period and is still used for sea traffic today. Small networks of trade operated through the Arabian / Persian Gulf from as early as the fifth millennium B.C (Tomber 2008: 14). Following this, northern routes were used to conduct trade between India, Iran, Oman and the Gulf, sailing close to the edges of the Arabian Sea, with finds reputedly from Harappa recovered in the Gulf region (Vogt 1996: 107). There was a decline in the use of the northern routes following 1800 BC, although activity did continue in the other areas, and these routes were revived at the start in the sixth century BC. As this time a route linking the tip of modern Somalia (the horn of Africa), with India developed, facilitated by the growing knowledge of the monsoon system (Potts 1993: 187, Reade 1996: 15-16).

Ptolemy Philadelphus established the port of Berenike on the Red Sea by c.275 BC, with the primary aim of the import of elephants. This phase of activity was followed by trading in the early Roman Period after Egypt was annexed by Augustus in 30 BC and the trade routes became focused on developing the economy. The exploitation of the monsoon system facilitated trade with South Asia and beyond (Map 1.2. Tomber 2008: 18) and this allowed Red Sea ports such as Berenike, to become major international centres of exchange (Sidebotham 2002: 217 – 218). The flow of goods

included spices, gems, cotton and other textiles such as those from locations further away such as China (Casson 1984: 43). However, Whitehouse (1991: 216) on considering the knowledge available on Roman imports and exports states “*this is a remarkable list, so remarkable in fact that I sense a danger of exaggerating the importance of roman maritime trade, relative to that of other traders in the same waters, simply because we know more about it*”.

There was demand from the Roman Empire for goods produced in South Asia, and this exchange was reciprocated, resulting in a variety of archaeological and textual evidence. Trading activity in the Red Sea became more active than before during the Roman period, however, it had been in existence prior to this. Red Sea ports such as Berenike and Myos Hormos provided a means of supporting the moving of goods between east and west and formed part of “the Silk Road of the Sea”, which allowed commodities to be moved from India and Sri Lanka through to the Roman empire, and good sent back in return (Sidebotham 2002: 217–218, Tomber 2008: 15). This route encompassed the southern coastal ports of China, along to the coast of Vietnam, through to Cape Ca Mau, the Gulf of Thailand and then the straits of Malacca and across to the Bay of Bengal, it encompassed Mantai, one of the key ports of the region in Northwest Sri Lanka, which was the supplier to the kingdom of Anuradhapura. As discussed in the following chapter, the port would have supplied both local imports and those which have travelled more extended distances (Coningham 1999: XIX, Glover 2000: 93, Prickett Fernando 1990: 73).

Arikamedu Type 1, one of the ceramics in this study, was recorded along with “*Wares imported from the Mediterranean*” (Wheeler *et al.* 1946: 45), on its initial recovery at the site of Arikamedu. This ceramic, also commonly known as Rouletted Ware, has been the generator of much controversy since this initial interpretation by Wheeler *et al.*, who classified it along with Roman imports such as Amphorae and Arretine Ware. However, research published in 2005 by Ford *et al.* used chemical analysis to demonstrate that the two ceramics in this study, Arikamedu Type 1 and Arikamedu Type 10, were both the products of the development in local technology, a discovery that will be referred to during this research. This thesis will primarily focus on the analysis of data which can be extracted from the decorative features of the two South Asian ceramics in this study, Arikamedu Type 1 (commonly known as Rouletted Ware, and referred to hereafter in this thesis as such) and Arikamedu Type 10 (Figures 1.1 and 1.2, as seen at the end of the chapter). This focus can be linked to the quote at the start of this chapter which encapsulates the continuous referral to texts such as *Periplus Maris Erythraei* (Voyage around the Erythraean Sea) and written sources (for example Warmington (1928)), in an attempt to answer questions about the Indian Ocean. Glover’s quote was written in 1996 and since then there has been excavations published, including those at Trench ASW2 (Anuradhapura Salgaha Watta 2), Anuradhapura, Pattanam and Khao Sam Kaeo which contribute a wealth of new data as referred to in the quote above by Glover (1996: 368). These excavations, and others, will be investigated in this study.

1.2 Literary and historical sources

The paragraph above introduces the continuous referral to texts and written sources in an attempt to answer questions about the Indian Ocean. Glover's quote was published in 1996, and since then there has been reports on excavations made available including those from Trench ASW2, Pattanam and Khao Sam Kaeo, which contribute a wealth of new data as referred to in the quote above by Glover (1996: 368). These, and others, will be investigated in this study. Glover states that at this stage these sources are probably "*finite and mostly known*" (*ibid.*). Many of the classical authors have been extensively studied, but even if (in Glover's opinion) they are "*finite and mostly known*" (*ibid.*) they can provide evidence to supplement archaeological research. This evidence can be in several subject areas, but one key factor is that many classical authors have the potential to provide information which cannot be recovered in the archaeological record. This evidence can then be split into three areas, namely factors to assist in the identification of locations, perishable traded goods and also opinions- such as those on trading partners and foreigners, which can be extended to include names.

The chronological and geographical parameters explored in this study were recorded in a range of Classical texts, ranging from poetry (for example the *Puranuru*) through to functional handbooks, such as the *Periplus of the Erythean Sea*. The *Periplus of the Erythean Sea* is one of the most commonly referenced texts in relation to ancient trade, and it is believed to be a merchant's guide written in Greek. However, the date of this

text is heavily debated, although it is increasingly referred to as being written in the first century AD (Casson 1991: 8).

Due to the literary tradition of areas directly and indirectly connected with the geographical and chronological parameters in this study, accounts can be recovered from a variety of regions including Greece, Egypt, India, and the Roman Empire. As there is a considerable amount of literature linked to trade and exploration, the texts which encompass South India and Sri Lanka will be the priority. However, some of the writing must be viewed with judgements about accuracy. For example, the Greek historian Herodotus presents a wealth of geographical information, although the validity of some of it is rather questionable, or subject to incorrect interpretation. Herodotus famously writes about giant ants that dig up gold dust near the town of *Caspatyrus* (possibly Kabul) and the *Pactyic* country (Herodotus 3.102.1). Fortunately, some of the classical authors can provide a more realistic detail which can be used to supplement this study, although caution should be still be exercised.

As mentioned above, detail described by classical authors can aid the identification of locations, and highlight local conditions. An example of a port that is documented is that of *Muziris*, or *Murciri*. Here, the actual location of the port has been heavily debated, and this will be discussed further later. The current theories focus on the archaeological evidence, and these locate it as being at Pattanam on India's west coast (for example Shajan *et al.* 2004). Nevertheless, there have been occasions where too much emphasis has been placed on matching the discovered archaeological site to a location discussed in a classical text, a comment that may be applicable to the

viewpoint of Wheeler once he was aware of Arikamedu (Wheeler 1955: 156). Pliny the Elder provides his opinion on the trade with India by commenting “*trade which in no year does India absorb less than fifty million sesterces of our empires wealth, sending back merchandise to be sold with us at a hundred times its prime cost*” (6.96-111). However, in addition to this opinion, which may be related to the costs of running such a trading empire, other detail is given by Pliny the Elder in relation to locations, and he also demonstrates his awareness of the monsoon trade in Book VI of the *Natural History*. He was aware that if the monsoon winds are favourable it can take forty days to travel to the port of Muziris.

The location of Muziris is also referred to in other texts including Tamil Poetry, the second century Papyrus, *Papyrus Vindob*, and the fourth century *Tabula Peutingeriana* (Seland 2010: 57). The 400 poems which make up the *Puranuru* were written in old Tamil between the first and third centuries AD (Ray 2003: 126). Included are poems in praise of kings and their generosity, ethical and moral issues, alongside an almost consistent theme detailing the struggle for authority amongst chiefs. Muziris is mentioned in verse 343 being a place which “*offers toddy as if it were water to those who come to pour there the goods from the mountains and those from the sea, to those who bring ashore in the lagoon boats (toni) the gifts of gold brought by the ships (Kalam), and to those who crowd the port in the turmoil created by the sacks of pepper piled up in the houses, and finally to those who return home having sold the fish and having heaped the rice on the boat*” (De Romanis 1997: 94f).

Papyrus Vinob G 40822, commonly known as the “*Muziris Papyrus*” as it is believed it was composed there, dates to the middle of the second century AD and deals with the shipment of goods from India (Casson 1990: 195, De Romanis 2014). The purpose of the document was originally interpreted as remnants of a maritime loan between a ship owner who had borrowed from a merchant, with the pledge of the boat as security (Casson 1990: 202). However, in his translation, Casson (*ibid.*) believes the guarantee of the security was not a ship, but items subject to customs duty. The document references Coptos (Egypt) and Muziris, with information about the repayments of loan agreements and penalties for noncompliance. As the papyrus is incomplete, the origin of those involved remains an unanswered question (*ibid.*: 196, 200).

The *Arthashastra* (II.11.2: VII12) presents further indications of trade. Pearls and chank (gastropod molluscs) are described as cargos of high value, and this trade in has been verified through finds from excavations (Ray 1994: 19). Additional commodities are also mentioned in the *Akhananuru* in verse 149, where “*The flourishing town of Muciri where the large beautiful ships of the yavanas which bring gold and take pepper come disturbing the white foam of the little fair Periyar of the Cheras*” (Srivathsan 2013).

There are various writings detailing locations as introduced above, however, it must be considered whether the writer had been to the location. None of the early western writers who wrote about Sri Lanka, (Onesicritus, Megasthenes, Eratosthenes and Hipparchus) had visited the island. Onesicritus, who is mentioned by later writers, had

visited the Indus as a commander in Alexander's Army, but no other parts of India (Francis 2013: 53). On writing about Sri Lanka, he is describing "*Taprobane*", which, after twenty days' travel from India on a dangerous voyage, is 5000 stadia (1000km) "*in extent*" (*ibid.*). Further descriptions are extremely varied, with the size of the island greatly exaggerated, for example Megasthenes, who wrote that Taprobane was separated from India by a river, and inhabited by a population of people called *Palaeogonos*. Pliny included an account of Sri Lanka by Megasthenes who described Sri Lanka as a mountainous country which is 7000 stadia long and 5000 wide. Strabo, using the writing of Eratosthenes, described contrasting measurements with Taprobane being seven days sailing from India, and 8000 stadia long stretching out towards Ethiopia, but Eratosthenes was aware of Adam's Bridge (*ibid.*: 54).

While often citing from Onesicritus, Eratosthenes and Hipparchus, Strabo's complete text added information about what was being traded from Taprobane. This information enhances what can be recovered from the archaeological record. Strabo includes tortoise shell and ivory as commodities which were traded to India (Francis 2013: 54). Following on from Strabo, Pliny expands on what is known about Taprobane. Quoting a slightly different range of authors (Onesicritus, Megasthenes, and Eratosthenes), information is disseminated about some of the people who may have been travelling in the area and the reasons for the journey – details which may be difficult or impossible to extract from the archaeological record. Pliny writes about a freed slave who is blown off course and into the Harbour of Hippuros at Taprobane. Annius Plocamus, the slave, spent six months on Taprobane, and information was exchanged between himself and the king, which led to envoys being sent to Rome.

As indicated in the paragraph above, though not directly linked to traded goods, classical authors can also present an insight to the society and people in the region. For example, the Pandyan empire is acknowledged in Strabo's Geography, where Emperor Augustus received an ambassador from India (Strabo. 15.1.73). References are made to a variety of classes, for example the *Mahavamsa* makes references to *Damilas* who bring horses from South India (Bopearachchi 2002: 101).

Beyond the end of the Early Historic period textual evidence is still forthcoming. An example of this is Cosmas Indicopleustes, an Egyptian Greek in the sixth century AD, who bore witness to the presence of Persian traders in Sri Lanka (Bopearachchi 2002: 104). According to a description in "*Christian Topography*", Sri Lanka played an important role in transmitting merchandise between east and west, a role once performed by western India. Cosmas Indicopleustes (XI 15) provides evidence of perishable and non-perishable goods - silk from China and aloes, clove-wood and sandalwood which are then distributed further. It is presumed Cosmas Indicopleustes is writing about events after the fall of the Roman Empire, therefore demonstrating the range of goods that were still being traded.

1.3 Rouletted Ware and Arikamedu Type 10: an introduction

Following their initial recognition at Arikamedu (discussed further in the next chapter), recordings of both ceramics in this study have been made in other locations across South East India, at Pattanam, and along the East Indian coast. The ceramics

have also been recorded on island locations, for example Trench ASW2 in the city of Anuradhapura, Sri Lanka (Coningham *et al.* 2006: 136), and in Southeast Asia at Sembiran, on the island of Bali, Indonesia (Ardika & Bellwood 1991: 224). In a westerly direction, both types have been recorded at sites on the Red Sea coast of Egypt. For example, at Berenike, sherds have been excavated alongside a selection of artefacts of Indian origin including other ceramics (Begley & Tomber 1999: 166).

The aim of this chapter is to introduce this current research into Rouletted Ware and Arikamedu Type 10, and it should be noted that across the relevant literature these ceramics are referred to by a variety of names. This is highlighted by Coningham *et al.* (2006: 127), “*a further problem is with individual scholars or projects producing their own unique classifications*”. Rouletted Ware is also recorded as Arikamedu Type 1, but the terms Wheeler Type 1 (Begley 1983: 48), Begley Form 1 (Begley 1996b: 226), and Ragupathy Type 4 (Ragupathy 1987: 13) have also been used. It is generically referred to as Rouletted Ware (for example Coningham *et al.* 2006: 133) or Indian Rouletted Ware (Magee 2010: 1043). Arikamedu Type 10 can also be recorded as Wheeler Type 10 (Begley 1983: 53), and Begley Form 5 (Begley 1996b: 229).

Both the ceramics in this study demonstrate particularly distinctive features which make them instantly recognisable in the archaeological record, and more thorough descriptions will be presented in the following chapter. The characteristics displayed by these ceramics should ensure that they are always correctly identified, but Chapter Two, Section 2.19, will highlight that is not always the case. Rouletted Ware displays

a series of distinctive indentations, commonly described as rouletting (for example in Begley 1983: 47). Wheeler *et al.* (1946: 45) describes the Type as “... a dish (Type 1) sometimes more than 12 inches in diameter, with an incurved and beaked rim which usually has a faceted edge”. He continued by describing the interior as “decorated with two, occasionally three concentric bands of rouletted pattern”. However, the following statement made by Wheeler *et al.* (*ibid.*) probably stoked the ongoing debate since the excavations, where Wheeler states that the “*pattern is not an Indian feature and may be regarded as an importation from the Mediterranean region*”. When compared to the other ceramic in this study, Rouletted Ware has the wider spatial and chronological distribution, and unlike Arikamedu Type 10, it is found without its counterpart. It is this type of Rouletted Ware which was originally recorded by Wheeler that is the focus of this research, however it is acknowledged that rouletting does appear on other ceramics, and examples of this can be found in Chapter Two.

The second ceramic in this study, Arikamedu Type 10, also displays distinctive decorative features, but possibly, as it has not attracted the controversy associated with Rouletted Ware, it has never been as well recognised, documented or debated. In common with Rouletted Ware, it was originally recorded at Arikamedu by Sir Mortimer Wheeler, who described it as a “*special form of cup or bowl..... it has a flat base and tapering profile, and is ornamented on the interior of the sides with a row of stamped medallions between two bands of multiple incised grooves*” (Wheeler *et al.* 1946: 59). The potential to utilise the characteristics of the decoration has generally been overshadowed but has been recognised by some, such as Begley (1996: 229).

Trench ASW2 from Anuradhapura will provide a large proportion of the data for this thesis, and is classed as the ‘Level One’ site (further detail can be found on this in Chapter Two). Rouletted Ware appears throughout the stratigraphy of Trench ASW2 with the exception of the earlier Periods J and K; its highest concentration is in Period D, Phase XCV, which may not be a reliable indication of the density of the ceramics due to the interpretation of this context as a robber trench. A more reliable figure may be achieved from the concentration in Period G5, phase XCI, which has been radiocarbon dated to between 200 cal. BC to AD 130 (Coningham *et al.* 2006: 133). Sherds of Arikamedu Type 10 at Trench ASW2 have been recorded from *c.* 200 BC through to AD 1100, with the peak period being between *c.* 200 BC through to AD 130, which is a reliable date due to the radiocarbon dating of the G5 level (Coningham *et al.* 2006: 159).

1.3.1 Reference system for the sherds in this study

The sherds in this study come from a variety of excavations. These excavations are from different locations, conducted at different times and by different people. Such factors have presented a range of classification and recording systems. Some of the ceramics that have appeared in publications were not published with any find numbers. To combat any issues that may arise from using a variety of systems, a standard numerical system has been developed as a reference aid for the sherds in this study. All the Rouletted Ware sherds have been assigned a number, as have the Arikamedu Type 10 sherds. To distinguish between the two types, the Arikamedu Type 10 sherds are prefixed with a ‘T’. The reference for the sherd can then be identified in the

database (Appendix One(i) and Appendix One(ii)) where further details (including references) of the sherd can be found.

1.4 Aims and Objectives of this research

This study will exploit the distinctive decorative features of the two ceramics in an attempt to reconstruct ancient networks across the Indian Ocean in the Early Historic period, and also investigate the spatial and temporal distribution of the ceramics. As discussed below, scientific research is not the key to remedying the questions raised by this study. Previous scientific investigations into these ceramics have failed to provenance these types, therefore this study will use alternative archaeological evidence, rather than personally generated opinion, such as Wheeler's colonial and diffusionistic views. Despite the developing knowledge of Indian Ocean trade through texts and archaeological evidence, Wheeler held colonialist views which led him to believe that Indo-Roman trade was generated through stimulus from the west (Wheeler *et al.* 1946: 18, Coningham 2002: 100). Wheeler's model of Indian Ocean trade, fuelled by evidence from Arikamedu, formed part of his 1955 publication "*Rome beyond the Imperial frontiers*". Wheeler's diffusionistic views were not unusual for the period in which they were written. Along with fellow diffusionists, a school of thought was followed where development occurred through the impact from one society which was demonstrably more complex, both politically and socially, than the one it was moving into, and that the impact of this was the driver for change. It is a possibility that in areas that were subject to the incoming of the more 'advanced' society, there would have been something that was of value – whether this be a

commodity, natural strategic position or feature such as a harbour, an opportunity to expand an empire, or spread a school of thought.

Wheeler applied his diffusionistic thoughts to his excavations at Arikamedu – entitling his 1946 excavation report “*Arikamedu: An Indo-Roman trading station on the East Coast of India*” (Wheeler *et al.* 1946: 17), and directing readers to the publications by Warmington and Charlesworth (see below) as sources about Indian trade with the Roman empire, demonstrating that even after the excavations his diffusionistic views were not wavering at all. As will be discussed later, what Wheeler failed to consider was the pre-roman activity at the site – leading to the fact that the knowledge of the monsoons was not the factor that generated trading networks in the region and turned villages such as Arikamedu from neighbourhoods that “*doubtless consisted of simple fisherfolk who caught the gullible fish of the region from the shore or from small outriggers And lived in a leisurely and unentertaining fashion just above subsistence level*” into “*Indo Roman trading stations*” (Wheeler 1955: 174f). Excavations at Trench ASW2 demonstrate evidence of an extensive trading network, with evidence coming from as far away as Gujarat (carnelian) and Afghanistan (Lapis Lazuli) (Coningham *et al.* 2006a: 377).

Wheeler’s views have been echoed by others working in South Asia, and other parts of the world. As mentioned above, he referred readers to the work of Warmington and Charlesworth. Warmington wrote the book “*The commerce between the Roman empire and India*” which was published in 1928, while Charlesworth wrote “*Trade-routes and commerce of the Roman Empire*” which was published in 1926.

Charlesworth portrayed the Roman influence in the region as getting trade in the region organised. When referring to the Parthians, his view was summarised as – “*Here, as elsewhere, the instinct of the Romans was for sound and orderly trading with peaceable and law-abiding neighbours, and that is why we have dwelt at greater length upon this sea-route whereon they tried to carry out these principles*” (Charlesworth 1926: 73). This quote gives the impression that the processes introduced by the Romans were new, and the local people were subservient to this. In part one of his 1928 publication, entitled “*the opening up and progress of Rome’s commerce with India*”, Warmington presents a comparable view, although he is describing the influence of a merchant party rather than directly from Rome. Warmington states how the “*merchants filled with the western characteristic of energetic discovery and the will and power to expand backed by the governing power of Rome and the prestige of her great name were readier to push eastwards by land and sea than they had been before*” (1924: 1). This was further developed by describing “*the moving force first to last came from the West; the little changing peoples of the East allowed the West to find them out*” (*ibid.*). Warmington, along with Wheeler, compared the Indo-Roman trade with the later colonial trade networks of the British Empire, with no consideration of the local development of trade (Warmington 1924, Wheeler 1954). This theory corresponds with the development of the European trading stations in the seventeenth and eighteenth centuries (Coningham 2002: 100 Chaudhuri 1985: 80ff).

Therefore, the primary aim of this thesis is the reconstruction of Early Historic networks of communication in South Asia and beyond using a methodology developed for this research. The elements of analytical techniques to be applied to the ceramics

in this study were piloted by Shoebridge (2009) and Blair (2010). By investigating the networks, in addition to understanding ‘who was communicating with who’, the assessment of the spread of these ceramics will allow the study to investigate whether these were moving for commercial or possibly other reasons. After developing a chronological list of the ceramics from Trench ASW2, this aim will encompass the comparing of corpuses at different sites and draw comparisons.

The secondary aim of this thesis is the identification of stylistic variances across the geographical and chronological boundaries of this research. This will show changes in technology which can possibly be related through sites and lead to proposals regarding the currently unknown productions site of the two ceramics in this study. The following objectives will facilitate in the attaining of these aims:

- Objective One To provide an overview of current research literature on the subject of Indian Ocean networks of communication.
- Objective Two To introduce the distinguishing characteristics of the ceramics utilised in this study by providing a description of Rouletted Ware and Arikamedu Type 10.
- Objective Three To discuss the locations where Rouletted Ware and Arikamedu Type 10 have been recorded.
- Objective Four To evaluate, develop and enhance the applicable elements of the methodologies created by Shoebriidge (2009) and Blair (2010) and examine other image analysis studies in order extract the maximum amount of data from casts, published images and original photographs of Rouletted Ware and Arikamedu Type 10 available to this study.
- Objective Five Analyse the distribution and chronological changes of Rouletted Ware
- Objective Six Analyse the distribution and chronological changes of Arikamedu Type 10

- Objective Seven To compare the chronological and spatial data from the results of Objectives Five and Six, including the significance of the ceramics in relation to the development of networks of communication, propose dates for some of the ceramics in this study.
- Objective Eight To propose what the purpose of the ceramic may have been
- Objective Nine Propose an origin for the production of the ceramics
- Objective Ten To appraise the methodology and discuss its transferability to other ceramics and to propose future research projects.

1.5 Methodology: overview

The methodology for this research will consider the previous attempts to investigate the ceramics in this study, which have been unsuccessful due to the geological consistency of much of South Asia, therefore including many of the locations that the ceramics in this study have been recovered from. This is an issue raised by both Ford *et al.* (2005: 917) and Krishnan and Coningham (1997: 935). Ford *et al.* proposes that (2005: 919) “*only intensive survey in the coastal regions of south-east India with a view to recovering evidence of production sites*” will lead to the provenance of Rouletted Ware pottery and its related Fine Wares.

The methodology applied in this research will use a combination of specifically developed image analysis techniques that will extract data from the ceramics in this study. Pilot studies have explored these ceramics, with Shoebridge (2009) applying image analysis techniques to Arikamedu Type 10 and Blair (2010) to Rouletted Ware. Shoebridge's (2009) study, and these are discussed below and at relevant points in this research.

This study will see the expansion of the data set through the sourcing of further examples of Rouletted Ware and Arikamedu Type 10. This increase in data will be the result of investigations into excavation reports, related texts and also museum research. However, unfortunately, examples from museums do not always have context information, or may be the result of surface finds – a point verified by Begley (Begley 1975: 192). A website has been developed to disseminate some of the earlier research by Shoebridge in relation to Arikamedu Type 10, and through developing awareness it is hoped that further examples will be located, resulting in additional data to be analysed.

The achievement of the secondary aim will allow this research to present the chronological and geographical variants of the ceramics in this study, ultimately providing a transferable method which can be used to propose dates for other sites. This will provide data that can be analysed to show how the decoration changed over time, and reasons for these changes will be discussed. The techniques used in this research, namely the methodology for investigation and interpretation of the results,

and the theories regarding reasons for variation will hopefully provide data that can be applied to studies of archaeological ceramics in the future.

1.5.1 The Previous studies by Shoebridge and Blair: an introduction.

Due to the failure of the scientific methods to identify the provenance of the ceramics, there has been more recent investigations into Arikamedu Type 10 (MA thesis by Shoebridge 2009) and Rouletted Ware (MA thesis by Blair 2010). Both are relevant when considering the ceramics that this current study is investigating, however, to present an in-depth study into these vessels, a more extensive and thorough approach needs to be developed. However, these studies will be referred to at several points in this thesis. On initial investigation when reading excavation reports, such as that by Wheeler *et al.* (1946) and Coningham *et al.* (2005), it became clear that to analyse the designs of these sherds, the factors which they were composed of would need to be grouped in some way to allow any kind of contrastive analysis. All the sherds used have been assessed for this current study.

Shoebridge 2009 primarily used illustrations of Arikamedu Type 10 to investigate traits on the Arikamedu Type 10, Coningham *et al.* presents a very high-level classification system (2005: 159). Shoebridge addressed this by breaking it down into further parts of the birds to analyse, namely the Borders and dividers, ‘v’ symbols and also does discuss the heads primarily in Section 6.4 (2009: 74) which was entitled ‘Bird images on the stamps’, and also comments on the direction that the birds are facing. This current research does divide the birds up, into what it has developed into the component code system (see Section 5.7). The criteria highlighted by Shoebridge

2009 did not allow for an in-depth investigation at the level required, so the system introduced in this current study allows for analysis of all the factors in the composition of the bird in an attempt to look for matches. Shoebridge (2009) included a table of chronological changes within the Arikamedu Type 10 at trench ASW2, this has been assessed in Chapter 5 (Table 5.12) and a more detailed result presented (Table 5.13).

The system used by Shoebridge (2009) to draw the sherds was useful to highlight the detail. This current study has found 39 suitable sherds to have their design investigated (see appendix one ii), as opposed to the 19 used by Shoebridge (2009: Table 6.1) and repeated below. This demonstrates an increase of over fifty percent, and includes new locations such as Pattanam and the sherds from Thailand

	Origin	Reference if known
1	Arikamedu	
2	Arikamedu	AV90-I 024
3	Alagankulam	
4	Alagankulam	
5	Anuradhapura – ASW2	6710
6	Anuradhapura– ASW2	15514
7	Anuradhapura– ASW2	17710
8	Anuradhapura– ASW2	6520
9	Anuradhapura– ASW2	7051

10	Anuradhapura– ASW2	6280
11	Anuradhapura– ASW2	
12	Chandraketurgh	
13	Chandraketurgh	
14	Chandraketurgh	
15	Tissamaharama	
16	Tissamaharama	
17	Tissamaharama	
18	Anuradhapura– ASW	ASW/87/PT-217
19	Adam	

Table 1.1 Catalogue of sherds used by Shoebridge (after Shoebridge: 2009)

Initial investigations in this current study highlighted that due to the format of the designs on the Rouletted Ware, clearly the two points that needed to be investigated were the rouletting indentations themselves, and how they were positioned on the sherd. Blair (2010) principally focussed on the Rouletted Ware corpus excavated at Trench ASW2, in parts encompassing the weight of sherds from the whole Trench ASW2 Rouletted Ware corpus (for example in 2010: Table 6.1) and also selecting 12 sherds in particular for the measurements in Chapter 5 (*ibid.*, Table 2.1), it is a little difficult to total the sherds used for the decorative analysis.

Blair had access to many of the sherds in his study, unlike Shoebridge (2009) above. Blair's research is discussed at various points in this thesis, but particularly in Section 4.12. In an investigation into the designs, Blair also considered the variation in rim sizes of the ceramics from Trench ASW2, which is beyond the scope of this present study. Section 4.12 discusses Blair's typology of the shapes of Rouletted Ware (Table 4.4) and Table 4.5 highlights the variance within this study. He also looks at the rouletting at two different levels – the element (the actual rouletting) and the configuration of the design. Whereas Blair does produce some interesting results from the method, it was decided that it was too restrictive for this current study and needed to be enhanced. There needed to be a means of plotting the data geographically, hence the development of the Design Code system.

As Blair had access to most sherds that he was investigating and some already made casts, he could conduct further research into the depth and measurements on the sherds, which was not possible with this current study due to the number of photographs and published images. This current study did access the moulding compound used by Blair (*Smooth On's Equinox 35 fast set addition cure silicon putty*), as it had been used previously and good photographic images are in his dissertation, however there were seen to be some disadvantages to the compound as discussed in section 3.2.2. All the impressions for this current study were taken as described in section 3.3 onwards.

1.6 The archaeological significance of this study

Research published on Indian Ocean archaeology encompasses wide chronological and geographical parameters, pushing some outside the parameters of

this study. Therefore, not all of the research into the subject matter has been included in this thesis, and it will primarily focus on literature between the parameters of approximately 500 BC through to AD 450, encompassing Early Historic South Asia and the Indo-Roman trading from a chronological perspective. Geographically it will consider the Indian Ocean littoral, with East Africa as one geographical boundary, and Southeast Asia the boundary to the east (as shown in Map 1.3). To set the chronological terminus much more recently would have encompassed the start of Islamic trade, Chinese trade and leading on to colonial trade across the Indian Ocean, which would incorporate a whole plethora of further literature which would have been beyond the boundaries of this current research. The two outlying points noted on the map are Berenike in the west where both the ceramics in this study were recovered (Tomber 2002: 28), and Sembiran, Bali in the east (Ardika & Bellwood 1991: 223*f*). This map details the key sites in this study and a further discussion on distribution will be made in the following chapter, although it can be noted primarily that the two ceramics in this study are recorded on the east coast of the India, and also, on the island of Sri Lanka, for example at Trench ASW2 (Coningham 2006) Kantarodai (Begley 1967) and Tissamaharama (Schenk 2000: 661*f*).

Only relevant scientific research applicable to this study will be considered, and although the thesis is partially a result of the common geology of a region as discussed, geological studies will not be reviewed. However, in Chapter Three it will address comparable materials and methodologies. Various pieces of research will be referred to at relevant points through the thesis, but a selection of texts detailing previous research, debate and geographical distribution are outlined below.

It can be argued that although a wide range of research has contributed towards the body of knowledge of these ceramics, with the exception of the studies by Shoebridge (2009), Shoebridge and Coningham (2011) and Blair (2010), there has been little investigation as to what data the designs on the sherds can provide. The movement of goods in this study is often encompassed by one of two terms, firstly the term ‘Indian Ocean trade’, for example as used by Prickett Fernando – “*Durable Goods: The Archaeological Evidence of Sri Lanka's role in the Indian Ocean Trade*” (1990). Secondly, the term ‘Indo- Roman trade’ is also often used to describe the movement of goods in this period, such as “*Indo-Roman trade: the ceramic evidence from Egypt*” (Tomber 2000). A similar term was used by Wheeler *et al.* (1946) when describing Arikamedu - he used the term “*Indo -Roman Trading Station*”, as discussed in the next chapter. The Oxford Dictionary describes the noun trade as “*the action of buying and selling goods and services*” or, similarly, when used as a verb “*buy and sell goods and services*” (Oxford University Press 2016). The Concise Oxford Dictionary of Archaeology makes this a little more precise and does state that the dictionary entry is specific to archaeology, and that the term “*in its broadest sense*” means the “*transfer of goods between communities recognizing that many different social mechanisms may be responsible for those movements*” (Darvill 2002: 436). In the same entry, the dictionary then directs its reader to the entry on exchange, which it describes as a “*transfer of goods, services or information between individuals or groups of individuals. Such transfers may not necessarily involve payments or reciprocation with equivalence. The term is often used by prehistorians wishing to avoid the modern connotations of the word trade*” (*ibid.*: 140). Although there is a concession made towards the study of prehistory – there is a common understanding that a product was

given in exchange, even though it may not be of comparable monetary value to what was received, it may have intangible value. However, if trade has taken place, a service may have been offered which has been paid for, even though it may not be of comparable value to what was received.

This research will investigate the movement of goods through networks of communications. Whereas trade and exchange as detailed above may be key drivers for the movement of material, other reasons will also be considered. A notable exception where goods were not identified as traded goods was the 2000 study by Tomber which discussed the possibility of traders taking their belongings with them as they acted as ‘middle men’ on the Red Sea coast. This theory, along with others, will be explored with reference to the locations in this study.

The research will extend to include locations where it would not be completely unexpected to excavate the ceramics in this study, but none have been recorded to date. It will also discuss locations where Rouletted Ware has been recorded, but on further investigation it can be noted that they are not the ceramics expected. There may be more familiarity with Rouletted Ware as opposed to Arikamedu Type 10 as a result of the debate following Wheeler’s interpretation of the Type (as discussed in Chapter Four).

Rouletted Ware and Arikamedu Type 10 have both been recorded at Trench ASW2, which is discussed further in Chapter Two. The extensive stratigraphy demonstrated by this site allows the positioning of the ceramics within their relative chronologies,

and therefore can be used as a dating tool for ceramics recovered on other sites. This forms an extremely valuable asset that may be particularly useful as some of the reports used in the study are not particularly lucid when discussing recorded find spots, especially in relation to a site's chronology. Therefore, to be able to link the ceramics to a reliable chronology will be an important factor as it should help when investigating the chronological distribution of the ceramics. By the building of the chronological sequence, changes in art and technology can also be investigated. Arikamedu Type 10 will provide a chronological and spatial distribution of the peacock designs on the vessel, allowing analysis of how this design on the ceramic varies and can be compared to other artwork with such characteristics. As discussed further in Chapters Five and Six, the peacock is a popular feature of Indian Art from the Indus Valley Period, through to present day.

The investigation into the two ceramics in this research aims to fill a void which scientific research, to date, has failed to close. Krishnan and Coningham (1997) used thin section analysis to investigate the evolution of the Type, and this research was followed by Ford *et al.* in 2005 who attempted a geochemical analysis on Rouletted Ware, Arikamedu Type 10 and also Grey Ware. Other studies have been carried out such as that in Satanikota by Ghosh (1986), and also by Gogte (1997), but all have failed to provenance the ceramics in the study. Therefore, an alternative method of research needs to be constructed and developed in order to present more data which, on analysis, can reveal information about the biographies of these ceramic types. The method devised needed to consider the failure of the scientific method (as discussed above) and contemplate the potential of an image analysis technique (which will be discussed in Chapter Three). The method would also move thought beyond the views

of Warmington (1928), Charlesworth (1926) and Wheeler (1955) and the still held belief in some recent publications that Rouletted Ware was a Roman import (for example Patra & Patra 1993: 109 & Tripathy 2007: 4).

Indian Ocean archaeology has often included discussions linked to Roman traders, with Wheeler *et al.* (1946) being a prime example of this. Much has been written on Indo-Roman trade and also later colonial ventures, with the knowledge of what actually occurred in South India reliant on texts such as the Sangam poets. Research has investigated what was traded across the Indian Ocean, particularly during this period from the South Indian ports across to the Roman Empire. Another point of focus has been the Red Sea ports and the artefacts of Indian origin which have been recovered there. Recently the trend has shifted slightly, and this has been influenced by excavations in certain regions, particularly Oman (Avanzini 2002, 2008) and parts of Southeast Asia (Chaisuwan 2011, Glover & Bellina 2011), however it is clear that on occasion India appears to act as a barrier that not all research will cross.

One noticeable factor with reference to the published research is how there is a considerable bias towards the investigation of Rouletted Ware in comparison to Arikamedu Type 10. This will be addressed in Chapter Four, where it can be proposed that this issue is linked to the variation in the number of sherds recovered in the archaeological record, leading to a limited amount of research specifically focusing on Arikamedu Type 10 such as Shoebridge (2009) and Shoebridge and Coningham (2011). Nevertheless, research such as Ford *et al.* (2005) and Ardika and Bellwood

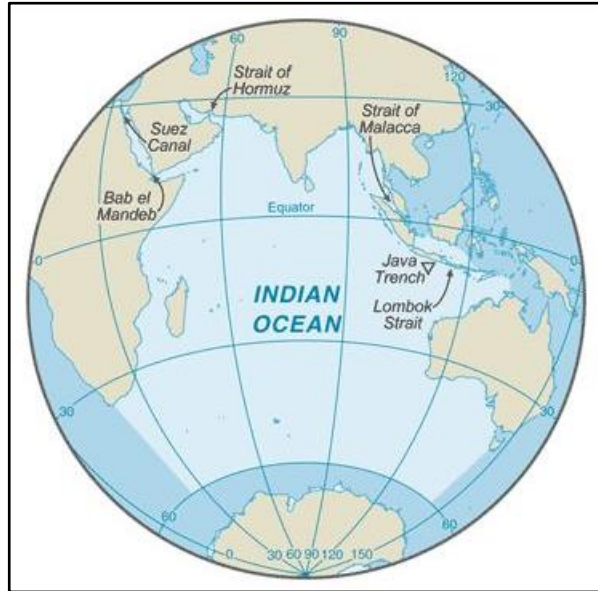
(1991) have included it along with Rouletted Ware, with Begley (1996b: 231) highlighting its real potential, as discussed in the next chapter.

1.7 Conclusion and overview of the following chapters.

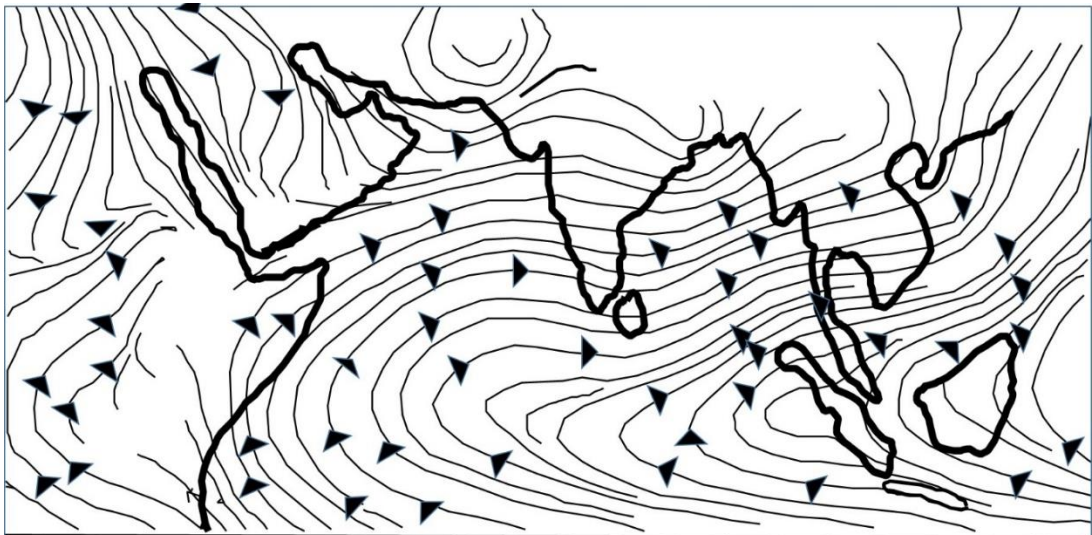
This initial chapter has introduced this research and provided an overview of current literature on Indian Ocean networks of communications, therefore meeting Objective One. The following chapter will provide descriptions of the ceramics in this study, expand on their known geographical and chronological distribution, and provide descriptions of some of the sites where they have been recovered. Therefore, Chapter Two will meet Objectives Two and Three. Moving on to Chapter Three, this will meet Objective Four by considering previous research that has been conducted in an attempt to provenance Rouletted Ware and Arikamedu Type 10. Chapter Three will also develop the methodology for the thesis while reflecting on the methods used by Shoebridge 2009 and Blair 2010, whose previous research investigated the reconstruction of Early Historic networks of trade and assessed chronological and spatial variances. Chapters Four and Five will partially meet Objectives Five and Six. These chapters will examine the data extracted from the Rouletted Ware and the Arikamedu Type 10, drawing some chronological and geographical conclusions. However, it is Chapter Six which will amalgamate the data to draw further conclusions and complete these objectives, and propose Early Historic networks of communication, partially completing Objective Seven which will be discussed further in the following chapter. Chapter Seven, the final chapter, will deliberate as to whether the data obtained through this study can propose any new light on dietary issues and table behaviour, in addition to theories about manufacture and the variability in style.

This chapter will also discuss reuse and circumstances where the ceramic has been imitated, therefore meeting Objective Eight. In addition, Chapter Seven will also consider the evidence that has been provided by this research in relation to production locations, therefore meeting Objective Nine. Finally, it will summarise this thesis, evaluate the methodology and debate what has been gained through this research, whilst also considering the application of the methodology to other research projects and propose future research, meeting Objective Ten.

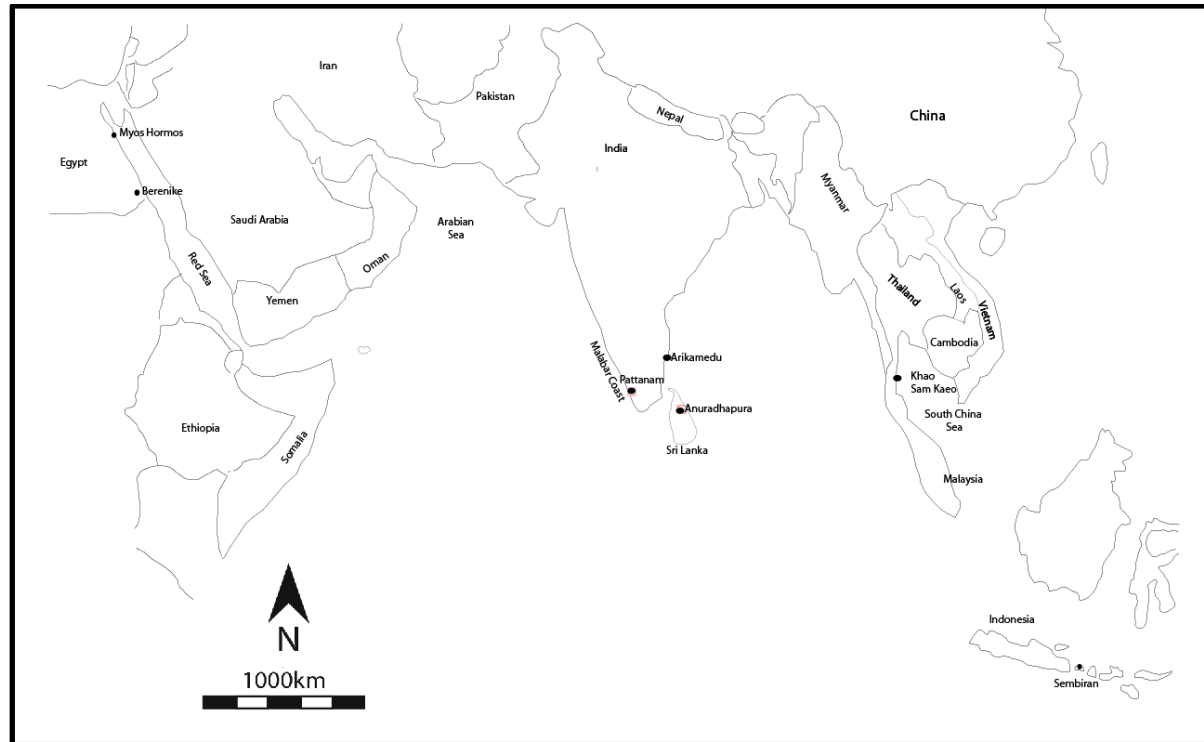
Chapter One: Maps



Map 1.1 The expanse of the Indian Ocean (Central Intelligence Agency: ND)



Map 1.2 The direction of the Indian summer monsoon winds between June and August (after Kar *et al.* 2010: Fig. 2a)



Map 1.3 Key sites that will be mentioned throughout the thesis, and also a demonstration of the easterly and westerly extremes of this research

Chapter One: Figures

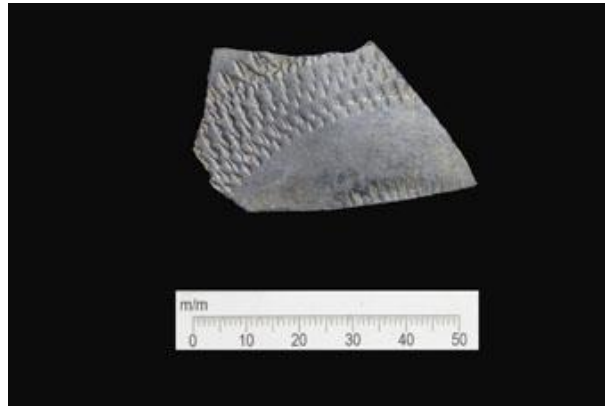


Figure 1.1 Example of Arikamedu Type 1, Rouletted Ware (sherd 590).

This sherd was excavated from Trench ASW2, Anuradhapura, Sri Lanka (photograph: author).

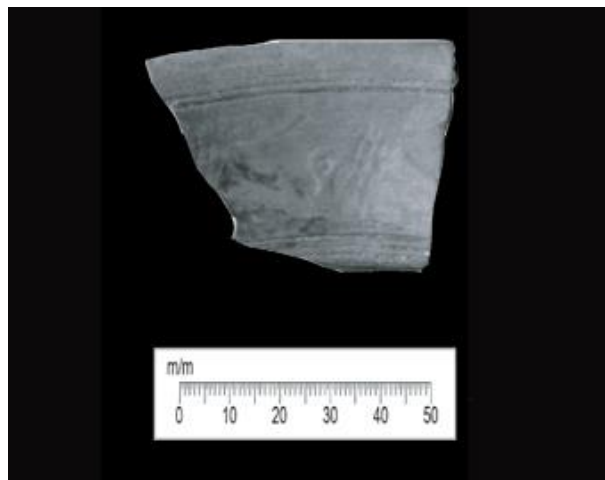


Figure 1.2 Example of Arikamedu Type 10 (sherd T37). This sherd has a visible bird stamp, grooves and dividers, excavated at Trench ASW2, Period G2. (Photo: Coningham)

Chapter Two

Across time and space: an introduction to the ceramics in this study and their distribution

“Pots also move about. They may be manufactured at a production centre and traded in their own right over greater or lesser distances, they may be traded as containers for wine, foodstuffs, fuel.... or other material..., they may be exchanged as gifts or brought back from souvenirs on travels.....”

Orton *et al.* (1993: 26)

2.1 Introduction

Indian Ocean archaeological research spans wide geographical and chronological parameters as introduced in the previous chapter. The ceramics in this study, Rouletted Ware and Arikamedu Type 10 have the potential to provide evidence which, following interpretation, will allow the reconstruction of lost trade routes. However, while the artefacts can provide a certain amount of data, this is only of value on successful interpretation. The quote above by Orton *et al.* highlights that pots may serve one of a variety of functions, while being traded over various distances. It is hoped that in this research proposals will be made about where the ceramics in this study “*move about*” to (Orton *et al.* 1993: 26), and this, along with questions about the purpose of the vessels, will be one of the key themes throughout this thesis.

This chapter will introduce the two ceramics on which the research is based. The second part of the chapter will introduce the locations from which the ceramics have been recovered. In particular, interest will focus on three sites, namely Arikamedu on the Coromandal coast in South India, Trench Anuradhapura Salgaha Watta 2 (Trench ASW2) at Anuradhapura, and also the site of Pattanam, on the Malabar Coast in South India. It was at Arikamedu that both ceramics types were identified for the first time during the excavations by Sir Mortimer Wheeler in 1945 (Wheeler *et al.* 1946). From his interpretation of Arikamedu, Wheeler developed his model of Indian Ocean trade. Subsequent publications by Wheeler, particularly Wheeler (1955) and Wheeler *et al.* (1946) regarding Arikamedu remain the focus of extensive debate, even though the site has been subject to two further excavation campaigns.

The most recent excavations at Arikamedu were led by Vimala Begley and a collaborative team from the University Museum of Pennsylvania and the Madras University in India, who worked at the site between 1989 and 1992 (Begley 1996: v). However, the site was also excavated by Jean-Marie Casal (Casal: 1949), a French archaeologist who excavated between 1947 and 1948. As discussed below, Casal's excavations (to date) have not received the recognition they deserve. In summary, this chapter will meet Objective Two of this thesis, which was to introduce the ceramics into this study, presenting an overview of where and how they have been recorded.

2.2 Networks of communication in South Asia and beyond

Archaeological research has the potential to provide data that, on interpretation, can allow the proposal of Early Historic networks of communications. This data can be supplemented by historical texts, for example, the *Periplus of the Erythean Sea* and also the *Mahavamsa* as introduced in the previous chapter. The previous chapter also introduced some of the terminology in this research, in that it will often refer to ‘networks of communication’ or ‘networks of contact’ rather than ‘networks of trade’. These are the terms of choice as it cannot always be presumed that commodities were always moved for financial gain or retail purpose by individual merchants or through organised trading systems. Difficulties can arise when attempting to determine from the archaeological record what is a traded object as opposed to one that has been transported for a different reason (Prickett 1990: 151). Examples of reasons for the movement of goods range from gifts, souvenirs, dowry and religious tribute through to the more intangible assets such as scholarship, teachings, curiosity for exploration and travel, with some of these reasons highlighted in the opening quote of this chapter. Due to their presence in the archaeological record, ceramics play a key role in the analysis of networks, as Prickett-Fernando states “*the durable materials that are left for the study of trade are primarily ceramic*” (Lokubandara 2013: 13, Prickett-Fernando 1990: 15). It could be argued in this quote that possibly the word “*trade*” could be exchanged for “*networks*”. This activity may have involved a whole range of carriers, from international

merchants to small-time traders, and a core of middle men that may have been facilitating the progress (Prickett-Fernando 1990: 60).

In addition to the difficulty of identifying the reason why an object was transported, usually there is very restricted (if any) evidence to support who may have actually moved it. Limited historical evidence may be provided by texts, with references to the arrival of ships loaded with gems, gold and other valuable cargo in the second century BC, possibly at Tissamaharama (Prickett 1990: 153). There is also evidence from graffiti on sherds which may depict a person's name, which may be repeated at more than one location, as discussed later.

2.3 Previous research into Rouletted Ware and Arikamedu Type 10.

The previous chapter introduced this research and the ceramics. This section will discuss the research that has been conducted on these vessels. The two ceramics involved in this research have attracted very different levels of academic interest since their initial reporting by Sir Mortimer Wheeler at Arikamedu in 1945. As detailed later in this chapter, Rouletted Ware has a considerably wider distribution network. Arikamedu Type 10 has not been recovered to date without Rouletted Ware, whereas Rouletted Ware has often been recorded on its own. On its initial recording at Arikamedu, Rouletted Ware was recorded in the same stratigraphic level as amphorae of "*Mediterranean type and fabric*" (Wheeler *et al.* 1946: 41) and Arretine

Ware. The recovery of these vessels together possibly provided him with the evidence to support his views that Rouletted Ware was an imported product (Begley 1988: 427, Ford *et al.* 2005, Wheeler *et al.* 1946: 17 – 137). However, later excavations at Arikamedu conducted by the team led by Begley between 1989 and 1992, revealed that Rouletted Ware was present in lower levels than those which Wheeler investigated, therefore predating the imported materials (Begley 1988: 461). This leads to the consideration that if Wheeler had excavated further, he would have produced evidence which could have invalidated his own model of Indian Ocean trade.

2.3.1 Evolution of the type

The debate surrounding the origin and the dating of Rouletted Ware has continued since the publication of Wheeler's initial excavation, and some of the research into Rouletted Ware has extended to incorporate Arikamedu Type 10 and also other selected South Asian ceramics (for example Krishnan & Coningham 1997, Ford *et al.* 2005). Archaeological research has the potential to be the result of scientific analysis combined with multi-disciplinary research. Data resulting from such a combination could include artistic detail which may allow for proposals to be made regarding the motivation for production, workmanship and provenance. No evidence has been recovered to date which supports the production of these ceramics or possible kiln sites (Begley 1988: 429).

Krishnan and Coningham (1997) used thin section analysis to investigate the links between Rouletted Ware, Arikamedu Type 10, Fine Grey Ware, Coarse Red Ware, Coarse Red and Black Ware and also what they described as “*suspected Hellenistic Wares*” (Krishnan & Coningham 1997: 926). All the samples in their research were excavated at the site of Trench ASW2, and their analysis led to the conclusion that the supposed Hellenistic Ware was the product of clay from an alternative source to that used for the Rouletted Ware. However, although the clay may be dug from a different source, the paste is prepared using a similar method, suggesting an evolution of the ceramic – the material may have changed, but the method of preparation has evolved into similar forms.

The research and proposals of Krishnan and Coningham (1997) were supported by the outcome of research conducted by Ford *et al.* (2005). This research investigated what Ford *et al.* describes as the “*Rouletted Ware family*” (*ibid.*: 909), namely Rouletted Ware, Arikamedu Type 10 and Grey Ware, through the application of Inductively Coupled Plasma-Atomic Emission Spectroscopy, which attempted to determine the chemical elements in this family of ceramics. With samples from a variety of locations, including Mantai, Anuradhapura and Kantarodai in Sri Lanka, and also Alagankulam, Vaddamanu and Arikamedu in India, the results from this research showed that the sherds analysed were all the product of one source, or a set of sources located close by to each other. The study also proved that these same sources were exploited over an extended period of time: as the Rouletted Ware, Arikamedu Type 10 and the Grey Ware were dated from 500

BC through to AD 200. An extensive period such as this implies the presence of a craft production centre with a lengthy duration, possibly in a location away from any other urban centre, for which no evidence has yet been recovered (*ibid.*: 918). In an attempt to resolve the gaps in knowledge, Ford *et al.* (*ibid.*: 998) proposed that an extensive field survey over the appropriate areas may reveal the production centres. Such an investigation may also provide evidence for the volume of goods manufactured and transported, and additionally the route that the finished product travelled from its production centre to the trading centre, and onwards to its findspot. Nevertheless, it must be considered that some of the coastal regions which may have the potential to have been sites of production, may now be under urban developments.

Whereas the majority of the investigative literature into the ceramics has focused on Rouletted Ware, possibly due to Wheeler's captivation with the ceramic, theories can also be presented which supports the evolution of Arikamedu Type 10. Coningham (2006b: 334) comments on the similarities between Arikamedu Type 10 and the late Hellenistic or early Roman glass vessels such as that seen in Figure 2.1, leading to the proposal that the Arikamedu Type 10 may be a skeuomorph of these vessels (*ibid.*). Although the glass displays the design on the exterior of the vessels, there are similarities between the decorative styles of late Hellenistic or early Roman glass and Arikamedu Type 10.

Other proposals on the origins of these ceramics include research by Ardika (for example Ardika 1994, 1995). Ardika also concluded that it is not possible to identify a production centre for Rouletted Ware, although he did suggest Arikamedu and also Salihundam in Andhra Pradesh as production points, and proposed that further research into pottery from Arikamedu and Sembiran (Bali, Indonesia) would be required in the future (Ardika 1995: 363). X-ray diffraction analysis conducted on the Rouletted Ware sherds from Sembiran, Arikamedu, India and Sri Lanka highlighted identical characteristics of the mineral composition of the eight Rouletted Ware sherds that were involved in the study. Further research in the form of Neutron Activation Analysis (NAA) was applied to two sherds of Rouletted Ware from Anuradhapura, three from Arikamedu, one from Sembiran, Pacung and also Karaikadu in India. This supported the XRD analysis in that the sherds were the product of clay from a similar source. These results are comparable with the research conducted by Ford *et al.* (2005), as discussed above. On considering the stratigraphy of the site, Ardika dated the Rouletted Ware in Bali to sometime in the first and second centuries AD (Ardika 1998: 143).

The use of X-Ray diffraction analysis as used in the examples in this section has been discussed by Begley in Appendix D of the second volume of the Arikamedu (1989 – 1992) excavation report (Begley 2004: 632ff). Although primarily reviewing the article by Gogte (1997), Begley has sought further information on XRD, providing comments from Glover (*ibid.* 632). From these comments, and the appendix by Begley, it is clear that the use of XRD analysis to answer questions regarding the origin of the ceramics and the

report by Gogte do need to be addressed with caution. In the comments Glover highlights the subjectivity of analysing XRD results and that here it is not a method to be used in isolation (*ibid.*). There is also criticism of Gogte through his claims that by using XRD he is able to identify the finer details when trying to deduce the location of the clay (Gogte 1997: 71), this is supplemented by Glover's comments on confusion linked to the presentation of the results.

Other research focussing on provenance includes that by Gogte (1997), whose method involved the use of X-Ray diffraction analysis (XRD), which led him to conclude that Rouletted Ware was produced in the Chandraketurgarh – Tamruk region of Bengal. Rouletted Ware and Arikamedu Type 10 have both been recovered in this region but in limited quantities, raising the question as to why they would be manufactured at those locations and the bulk of the material transported great distances. Bellina and Glover's (2004) paper also questions Gogte's theory surrounding manufacture "*we find this difficult to accept... that it all came from Bengal where very little, and that not typical Rouletted ware has been found*" (*ibid.*: 78). Suresh (2004: 95ff) and Begley (2004: 631) also question the claims made by Gogte. A further investigation into the origin of Rouletted Ware was conducted by the Archaeological Survey of India following the excavations at Satanikota by Ghosh between 1977 and 1980 (Ghosh 1986: 102). This research was limited and used spectrographic analysis (in the appendix Ghosh (*ibid.*: 150) states that he used "*Emission-spectrographic analysis and 'X-ray analysis'*") and results demonstrated that the clay used in the production of the Black and Red Ware

and the Rouletted Ware was the same (*ibid.*: 102). Therefore, it did not reveal any further information but supported the suggestions which have highlighted the consistency of the geology.

Considered together, these previous scientific attempts present evidence that the two ceramics in this study, most likely came from one location or a series of very closely located production points but, on that basis, the actual location of manufacture remains speculative. Therefore, a consideration of the decoration of the ceramics rather than their composition has the potential to assist the archaeological investigator in the identification of the workshop or possibly even the craftsman who produced a particular artefact. The two ceramics in this study both carry decorative features which on investigation may provide data regarding the workmanship.

2.4 Rouletted Ware: a description

Rouletted Ware (Figure 2.2) is a Fine Ware as introduced earlier, with the noticeable feature and the reason for its name, on the interior base. This feature comprises bands of indentations in a variety of tiny shapes, such as triangles, dots, crescents and diamonds. It is certainly the description by Sir Mortimer Wheeler that is quoted in all or part in almost every publication referring to this ceramic - *“A characteristic pottery-type of Arikamedu is a dish (Type 1) sometimes more than 12 inches in diameter, with an incurved and beaked rim which usually has a faceted edge. The flat interior is normally decorated with two, occasionally three, concentric bands of*

rouletted pattern.” (Wheeler 1946: 45). Wheeler noticed that at Arikamedu the most common indentations were triangles, which appeared in all the strata he excavated, with all the other indentation styles being present over long periods with the exception of the eye-shaped detail (*ibid.*: 48).

This is followed by a further definition of the Type with what can possibly be described as one of the more controversial sentences when referring to South Asian ceramics, “*the pattern is not an Indian feature and may be regarded as an importation from the Mediterranean region, but it has not been possible yet to ascertain whether the type itself is of similar origin*” (*ibid.*: 46). In Wheeler’s report, several plates of Wheeler Type 1 ceramics are published displaying rouletting from Arikamedu (*ibid.*: plate xxv to xxvi), followed by a plate containing comparable ceramics from Chandravalli and Mysore. This data is further supplemented by drawings of the Rouletted Ware from Arikamedu. The report also draws attention to the rouletting on the Arretine Ware by illustrations highlighting the rouletting on Dragondorff types, which regularly appear throughout the Roman Empire (*ibid.* Fig 8). Wheeler’s report interprets the poorer quality Rouletted Ware as being locally made, and his comments on this pattern are even fewer. He states that the “*rouletted pattern shows deterioration on these varieties*”, and discusses several sherds referring to the rouletting as “*shallow*”, “*poor*” and “*scattered and rough*” (Wheeler *et al.* 1946: 48), and some of these are pictured in the figures in the report.

2.4.1 Coningham *et al.*'s definitions of Rouletted Ware from the Trench ASW2 report (2006)

Despite the criticism of Wheeler's report, it did establish the naming conventions used in later references to Rouletted Ware. In the recording of the Rouletted Ware at Trench ASW2, Anuradhapura, Coningham *et al.* modelled the classification of the Fine Ware at the site on Wheeler's excavations at Arikamedu (2006: 127). However, the ASW2 report does present further analysis of the rouletting by using categories such as "*spike*" and "*dia*", although there is no apparent explanation of what these characteristics are.

The Trench ASW2 report, categorises the rims of the Rouletted Ware into several categories. The body sherds are individually divided into those with and without impressions, those with and without decoration (external and internal) and there is a further category for the Rouletted Ware discs (Coningham *et al.* 2006: 150f). As this research progresses it will be clearly visible how comprehensive this report is, in comparison to many of the other reports available, particularly in relation to the quality of the data available and that for which quantification is published. Coningham *et al.* (*ibid.*: 133) introduced another category – Baby Rouletted Ware. In order to be classified as such, a vessel had a diameter of less than 15cm, with the height of the vessel measured at less than 3.5cm. These sherds are also categorised as rim or body sherds.

2.4.2. Begley’s definitions of Rouletted Ware from the Arikamedu excavation report (1996).

In her excavation reports on Arikamedu, Begley (1996b: 227) veered away from the nomenclature developed by Wheeler which had been used by many researchers when describing the ceramics in this study. Begley describes a ceramic named as ‘Begley Form 1’, a fine ceramic which she describes as “*a sharply incurved, high-walled dish, ranging from 22 to 34 cm in diameter at the rim*” (*ibid.*: 226). Begley compares the ceramics to Wheeler Type 1 and Wheeler Type 3: “*the form parallels Wheeler et al. (1946) Types 1 and 3 respectively*” (*ibid.*). Begley noted that sherds made in a Fine Ware fabric were considerably more common than coarse wares, leading her to state that the form was originally produced as a Fine Ware that moved to production as a Coarse Ware (Begley 1996b: 226). When considering the prolific presence of Rouletted Ware at Arikamedu, the sherds of ‘Form 1’ were found in all the trenches in Begley’s excavations and across almost all the loci.

Begley’s 1998 article “*Rouletted Ware at Arikamedu: a new approach*”, investigates Rouletted Ware in further detail. Whereas in her excavation report, the term ‘Rouletted Ware’ is continuously used, she does describe it as “*a misleading nomenclature as roulettes were not likely to have been used in the decoration of the dish*” (Begley 1996b: 226). Begley acknowledged that many of the sherds available for analysis are too small to draw conclusions from in regard to the number of bands of rouletting that originally

formed part of the design, which is a problem that can be echoed in this present study. In her 1988 article, and with reference to the research in her Arikamedu excavation report (1996b: 226), Begley discussed her ethnographic research carried out with the potters of Bijnaur Village in India. Although the name Rouletted Ware has ‘stuck’ to the Arikamedu Type 1 ceramic, Begley’s investigation led her to conclude that possibly another method, known as ‘chattering’, was used for some of the impressions. Through her research in conjunction with Maulvi Imam Ali in the village of Bijnaur, several methods were demonstrated by Imam Ali that may have resulted in the production of the rouletted design (Begley 1988: 435). Begley discusses the throwing of the pots and post-firing cleaning, but it is principally the decoration that will be discussed here. Roulettes were made of metal sprocket wheels from clock mechanisms attached to wooden sticks that formed a handle. The smaller roulette made small, close indentations, whereas the larger roulette made comparatively large indentations spaced more widely. The handling of the roulette wheel at different angles by Imam Ali produced different types of indentations, holding the sprocket head parallel to the clay surface resulted in “*uniform strokes of the same length as the sprocket teeth*” (*ibid.*: 435f). Differences were visible when the roulette wheel was held at a “*slight angle*” (*ibid.*: 436), the result being a “*shorter, wedge-shaped strokes and when held as at a sharper angle with only one edge of the roulette wheel touching the vessel as it rotates on the wheel, then small wedged dots are impressed*”.

Following the discussion of rouletting in her 1988 article, Begley then details some of the tools used by Imam Ali, these include a *dharra* and a *katarni* (1988: 436). A *dharra* is a triangular metal strip, 13.7cm in length, which is bent on one side so it can be held comfortably, and has a side for the production of indentations. The *katarni* is 10.5cm long and used for finer indentations and creates a shallower impression. In the process of creating a decoration, the pointed end of these strips, or part of the side is “*held against the vessel as it slowly rotates on the wheel and is allowed to jump or chatter*” (*ibid.*). This technique, Begley believes, is probably of classical origin, producing the desired type of indentation (*ibid.*: 437f, 440). There are several factors that can affect the finished pattern, such as the angle that the strip is held at and also how dry the surface to be impressed is. Greater control of the size and the shape of the impression can be achieved when the “*working end*” (*ibid.*: 437) of the tool can be held.

Rouletting, although an easier method to use, produces a more limited range of shapes when compared to the shapes available from the metal strips (Begley 1988: 437). Begley’s research with Imam Ali led her to state that on observing the range of indentations made at Arikamedu they “*could not have been achieved with a roulette alone*” (*ibid.*), whereas all could have been produced with the use of a metal chattering strip. Begley raised the question that differences in the quality of the design could allow the work of certain potters to be identified, but without further evidence that is highly speculative. However, the comparisons do lead Begley to believe that the majority of the indentations on the Rouletted Ware that she examined from Arikamedu could

have been the result of a metal strip, whereas only a few of the designs could have been the result of a rouletting wheel (*ibid.*: 438, 440).

Blair's experimental research (2010) investigated the type of tool used to make the impressions on the Rouletted Ware. However, as the author admits (*ibid.*: 68), he has limited experience of working with ceramics. Despite this, Blair hoped to produce experimental decoration that could compare the techniques of chattering, stamping and rouletting. Difficulties were experienced when attempting to use the chattering technique to replicate the design seen on Rouletted Ware. Experimental discs were produced that could demonstrate rouletting and stamping, and then the study referred to the images from Begley's article (1988) to provide suitable examples of chattering. Begley herself comments that it would require an experienced potter to produce a Rouletted Ware pattern using the chattering technique, and when considering the abundant supply of Rouletted Ware, there may have been a collective of expert potters continuously working - or perhaps this was not the method used. However, it must be considered that to produce a 'perfect' piece of Rouletted Ware, one where the rouletting does match around the full circumference of the vessel, would have also taken considerable skill when compared to the proficiency required to produce a moulded or even a stamped vessel. Manufacturing of the vessels will be discussed further in Chapters Four, Five and Six.

2.4.3. Other descriptions of Rouletted Ware

“In the south and east of the subcontinent there are a group of wares known as Rouletted Wares which are well made ceramic forms with a rouletted or chattering design”.

Smith (2002: 142)

Rouletted Ware demonstrates quite a prolific presence throughout the archaeological record in South Asia, however the reporting quality does vary. Whereas there are some excavations which do report the presence of Rouletted Ware comprehensibly (for example Coningham 2006, and Begley 1996), this is not always the case. Some reports omit data regarding quantities or images, therefore such publications cannot always contribute to research such as this as fully as they could, but it is possible to grade the sites (and the excavation projects) that the Rouletted Ware and the Arikamedu Type 10 are drawn from, and this will be drawn into the discussion in Chapter Seven.

2.5. The chronology of Rouletted Ware

As discussed, Wheeler *et al.* allocated the earliest date for Rouletted Ware at Arikamedu to be between the end of the first century BC and the beginning of the first century AD, with a terminal date of AD 200 (*ibid.*: 46). The excavations that followed those of Wheeler have expanded the chronological period to a much earlier start date. Begley suggested that the characteristics displayed by Rouletted Ware were comparable with earlier South Asian ceramics, but the design had already been used in the

Mediterranean for several centuries by this time (Begley 1983: 470, Begley 1988: 439).

More recently published research from the excavations at Trench ASW2 provided reliable dating evidence that completely revolutionises the dating of Rouletted Ware (Coningham *et al.* 2006: 133). In total, 1191 sherds of Rouletted Ware were recovered here in reliable stratigraphic levels which date from Period I4 (which has been dated to c. 360 cal. BC to 190 cal. BC) through to Period A2 (AD 600 to 1100) (Coningham 2006: xix). The highest concentration of the ceramic (namely one hundred and seventy four sherds) was found in Period D (c. AD 200 to 600); however, this may be a re-deposition as it has been interpreted as a robber pit. One hundred and seventy one sherds were recorded in Period G5 phase XCI, which analysis shows to be the remains of a collapsed structure radiocarbon dated between 200 cal. BC and AD 130 (Coningham 2006c: 5).

The dates from Trench ASW2 are supported by evidence from excavations at Khao Sam Khaeo in Thailand, which will be discussed later in this chapter. Bouvet (2012) has dated Rouletted Ware from the site to 400 to 200 BC. This evidence supports the argument that the claims by Wheeler can be disregarded.

2.6 Arikamedu Type 10: a description

Arikamedu Type 10 (as shown in Figure 2.3) was originally recorded alongside Rouletted Ware by Sir Mortimer Wheeler in his excavations at Arikamedu, South India. Wheeler's description of the ceramic has been quoted frequently through relevant literature, "*Type 10 represents a special form of cup or bowl of grey, greyish pink or black and red ware of fine fabric usually with a black slip inside and pink outside. It has a flat base and tapering profile and is ornamented on the interior of the sides with a row of stamped medallions between two bands of multiple incised grooves on the inside of the base*" (Wheeler *et al.* 1946: 59). Proposing an opposing view to that which he put forward for Rouletted Ware, Wheeler believed that Arikamedu Type 10 was a locally-produced vessel, possibly his reasoning being that he could not relate it to a comparable Roman artefact known to him (*ibid.*). Although little is written about the vessel in the report, it is described as "*a special form of cup or bowl*" and described as "*one of the characteristic shapes of the site and is occasionally found throughout the occupation of both sectors*" (*ibid.*), so the potential of the bowl may have been recognised, but this was never fully exploited.

The distinguishing feature of the decoration on the Arikamedu Type 10 is the peacock stamp which will be discussed in Chapter Five. The peacock is a reasonably common decorative feature on Roman artefacts, which does make it surprising that Wheeler did not attempt to link the peacocks on these vessels

to those represented in Roman art, for example the intaglio and lamp shown in Figures 2.4 and 2.5. In general, published research is in agreement with Wheeler that the ceramic is of local production, with the exception of Nagaswamy (in Begley 1996b: 231), who believed the sherds are of imported origin, but does not clarify from where.

In consideration of the date of this ceramic, Trench ASW2 provided results which showed the distribution at the site started in the radiocarbon dated Period G2 (200 BC to AD 130) with the final pieces recorded in Period B4, (AD 600 to 1000). The peak distribution period was between 200 cal. BC to AD 130 where 24 of the 45 sherds excavated were recorded, see Appendix One ii (Coningham *et al.* 2006: 159).

The stamped feature on Arikamedu Type 10, referred to in Wheeler's description as "*stamped medallions*" (Wheeler *et al.* 1946: 59), appears on the interior of the ceramic. These stamped impressions often take the form of a highly stylised bird, usually described as a peacock, which is impressed around the inside of the bowl (see Figure 2.3). At present, the reason for the decoration (should there be one) is unknown, but the peacock is a common feature in Indian art. This feature is not present on all vessels, its absence can be noted on vessels such as Wheeler Type 10*k* (Wheeler *et al.* 1946: 59). Begley & Tomber (1999: 165) and Coningham *et al.* (2006: 159) also refer to examples of Arikamedu Type 10 with the stamped feature omitted. This will be discussed in Chapter Six, but it can be considered as to whether this may

be a manufacturing error, the result of a conscious decision, possibly a regional variation, or if the ceramics were the result of a 'production line' system, where detail may have been missed by the person who should have applied it, unintentionally or otherwise. Wheeler commented how the Type 10k is noticeably smaller than the other vessels of the type, and noted the fragility of the piece, suggesting that the vessel was considered too thin to bear the impact of the stamp.

Rouletted Ware is known by several different names, and the same issue can be noted for Arikamedu Type 10. Arikamedu Type 10 does have an extremely reduced presence in the archaeological record in comparison to Rouletted Ware, but similar problems relating to the recording of Arikamedu Type 10 exist. One further issue that needs to be contended with is the unfamiliarity by some who may encounter Arikamedu Type 10 in the archaeological record. In the recording of the vessel, comparable problems in relation to the standard of recording can also be seen, and it is on occasion just referred to as 'stamped ware'. An example discusses "*Stamped Pottery*" (Sridhar *et al.* 2005: 27) where a vessel with a "*row of stamped motifs is running around the inner portion of the vessels between two bands of grooves*", presenting a description which corresponds to that of Arikamedu Type 10, but also includes other stamped wares in the same category. The reader is also referred to a figure in the publication which appears to show some examples of Wheeler 141 (Wheeler *et al.* 1946: 89, Figure 36 for detail and example).

2.6.1 Coningham *et al.*'s definitions of Arikamedu Type 10 from the ASW2 report

Coningham *et al.*'s (2006) section on Arikamedu Type 10 is considerably more in depth in comparison to the description provided by Wheeler *et al.* (1946). This increase in information is partly due to more data being collected by 2006, and also Coningham *et al.* providing detail on locations where the type has been recorded and also the results of the radiocarbon dates (Coningham *et al.* 2006: 159). Coningham *et al.*'s section on Arikamedu Type 10 details a “*classification of features*” (*ibid.*: 127), which breaks up the features on the ceramics – categorising the style of the bird, the frame, the ‘v’ symbol and to which direction the bird is facing, although some of the categories could be open to interpretation.

2.6.2 Begley's definitions of Arikamedu Type 10 from the Arikamedu excavation report (1996)

Begley's report of the 1989 to 1992 excavations at Arikamedu, in common with the nomenclature of the Rouletted Ware, used a different term to refer to Arikamedu Type 10 (Begley 1996b: 229). Throughout the 1989 to 1992 excavation report the ceramic is referred to as Form 5, and it is noted that the vessel is produced in the same ceramic as Rouletted Ware, with the exception of Begley reporting that the ceramic was also produced in Coarse Ware 1a (Begley 1996b: 229). As no complete Arikamedu Type 10 vessel has been recovered in the archaeological record, Begley's report does endeavour to describe the sherds, and these descriptions are supported by

quantities of sherds recorded. As with Rouletted Ware, the Arikamedu Type 10 is a ceramic which did appear in both the northerly and southern sectors of the site. Begley's report demonstrates a realisation of the potential of Arikamedu Type 10 in the exploration of trade networks, although she does limit this importance to "*the study of trade networks on the eastern coast of India and Southeast Asia*" (*ibid.*). It is hoped that this present study will demonstrate this, and also the networks that the ceramics were a part of to a wider geographical parameter.

2.7 Geographical distribution

The remaining sections in this chapter will present the available evidence for the distribution of the two ceramics in this study. Some of the details for the locations are very limited, as available evidence and quality of publication does vary considerably. This has also led to some sites being investigated on their own, and some being grouped together.

On the Indian mainland, Rouletted Ware and Arikamedu Type 10 have been recorded together at several locations including Pattanam and Karaikadu which are both ports. However, it has also been recorded at sites inland, such as Adam (Begley 1983: 462, Tripathi 2011: 1076). Previous studies by Shoebridge and Coningham (2011: 130*ff*) and Begley (1996b: 229, 231) comment on the differences, and the similarities between the Arikamedu Type 10 recovered at some of these sites.

2.7.1 Classification of sites

The following sections discuss the locations where the ceramics in this study have been recorded. Different sites have contributed varying levels of data to this study, and the sites have been classed at levels according to their impact on the research based on several factors, but primarily the amount of data available, and the quality and reliability of that available data.

Trench ASW2 has been designated as the Level One Site in this study. This is due to the amount of data that it has contributed from well stratified contexts, supported by access to actual sherds of Rouletted Ware from the excavations. These sherds could be used to make casts which allowed the further clarification of the designs of these ceramics, allowing the chronological changes in the sherds to be carefully investigated, and then these changes can be compared to other sherds in this study.

The sites of Arikamedu and Pattanam form the Level Two Sites in this research. Both contribute a wealth of data to this study but in different ways. Arikamedu, in addition to being the site where the two ceramics were originally recorded, has a considerable amount of data to contribute, primarily in the form of published images of sherds, but also in the form of a few original photographs and some impressions of sherds kindly loaned by Professor Ian Glover. There are no casts available from sherds at Pattanam due to the fragility of the sherds (this will be discussed in Chapter Three), but,

as the author was allowed access to a wide range of sherds from the 2007 and 2008 excavations through the generosity of the Kerala Centre for Historical Research (KCHR), there are many original photographs that can contribute to this study.

The remainder of the sites are categorised as Level Three Sites. In summary, this covers the sites from India (with the exception of Arikamedu and Pattanam), Sri Lanka (excluding Trench ASW2 but the rest of Anuradhapura and other locations on the island), Bangladesh, the Southeast Asian sites (Cambodia, Indonesia, Vietnam), and Egypt.

To aid with the management of data and further analysis, in addition to the sites being categorised as a Level depending on available data, they have been grouped into a geographical region as seen in Table 2.1. Therefore, the categories in summary are shown below. Not all sherds from a site will be able to contribute to this study, for example in the excavation report for Trench ASW2 where over 1200 sherds of Rouletted Ware were found, not all have the design features on that are required for analysis (Coningham, *et al.* 2006: 127).

Region	Region code	Rouletted Ware sherds contributed to this study	Arikamedu Type 10 contributed to this study
Level One			
• Trench ASW2, Anuradhapura	6	76	7
Level Two			
• Arikamedu	13	79	13
• Pattanam	12	68	3
Level Three			
• Africa	1	4	4
• Anuradhapura (Not Trench ASW2)	7	5	1
• Bangladesh	3	3	0
• Cambodia / Vietnam	10	0	0
• United Arab Emirates	2	1	0
• India: north of the Godavari River	4	24	2
• India: south of the Godavari River (excluding	5	31	4

Arikamedu and Pattanam)			
• Indonesia	11	7	1
• Sri Lanka (not ASW2, not Anuradhapura)	8	21	2
• Thailand	9	19	7

Table 2.1 Geographical distribution of the ceramics in this study

Although the above regions have been set for this research, it must be highlighted that for ongoing research they are flexible to accommodate any further excavations or discoveries in established collections that increase the recorded amount of Rouletted Ware and Arikamedu Type 10. As mentioned in Chapter One, this study is not producing a complete distribution record of these ceramics, but it is focussing on what information can be extracted from the designs on the ceramic. Therefore, primarily only sites which can contribute clear photographic images or casts are used in this research. The sole exception to this is some of the illustrations provided by Wheeler *et al.* (1946) and Coningham *et al.* (2006) of Arikamedu Type 10. By using photographs as well, any cases of misinterpretation, such as that seen by the research conducted by Tomber on Torpedo Jars, may possibly be avoided. Tomber realised that some of the vessels recorded in India and Sri Lanka as early Roman Amphorae are Mesopotamian Torpedo Jars, which obviously

impacts on previous research, as the amount of Roman sherds declines, different trading networks are highlighted and possibly different chronologies. Tomber reports that some of the Torpedo Jars are Sassanian, whereas some may be early Islamic (Tomber 2008: 146, 167, 171).

2.8 Overview of the sites where the ceramics in this study have been recovered

The previous section mentioned how the sites in this study have been divided into three different levels based on various factors. The remainder of Chapter Two will introduce the sites within the different levels.

2.9 The Level One Site: Trench ASW2, Anuradhapura, Sri Lanka

Trench ASW2 provides the key data for the reasons mentioned above. Anuradhapura is an UNESCO World Heritage Site situated in the North Central Province of Sri Lanka (see Map 2.2). It was at one time the island's capital, and it has played a significant role in the development of Sri Lanka, being the location of important sites of Buddhist Pilgrimage and it also has served as the island's political centre (Bandaranayke 1974, Coningham 1999: 1ff, Seneviratna 1994: 1f). The city attracted pilgrims both from abroad and the locality, leading to financial benefit and great importance throughout the Buddhist world, a trait that continues today.

The initial quote at the start of Chapter One of this thesis referred to the reliance of new evidence coming from archaeology – Glover wrote (1996: 368) “*I would also argue that virtually all new data on this trade are likely to come from archaeology, which has barely started to research the problem, rather than literary and historical sources which seem to be finite and mostly known*”. This can be supported by Begley’s statement (1975: 191) “*the proto-and early history of Sri Lanka (Ceylon) has been largely reconstructed on the basis of information derived from Buddhist literary sources, primarily the Mahavamsa, in conjunction with some early Buddhist inscriptions*. The excavations such as Trench ASW2 (see below) and other locations detailed later in this chapter show that evidence is coming through from archaeological sources. Begley emphasised that the sources she refers to are “*limited*” and the earlier ones are probably based on legend more than fact (*ibid.*).

Archaeological evidence recovered from excavations at Trench ASW2 shows that despite the city being sixty kilometres inland with no navigable river, it could demonstrate extensive international trade links (Coningham 2002: 99, Coningham 2006c: 1ff, Tomber 2000: 629). This can be evidenced by the recovery of marine gastropods at Trench ASW2 in the period between 350-275 BC (Coningham *ibid.*: 1, Coningham & Allchin 1995: 165). Evidence for trade is extensive throughout the stratigraphy of the trench, from this early evidence through to Roman materials, Islamic ceramics and later Chinese materials (Coningham *ibid.*: 5). This variety of imported materials needed a network along which to travel in order to reach the required destination.

Mantai, situated on the north-westerly coast of Sri Lanka was the nearest port location to Anuradhapura and existed for 1500 years in this capacity, developing its own urban traits to become a manufacturing centre as well as a centre for distribution (Carswell 1991: 198, Allchin & Allchin 1982: 57ff, Prickett-Fernando 1990a: 109). However, the collapse of Anuradhapura in the eleventh century AD must have imposed unfortunate consequences for the fortunes of Mantai (Prickett-Fernando 1990: 63).

2.10.1 History of excavations at Anuradhapura

Anuradhapura was subject to a considerable volume of archaeological interest which developed into the creation of the Archaeological Survey in 1890 (Coningham 1999: 1). During the late nineteenth century monuments were cleared and restored, and there were attempts to match the archaeological features to the *Mahavamsa*, (the text subtitled “*the great chronicle of Ceylon*”) (Coningham 1999a: 15ff). However, in 1957 major developments led to a research strategy that involved the vertical excavation of trenches which allowed the visibility of looking at a section, rather than a flat area. P. E. P Deraniyagala and P.C. Sestieri used this method at Anuradhapura in the citadel and this was developed further at the site by Codrington and S. U. Deraniyagala. The focus on the archaeological sequence rather than the artefacts allowed the presentation of archaeological evidence which could demonstrate a cultural sequence spanning over a thousand years. The UNESCO Cultural Triangle project was created in 1980 to instigate the conservation of the site and to extend the visitor demographic

to reach out to tourists. These earlier excavations were followed by a series of fourteen sondages which included Trench ASW (Anuradhapura Salgaha Watta) situated on the citadel mound (Coningham & Allchin 1995: 161, Deraniyagala 1990: 272). Also on the citadel mound is Trench ASW2, which demonstrated an extensive chronology and was 100 metre squared.

The extensive depth of Trench ASW2 allowed the exposure of the structural sequence right at the centre of Anuradhapura, demonstrating the development of the site from its earlier stages as an Iron Age centre through to an Early Historic city (Coningham & Batt 1999: 125, Coningham 1999: 1). This continuous sequence, along with calibrated dates provides a reliable record from which a considerable proportion of the data in this study comes from, see Figure 2.5i. The two ceramics in this study are both represented at this site, Rouletted Ware is represented from Periods I to A, with a total sherd weight of 6984.01 grams.

Within the recorded artefacts at Trench ASW2, the unglazed ceramics represent one of the largest categories, and the ceramic corpus here can draw several comparisons with that from Arikamedu (Coningham *et al.* 2006: 127, Wheeler *et al.* 1946: 41, 45, 59, 60) such as the recovery of Arikamedu Type 18, Omphalos Ware and amphorae in addition to the Rouletted Ware and Arikamedu Type 10. Trench ASW2 provides a structured chronological reference which can be used for this site and the interpretation of other sites. As mentioned above, the evolutionary development of the Rouletted Ware

family (Ford *et al.* 2005: 909) can be demonstrated through the initial appearance of two sherds of Grey Ware in structural Period J (c. 510 – 340 cal. BC) (Coningham & Batt 1996: 126f). Grey Ware demonstrates a consistent presence during Structural Period I (360 – 190 cal. BC), with a limited amount of Rouletted Ware appearing during this structural period in Phases I5 and I4 followed by an increase in Phases I7 and I8. At his excavations in the citadel, Deraniyagala (1990: 257) records the first appearance of Rouletted Ware in Period V of the site (ca. 500 – 250 BC).

Arikamedu Type 10 is first recorded at Trench ASW2 during Period G2 (Coningham *et al.* 2006: Table 6.1). It appears through to Period B, with the peak periods for the ceramic between 200 cal. BC and AD 130 cal. A classification system was developed for the stamped design and this is discussed in Chapter Five.

2.11 Level Two Sites: Arikamedu, Coromandal Coast, India

The previous chapter highlighted the site of Arikamedu in South East India, the location where the ceramics in this study were originally recorded by Sir Mortimer Wheeler in 1945 (Wheeler *et al.* 1946: 17 – 124). However, despite Wheeler's name being the one primarily linked with Arikamedu, he was not the first (or the most recent) to express an interest in the archaeology of the site.

2.11.1 History of research at the site

Arikamedu has been the subject of recorded interest through antiquarian investigation since the eighteenth century, when Le Gentil documented the visible remains in “*Voyage dans le mer L’Inde*” (Begley 1983: 462). On observation, Le Gentil (Le Gentil 1779 (2) 109 – 111 in Begley 1996c: 1) considered the remains of Arikamedu to be the remains of a town or large village which residents informed him was known as *Virapatnam*, an ancient name which has been much debated but not confirmed. Arikamedu is the name used by Wheeler to refer to the site and it has been referred to this in subsequent research. In his visits to Pondicherry between 1768 and 1771, Le Gentil recorded a range of features from his excavations including ten-foot-high walls built with large size bricks along the Ariyakkuppam river (*ibid.*) and the remains of wells exposed along the high river bank which he notes were originally at least twenty feet deep and four feet wide, possibly a reference to the terracotta ring wells of which Begley found a “*large number*” (Begley 1996: 1).

Interest in Arikamedu appears to have been reignited by the French archaeologist Gabriel Jouveau–Dubreuil, who started collecting surface finds from the mound and the riverbank from 1937. French scholars from the Ecole Française d'Extrême-Orient and Hanoi Museum also visited the site (Begley 1996c: 2, Aiyappan 1999: 56); during May 1939 a carnelian gem, possibly from a signet ring, was recovered and reportedly taken to Hanoi. Unfortunately, the location of the ring is now unknown. The following year

a land owner on the north river front dug an area to a depth of 80m for coconut tree planting, and this activity resulted in several artefacts being collected, amongst them Roman amphorae. Also in 1940 Aiyappan of the Madras Government Museum was invited to conduct archaeological excavations which resulted in a brief report being published in *The Hindu* Newspaper on the 23rd March 1941. Several other scholars visited at the time and sondages were made, but Begley was unable to find records of the location of this activity and what was recorded. Interest continued and between 1941 and 1944 a small excavation was conducted under the direction of Fauchaux and Sarleau from France, and this research was summarised in yearly reports by the Pondicherry Government (Begley 1996c: 3).

In 1940 Professor Jouveau Dubreuil sent the Madras Museum a selection of beads, terracotta figurines and a variety of potsherds from the site and declared that it was a “*ville romaine*”. He identified it with *Poduke*, the emporium of the classical writers and requested that the museum was “*to do something about the site*” (Aiyappan 1999: 57, Begley 1996c:1). Among the pottery handed over by Jouveau–Dubreuil were a few sherds that resembled some in the Madras Government Museum’s collection from Amravati (Aiyappan *ibid.*: 56). The initial excavations by Jouveau–Dubreuil were followed by financial aid from the French-India Government in Pondicherry who gave permission for trial excavations to be conducted at Arikamedu. These excavations uncovered the foundation of several buildings, amphorae and also beads that were “*typical of the Mediterranean area*” (*ibid.*). This exploratory work provided evidence that warranted further investigations and

the information was passed onto the recently appointed Director General of Archaeology in India, Dr Mortimer Wheeler, later to become Sir Mortimer Wheeler. Apparently, Dr Wheeler needed some amount of persuasion, but when he saw the evidence of Roman influence he agreed to excavate there.

2.11.2 Sir Mortimer Wheeler and his excavation at

Arikamedu

The excavations directed by Sir Mortimer Wheeler at Arikamedu in 1945 (Wheeler *et al* 1946: 17 – 124) still, although not always for the right reasons, serve as a model for archaeologists and historians working on the archaeology of Early Historic India. Although other sites in South India have the potential to reveal information about Early Historic Indian Ocean trade, it is Wheeler *et al.*'s excavation report and publications (for example, Wheeler 1955) that are constantly referred to, undoubtedly aided by what has been described as “*his gift for publicity*” (Glover 2010: 237). Begley, who excavated most recently at Arikamedu states that “*the most outstanding excavations were conducted by Sir Mortimer Wheeler during a short season in the summer of 1945 with the extensive sources of the Archaeological Survey of India (ASI) at his disposal as he was the Director-General at the time*” (Begley 1996c: 3f, Wheeler *et al.* 1946: 51, 54, 76). Wheeler described his excavations as that of a “*considerable buried town on the Coromandel coast*” (Wheeler *et al.* 1946: 17). He excavated in what he called the “*Northern and Southern*” sectors, areas partially excavated before, but his

work here led him to believe that he had found a Roman Market on the Coromandel Coast (Wheeler *et al.* 1946: 17).

2.11.3 Arikamedu after Wheeler

Excavations by Jean-Marie Casal followed those by Wheeler in 1947 and 1948; unfortunately, Casal's work never reached the academic recognition which it deserved, possibly due to the French text forming a barrier for many along with his selective publishing of the results in two reports (Casal 1949, Casal 1956). Begley (1996c: 4) comments on the locations of the material excavated by Casal, identifying specific locations where parts of the collection can be found, but the main body of the sherds that he certainly must have recovered are unaccounted for at present. The author of this research did make attempts to see some of the collection in the Guimet Museum in Paris, but beyond seeing what was on public display this was not possible. Casal's excavations covered a considerably wider area than those by Wheeler and Begley, and Begley describes the evidence he produced as "*extremely valuable data*" (Begley 1996c: 4). However, Wheeler never referred back to Casal's research in his later texts in any great detail, and it is only recently that it has started to have been referred to by Indian archaeologists (*ibid.*). Following Casal's investigations, it was not until the 1980's that the site was excavated again.

The most recent excavations at the site were conducted by a collaborative team from the University of Pennsylvania led by Vimala Begley (Begley *et*

al. 1996, 2004). These excavations provided evidence for coastal, inland and overseas networks, for which Arikamedu became a crossroads, and have also increased the understanding of the layout of the town. However, the archaeological evidence has not been able to provide data regarding the mechanisms for the trade conducted through the port. Although it was previously believed that the early settlement at Arikamedu was abandoned towards the end of the second century AD or slightly later, these more recent excavations suggest that amphora related trading still existed through the third to seventh century AD, and there is some evidence to support commerce with the east beyond the tenth century (Begley & Sidebotham 2000: 967f).

Two principal reasons can be proposed as to why Wheeler's research has remained the more commonly referred to excavation associated with Arikamedu. Firstly, he published his work promptly and promoted it further in publications such as "*Rome Beyond the Imperial Frontiers*" (1955) and he is still remembered across the discipline of Indian archaeology due to the legacy he left through the training that he provided at Arikamedu and Taxila (Aiyappan 1999: 57, Clark 1979: 25f). This chapter also considers some of the other sites in India where the ceramics in this study have been reported, leading to a question which must be raised in relation to Wheeler's initial visit to India - what would have happened if he had received information about Roman finds from another site, rather than Arikamedu? Alagankulam, also on the south east coast, commands a corpus which is comparable in many respects to Arikamedu, and although the site has received a considerable amount of attention (for example Nagaswamy 1991, Sridharan & Tulasi

Raman 2000), the profile of the site had the potential to be considerably higher had it been brought to Wheeler's attention.

2.12 Level Two Sites: Pattanam, Malabar Coast, India

Prior to excavations conducted at Pattanam, neither of the ceramic types in this study were recovered on the southwest coast of India, as Begley wrote "*There is no "rouletted ware" (or other Arikamedu fine wares) from sites in Kerala*" (Begley 1996a: 27). Begley's statement was invalidated shortly after "*Pattanam is the first settlement on the Malabar coast identified as having a typical early historic assemblage like that found on other Indian sites*" (Shajan *et al.* 2004: 319), with the corpus including both Rouletted Ware and Arikamedu Type 10. The South Indian sites discussed in this thesis are mainly situated on the east and southeast coast of India. However, recent work at the site of Pattanam in the lower Periyar River basin in the state of Kerala has revealed a presence of Rouletted Ware for the first time on the Western coast (*ibid.*: 313). Pattanam's location on the Malabar Coast, along with its size, urban characteristics and its extensive corpus, provide evidence of an Early Historic port site. These traits have led to the site being proposed to be the ancient port site of Muziris (as discussed in Chapter One) (*ibid.*: 319).

In Pattanam, both Rouletted Ware and Arikamedu Type 10 have been recorded, the quantities of Rouletted Ware recovered are described as being in their "*hundreds*" (Shajan *et al.* 2008). These vast quantities lead to

question the importance of the site but Shajan *et al.*'s (2004: 313) view that Arikamedu and Alagankulam played a “*less important role in the Indo Roman trade*” needs to be approached with caution. The corpus of ceramics recorded at Pattanam is comparable with those recorded on the major east coast sites such as Arikamedu and also Trench ASW2 at Anuradhapura, with ceramic types such as Wheeler Type 29, 75 and 148 being recorded, and also the Dressel 2-4 amphorae (*ibid.*: 318). Whereas the search for *Muziris* has been hindered by “*the discrepancy between historical and archaeological evidence*” (*ibid.*: 313), a further issue for consideration is the concentration of later structures in these regions, potentially concealing earlier sites.

2.13 Level Three sites: Alagankulam

Alagankulam is situated in the Ramanathapuram District near to the meeting of the River Vaigai and the Bay of Bengal. The Tamil Nadu State Department of Archaeology excavated from 1986 to 1987 at Alagankulam, and then from 1990 to 1991, and sherds of Rouletted Ware and Arikamedu Type 10 were recovered. During the 1986-7 excavations, a Type was also recorded which Sridharan and Raman called “*Alagankulam Rouletted Ware*” (Ramachandran 1997: 19-24, Sridharan & Raman 2000: 63ff).

Although Alagankulam has revealed quantities of the two ceramics involved in this study, according to Sridharan and Raman (2000: 64) “*large numbers*” of sherds were recovered in Periods II (300 BC to 100 BC) and III (100 AD

to 500 AD), which included a “*considerable number*” (*ibid.*) of Rouletted Ware, (Sridharan & Raman 2000: 64f, Sridhar 2005: 11) some of which display Brahmi characters, and the authors note that the Rouletted Ware has indentations in the form of triangles, eyes, wedges, crescents, diamond and ovals, and were recorded as being similar to those found at Arikamedu (Sridharan & Raman 2000: 64f). The type named as “*Alagankulam Rouletted Ware*” has the description of being “*peculiar red polished fragments*” which were originally interpreted as Arretine Ware, and then “*Late African Slipped Ware*” but this theory has now been disproved (Ramachandran 1997: 21). Sridharan and Raman (2000: 64) believe this ceramic is an import which probably originated in the Mediterranean region, and state that comparable sherds are recorded in Wheeler’s report of his excavation in 1945, and are also exhibited in the Pondicherry Museum.

According to Sridharan and Raman (2000: 64f) many fragments of Arikamedu Type 10 have been recovered at this site, but unfortunately no exact figure is given to allow comparisons with the 45 sherds found at Trench ASW2. The stamped feature at this site is described as a peacock or a dove (*ibid.*: 64), whereas the motifs in the excavation report are described as doves, peacock, floral, fish or parrots (Sridhar 2005: 27). The excavation report suggests that the stamped pottery was not produced locally, a theory which may be correct if proposed with reference to the immediate locality, however the report expands on this, noting that as the ceramic is predominately found in port sites it could be imported.

There are two artefacts from these excavations that should be mentioned further. One noticeable characteristic of the site was the recording of the decorated Rouletted Ware, which included a sherd with a human figure and another with an elephant figure, both found in a Trench AGM 5 (Sridhar 2005:17, 67, see Figure 2.6). It was from a Period Three trench that a sherd was recovered with a scratched figure of a mule and rider (Figure 2.7) (*ibid.* 2005: 67). A further sherd was recovered in 1996 – 1997 with a ship decoration on it (*ibid.* 2005: 69 see Figure 2.8). Casson (in Sridhar 2005: 69) has compared this with typical large ships in the archaeological record, one of which features on a mosaic in Ostia, and another in a mosaic from a house in Rome dated to between 200-300 AD. Rouletted Ware is also found with graffiti on, possibly the number 408.

2.14 Other sites in India

Due to the geographical spread of the ceramics in this study, is not unexpected to find their appearance at south, and east Indian ports. For example, both ceramics in this study have been recorded at Dharanikota on the banks of the Krishna River. Excavations here have revealed a wooden wharf, and post holes which date to the first and second centuries BC. While on the river Kaveri at Kaveripattinam, where Rouletted Ware has been recorded, the wharf was built from large bricks and lined with wooden poles for anchoring boats. Radiocarbon determination of the wood has given its

date as the third century BC although the wharf itself may be later (Ray 1990: 2).

The previous chapter referred to ceramics from Satanikota in Andhra Pradesh which were used by Ghosh (1986: 102) in an attempt to provenance the Rouletted Ware. Pottery recovered from the Megalithic and Early Historic period includes Rouletted Ware found in small quantities. This report quotes that “*it is interesting to note that clay used in the preparation of Black and Red and the Rouletted Wares were one and the same*” (*ibid.*: 102). This statement is founded on spectrographic analysis which has revealed that the clay of both these wares contains similar materials, and this will be discussed in the following chapter. Rouletted Ware at Satanikota only appears in Period II (*ibid.*: 107). The ware occurs primarily in Black and Red Ware, but can also be seen in Red Ware and in what Ghosh (*ibid.*) describes as “*a Black Coloured Ware*”. There were approximately 300 sherds of Rouletted Ware recovered from the site, representing only about three percent of the pottery recovered from this period. The quality of workmanship varies from “*fine fabric with a thin section made of well levitated clay and exhibit superior workmanship*”, to a few pieces being described as “*local character in treatment and also in rouletting patterns*” (*ibid.*). In the excavation report, Ghosh does make a brief suggestion regarding the origin of the Rouletted Ware and states that “*the similarity of types with Arikamedu, Brahmagiri, Chandravalli and Salihundram in the South, the bright fine, polished treatment of surface and the patterns of rouletting would naturally associate*

this industry with that found at these sites and indicates its origin outside the place” (ibid. 108).

The casts that have been made available for this current research are from the sites of Arikamedu, Kanchipuram, Karakaidu and Uraiur. Kanchipuram is situated on the northern bank of the Vegavati River and has been the subject of excavations by the Archaeological Survey of India and the University of Madras. Comparable characteristics between this site and that of Arikamedu can be noted (Mahalingam 2001: 200). The excavations between 1970 and 1976 by the University of Madras took place at different locations in the city and revealed three sequences, Period I which dates to between 300 BC and AD 100, Period 1A, which dates from AD 100 to 500, Period II from AD 500 to 1000, and finally Period III, from AD 1000 to 1500. It is the Period I from which one can draw similarities between Kanchipuram and Arikamedu, when it can be noted that Rouletted Ware was present (*ibid.*: 201). Earlier excavations at what were described as being in “*the heart of the city*” revealed two different periods with the middle and upper levels of the early period revealing Rouletted Ware. Along with the Rouletted Ware, amphora has also been recovered. (Mahalingam 2001: 201).

In consideration with the other two sites where an impression originated from, Karaikadu is situated approximately 30 kilometres south of Arikamedu, and in common with Kanchipuram it displays similarities with the site (IAR 1966–7: 21). There is a description that “*three principal ceramic industries*

were found” (*ibid.*) but it appears the only evidence is the actual ceramic itself, no evidence of manufacture is listed, the three ceramics referred to are Red-slipped Ware, Black and Red Ware and Rouletted Ware. Like Kaveripattinam mentioned above, Uraiyur, where a further impression originates from, is also situated on the banks of the River Kaveri. During the Early Historic period Uraiyur has been described as a “*Capital city*” (Rajan: 2011: 180). The site presents a corpus comparable to key port sites such as Pattanam and Arikamedu (Raman 1990: 452).

2.15 Sri Lanka excluding Trench ASW2

In addition to being recovered at Trench ASW2, both the ceramics in this study have been found at sites across Sri Lanka. This includes at Mantai, the port which served Anuradhapura, a location which in addition to the unloading of shipped goods, would have been the disembarking and embarking point for a variety of travellers with different agendas, such as members of the Indian Ocean Trading community, Pilgrims and Monks who came following the establishment of Buddhism on the island (Kiribamune 2013: 47, Indrapala 2013: 61). The role played by Mantai allowed a small island to elevate to a key site in Indian Ocean trade, while developing its own industries close by, for example pearl fishery and manufacture of pearl goods at a time when these commodities were in demand from the west. Iron slag, half worked stone, and glass beads have also been recovered. It is its relationship to Anuradhapura which cements its importance within the Indian Ocean (Kiribamune: 2013: 46f). The majority of Greek, Roman, Arabic and

Chinese texts refer to Sri Lanka in its entirety rather than identifying any particular port (*ibid.*: 42), it can be proposed however, that as this was the focus of trading links, it was the location that was being referred to.

The port of Mantai served Anuradhapura for over 1200 years. Mantai is also known as Mahittha (Pali), Matota (Sinhalese) or Mantottam and possibly Perunturai (Tamil) (Indrapala 2013: 62). It appears in the Tamil literature in a selection of hymns, and in inscriptions relating to Matottam, including a pillar from a temple in Rajaswevaram (*ibid.*: 63, 65). The pillar is now part of the collection of the National Museum in Colombo, and on it can be seen the lengthiest inscription relating to Matottam, dating to the early eleventh century – the period of Chola rule in Sri Lanka. The inscription details the builder of the temple and possibly the earliest street name in Sri Lanka, indicating the level of urban development at this stage. Mantai is situated on the northwest of the island, and the location of the port at this central point in the Indian Ocean escalates its importance (Kiribamune 2013: 40). It had inlets and river estuaries for anchorage, close proximity to ports on the South Indian Coast (to acquire and distribute cargo, - including merchandise and sailing supplies). In addition to its importance in this study as a port, Rouletted Ware has also been recorded here (*ibid.*: 47).

Map 2.2 shows Mantai's position, situated on a prominent maritime route and in close proximity to Adams Bridge and the coast of South East India (Carswell 1991: 197f). Excavations at Mantai, reveal an early occupation during the Mesolithic period but this settlement was eventually abandoned.

A second phase of occupation can be demonstrated from as early as the fifth century BC, and Mantai was the principal port of Sri Lanka until the eleventh century AD. These dates correspond with the inhabitation of Anuradhapura as demonstrated by the chronological sequence recovered at Trench ASW2. Various excavations were conducted at Mantai between 1886 and 1970 onwards by a variety of archaeologists including Hocart, who excavated between 1927 and 1929 (*ibid.*: 202). Excavations directed by Carswell and Deraniyagala were conducted in 1980, 1982 and 1984, Carswell ceased the excavations at this point due to what he describes as the “*uncertain political situation*” (*ibid.*: 202).

For a port like Mantai, when those locations it served were prosperous, Mantai reflected this, however when the fortunes of its trading partners changed, this would ultimately impact on the port (Kirabamune 2013: 40, 47). This could be political links, or economic crises that would impact the chain of supply and demand through the port. The links that Mantai had to Anuradhapura and also the ports on the South Coast, left it open to fail should their fortune fall, and it can be noted how the port fell following the fall of Anuradhapura. The presence of Rouletted Ware at the site ends abruptly at the close of the second century AD, it is superseded by Indian Red Polished Ware produced in Gujarat (*ibid.*: 48f). This highly diagnostic ceramic, found in quantities in Saurashtra and Kathiawar was a key feature between the second century AD and the fourth century AD, and has also been recorded at Siraf and Rishahr. It is apparent from the archaeological evidence that trade at Mantai continued beyond this period. The appearance of Chinese, Islamic

and West Asian ceramics in the archaeological record demonstrates the trade that has passed through the port by those crossing the east west open route. Examples of Tang Ware have been recorded which are comparable with Siraf, Aqaba on the Red Sea, Sind, Mesopotamia and Egypt. Islamic wares recovered at Mantai have also been recovered in dated tombs in China. Therefore, Mantai presented an attractive option to a range of traders.

In addition to Anuradhapura and Mantai there are two other sites in Sri Lanka where both Rouletted Ware and Arikamedu Type 10 have both been recorded, these are Kantarodai and Tissamaharama, situated at the opposite ends of the island. Kantarodai situated on the Jaffna Peninsula was subject to some excavations in 1917 when the French archaeologist Paul Pieris “*excavated a few trenches*” (Begley 1975: 193). In 1967 Begley and her team excavated an extensive area within Kantarodai, Rouletted Ware was found in surface collections along with related Fine Wares and recorded again in her 1970 excavations. Both Begley (*ibid.*: 193) and Coningham and Allchin imply a similarity between Kantarodai and Arikamedu. The ceramics sequence at Kantarodai was described by Coningham and Allchin (1995: 171) as “*remarkably similar to that of Arikamedu*” and by Begley (1975: 193) - “*the upper phase*” of her three phases of occupation from the 1970 excavations “*is comparable to Arikamedu “Andhra” or Early Historical Period and therefore may date from the first century B.C. to the first century A.D.*”. Coningham and Allchin refer to the earlier chronology of Kantarodai as the “*pre-Rouletted ware period*” (1995: 171), dated to between c.480 to 130 BC and this is followed by a period from c.100 BC to 10 BC, where Rouletted

Ware and Arikamedu Type 10 are recorded in addition to other ceramics including Black and Red Ware, Fine Grey Ware and possible Eastern Hellenistic Wares.

A systematic survey was conducted by Ragupathy between 1980 and 1983 and published in 1987 with the main objective to “*locate the archaeological sites and carry out surface studies*” (Ragupathy 1987: 4). The survey extended through Jaffna and included Kantarodai. In addition to recording Rouletted Ware at Kantarodai, Ragupathy recorded it around the islands of the Jaffna peninsula, recording it as “*Pottery Type 4*”, he wrote that the pottery was collected from “*nearly 10 sites in the Jaffna Peninsula*” (*ibid.*: 10), particularly noting the “*abundance*” (*ibid.*) in Kantarodai. All the sites where Rouletted Ware has been recovered, except for Kantarodai are coastal sites.

With just a few exceptions, the archaeological sites that were recorded by Ragupathy in Jaffna were situated along the coast of the lagoon or the sea, possibly demonstrating the populations reliance on these resources (Ragupathy 1987: 147). Rouletted Ware was recorded at port sites such as Vallipuram and Nakarkoyil which are both facing out to the Bay of Bengal. Like other locations discussed in this research Rouletted Ware appears more commonly recorded on coastlines than inland, the exception to this is South India and Anuradhapura.

In Ragupathy's 1987 report he does not refer to the recovery of any Arikamedu Type 10, although Coningham and Allchin do refer to its presence when discussing the excavations by members of the Sri Lankan Archaeological department that were published by Orton in 1993 (Coningham & Allchin 1995: 171). Ragupathy does not detail how many Rouletted Ware sherds are recovered at the sites he investigates, and there are some drawings available of forms and designs, it would have been useful if the report did contain some plates. However, the data from the report does make an interesting comparison with the data from Trench ASW2 and its hinterland. Whereas Trench ASW2 was served by the port of Mantai, the Jaffna peninsula was served by its own ports, and it must be from ports such as those mentioned above on the peninsular that goods, including Rouletted Ware, were imported and circulated. The scattered distribution of the Rouletted Ware across the peninsular gives the impression that it was available to many different communities, just as it was judging by the distribution in South India. However, Rouletted Ware (or Arikamedu Type 10) that came in through the port of Mantai to go direct to Anuradhapura, was not recorded as being recovered on any of the river surveys that were conducted in the hinterland.

Another site where both of the ceramics have also been recorded is at Tissamaharama, which is near to the south easterly tip of Sri Lanka (Bopearachchi 2002: 97). Excavations have been conducted at Tissamaharama on the south east coast of Sri Lanka since the early 1990's by the Archaeological Department of Sri Lanka in conjunction with the

Commission for General and Comparative Archaeology (KAVA) of the German Institute of Archaeology (Schenk 2000: 653). Details on the excavations have been quite widely published, for example Schenk 2000 and Schenk 2006, and this has included papers focussing on the Rouletted Ware found at the sites. The Rouletted Ware recovered at this site will be discussed in further detail in later chapters, Schenk dated the first appearance of Rouletted Ware to Phase B, equating with at least “*in the second half of the 3rd century BC*” (Schenk 2000: 660), 191 fragments were recorded in total, with 23 showing visible rouletting. The second ceramic in this study has also been recorded at the site, “*specimens of Wheeler Type 10*” (*ibid.*: 558) are mentioned, as well as other Arikamedu ceramics such as Arikamedu Type 18. Schenk also highlights repaired pieces of Rouletted Ware, such as a piece which has been repaired in antiquity with a rivet, therefore it can be highlighted that although this ceramic seems to be quite common in the archaeological record, there was a trait attached to it that made it worth repairing (*ibid.*: 123), the use and repair of the vessels in this study will be discussed in Chapter Seven.

2.16 Bangladesh

One of the most northerly locations for the recovery of the ceramics discussed in this research is Bangladesh. Rouletted Ware has been reported at Mahastangarh, Bagura District. Mahastangarh is a large fortified enclosure on the major Karatoya River (Chakrabarti 1992: 44). Chakrabarti presents the archaeology of the Early Historic period in Bangladesh as “*unevenly spread and imperfectly understood*” (*ibid.*), further research has been conducted in the past decade. Rouletted Ware has also been reported from the area known as Wari-Bateshwar. (two neighbouring villages of Wari and Bateshwar), nearby the course of the old Brahmaputra river and with access to the Meghna channel. Silver punch marked coins have been recovered here, proposing suggestions for early occupation in the district (*ibid.*: 57).

2.17 Africa – Egypt

Moving in a westerly direction from South Asia and across to Africa, the Red Sea coast region of Egypt has reliable excavations with some well documented Rouletted Ware and Arikamedu Type 10. A contributing factor for the identification of the ceramics (and this will be discussed at other points in this research) could possibly relate to the knowledge held by those that have worked on the sites. Archaeologists such as Tomber and Sidebotham, who have experience of excavations and ceramics in South Asia, have worked with collections from this region, and therefore were able to recognise both the ceramics in this study. Egypt was a vital link to the trade between India

and the Roman World, once at the Red Sea ports, goods from the Indian Ocean could move along to the Nile and ultimately to Alexandria from where they could be distributed further (Seland 2011: 399).

The two Egyptian Red Sea ports for which the most evidence exists for the early Roman period are Berenike and Myos Hormos. There is also evidence of Indian Ocean trade from Leucos Limen, however, as the ceramics in this study have not been recovered there, the site will not be discussed further. Both Berenike and Qusier al Qadim have provided evidence of long distance trade through a range of cultural and environmental artefacts that include Coarse and Fine Wares (Tomber 2002: 25), and Tomber (2012: 203) states that “*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*”.

Berenike is a Red Sea emporium forming part of the long-distance trade between the Mediterranean, Arabia, and Africa. The existence of a harbour is recorded in Classical texts such as Pliny the Elder’s *Natural History* (Weindrich *et al.* 2003). Archaeological excavations conducted by a team from the University of Delaware and their partner institutions since 1994, confirm the sites position as a port for long distance trade, and present a record of local and non-local artefacts. Excavations between 1994 to 2001 have shown that the harbour town existed for eight centuries and reveal that both Rouletted Ware and Arikamedu Type 10 have been recovered at this site.

Three of the Rouletted Ware sherds are recorded in the 1997 report, and a further three recorded in 1998, these having coarser materials than those previously published. (Begley & De Puma 2000: 150, Begley & Tomber 1999: 166). When considering Arikamedu Type 10, the 1997 report reveals fragments of a minimum of two bowls, and this appears to include one of the few examples that were recorded without a stamp, although there is a slight impression to suggest an attempt has been made to place a stamp between the two equidistant grooves (Begley & Tomber 1999: 165).

Following the Red Sea coastline in a northerly direction from Berenike there are remains of another site which was also trading during the Early Historic period. The modern location of Quseir al Qadim was excavated by the University of Chicago 1979 – 2003 and then from 1999 to 2003 by the University of Southampton. Textual evidence has led to the site being proposed as the port site of Myos Hormos and although the site does not form a natural harbour, satellite imagery reveals that major coastal changes have taken place in this area and access would have been available for ships (Peacock 1993: 229). Other suggestions for the location include Abu Sha'ar, Ras Abu Soma, Safaga and Leucos Limen.

Myos Hormos has relatively few examples of Rouletted Ware and Arikamedu Type 10 when compared to Berenike, with sixteen sherds possibly representing two or three vessels of Rouletted Ware and three sherds of Arikamedu Type 10 probably representative of two vessels. All were

recovered from the same deposit which is associated with the late Augustan period (Tomber 2002: 28). It can be noted that at Myos Hormos, as with Berenike above, the Arikamedu Type 10 recorded is the less common unstamped Type. The small quantity of these Fine Wares recovered at present and their restricted distribution may indicate that they were bought by merchants or sailors for personal use rather than commercial purposes (Begley & Tomber 1999: 168).

2.18 United Arab Emirates

Kervan (1996: 37) stated *“But unlike the Chinese stone ware or porcelain which is easily recognized amongst the local ceramics by most archaeologists working around the Red Sea and the Persian Gulf, this is not yet the case with Indian ceramics”*. Kervan (*ibid.*: 38) divided the Indian ceramics found at sites in United Arab Emirates into those that can be dated to between the third and second millennium BC, those of the first centuries AD and those belonging to the medieval period (sixth – twelfth centuries AD). However, no direct reference is made to the identification of either of the ceramics in this study. The appearance of ceramics displaying the characteristics of Rouletted Ware have been recorded at Khor Rori in Oman, which has been identified as ancient Sumhuram, however the surface treatment and the colour of the fabric is more typical of Black and Red Ware (Sedov & Benvenuti 2002: 192), Pavan and Schenk (2012) do detail Rouletted Ware recovered at Sumhuram, describing it as *“true RW”* (*ibid.*: 192) along with sherds of Arikamedu Type 18. As with the Indian material recovered at the Egyptian Red Sea sites, the question can be raised regarding

the reason for the imported Indian material to be distributed so far west. Sedov and Benvenuti (2002: 194) believe that the Rouletted Ware is a luxury product that could have been traded even though it is only recovered in small amounts; however, the extensive amount of Indian cooking pots at the site suggests that they may have been imported to be traded on elsewhere.

2.19 Southeast Asia

Up to this point the chapter has discussed locations in South Asia, Arabia and Africa. The final geographical area to explore in relation to this study is Southeast Asia. The far easterly nature of these locations provides a series of excavations that have not been so influenced by the legacy left by Sir Mortimer Wheeler in India, this is possibly because the area falls outside the realm of his model of Indian Ocean trade.

In his 1995 article Miksic discusses how Southeast Asian archaeology had evolved over the previous twenty-five years in a response to the theoretical perspectives of “*New Archaeology*” (Miksic 1995: 46). The region itself had often been labelled as being “*Indianized*”, a concept often associated with Coedes, especially through his publication “*Indianized States of South East Asia*” originally published in French in 1964, with the English version in 1968. However, the concept of “*Indianization*” has now been largely discredited mainly due to discoveries in the region which demonstrate indigenous developments (Smith 1999: 1f).

Although this thesis is focussing on two South Asian ceramic types from the Early Historic period, there are also numerous examples of other Early Historic Indian artefacts which have been recovered in this region. These include beads from Arikamedu and Mantai recovered at Khao Sam Khaeo in Thailand, (Bellina & Silapanth 2006: 386) and Indian and Roman material dating from the second century onwards has been recovered at Oc Eo in Vietnam (Bellina & Glover 2004: 71).

2.20 Indonesia

The area that is today known as Indonesia contains several locations where both the ceramics investigated in this study have been recorded, in addition to other artefacts of Indian origin, for example glass beads, carnelian beads and other ceramics, including a sherd with graffito which is believed to be Brahmi Script. The geographical position of Bali's north coast permitted it to form part of the trade route for commodities including spice and fragrant woods (Ardika 1998: 139). However, it is not determined as to whether the contacts between Bali and India were direct or possibly passed through Java or Sumatra (Bellwood 2007: 292). Rouletted Ware and Arikamedu Type 10 have been recovered at Sembiran on the island of Bali, with Rouletted Ware also being recovered at Pacung (Ardika 1998: 139).

In 1994 excavations were carried out at Sembiran by the Archaeological Research Centre and the Department of Archaeology of the Faculty of Letters of Udayana University (Ardika 1998: 139). Since then, more recent

excavations have taken place with a three-year collaborative project between the Australian National University and the Indonesian National Centre for Archaeological Research (Calo *et al.* 2015: 379). Ceramics recovered during the 1994 excavations included three rim and three body sherds of Rouletted Ware, and also a rim sherd of Arikamedu Type 10, other Arikamedu types were also recovered, including Arikamedu Types 18 and 141. These sherds are described as “well fired” and “very fine”, and the rouletting takes the form of triangles (or possibly parallelograms) wedges and dots (Ardika 1998: 223). In the earlier excavations two sherds of Arikamedu Type 10 were recovered; the sherd recovered in 1989 was described as having a glossy black slip, whereas the sherd recovered in the 1994 excavations is brown on the interior and exterior, with a bird impression between the grooves (*ibid.*: 141). Calo *et al.* report excavation of both of the ceramics in this study during their excavations, but unfortunately quantities were not available, although it is noted that over 600 sherds of Indian Fine Ware ceramics were recovered (2015: 383f).

Rouletted Ware has also been recovered in Indonesia on the island of Java at Kobak Kendal, Cibutak and Cibango (Selvakumar 2011: 199). It has been recovered alongside other ceramics in Buni grave complexes on the North West coast (Glover 1989: 4, Walker & Santoso 1980: 229). The Rouletted Ware recorded here is not quantified as far as the author of this study can verify, it is described as a “*circular band of Rouletted dots*”, these are described as “*blurred*”, although it is suggested that this is possibly a result of subsequent treatment (Walker & Santoso 1980: 229). There are also

descriptions of specific sherds, including a piece from Cibutak that has two concentric rings of rouletting which differ, and the rouletting is notably more sharply impressed than on other pieces. It also has decoration on the outside in the form of an incised chevron decoration, therefore possibly displaying rouletting but not of the type in this study, (as discussed earlier in this chapter and Chapter Seven) (*ibid.*: 231).

In Western Java at least sixty sherds of Rouletted Ware have been located at the large temple site of Batujaya, which has been subject to several archaeological investigations (Manguin & Indradjaja 2011: 120, Taim 2006: 334, 336, 338 – 339). The site had an extensive occupation period, with the period relevant to this research being that prior to 800 AD, which Manguin and Indradjaja describe as the “*Early Buddhist*” phase (2011: 120). This period consists of “...*early Buddhist / first temple construction phase and Buni phase*” (*ibid.*). Considering the location of the finds, it raises the question as to the purpose of this deposit, and whether it was possibly linked to a Buddhist donation. Ten percent of the pottery recovered at Batujaya is described as “*Fine*” Rouletted Ware and comparable with the sherds recovered at Arikamedu, this comparison extends to a “*rough Rouletted Ware*” which is described as “*heavy rough and porous*” in a lower quality fabric and starts to appear around the second century AD (Manguin & Indradjaja 2011: 120, Taim 2006: 339). This, and other Indian ceramics constitute the majority of what are classified as “*non-local*” ceramics, unfortunately these are simply classified as “*black*” and “*non black*” (Taim 2006: 339).

There is further evidence from around Indonesia of Indian imports, a sherd described as “*Roman Rouletted Ware*” was recorded in the Buni area, Kerrawang residency (Taim 2006: 336f) and Manguin & Indradjaja (2011: 126) refer to “*three well preserved ‘Rouletted Ware’*” dishes that were recovered in the Buni sites that are now on permanent display in the National Museum in Jakarta. These sherds were recovered in the 1960’s and identified as Rouletted Ware by Walker and Santoso who published their paper in the 1970’s and for an extensive period these were the only Indian wares known to have been recovered in Southeast Asia (Manguin & Indradjaja 2011: 120, 132). They also refer to stamped wares that appear to be of the same period as the Rouletted Ware, but these differ to the stamped sherds in this study.

2.21 Vietnam

Rouletted Ware has been recorded at several locations in Vietnam, although interestingly not at the site of Oc Eo, and this will be addressed below (Miksic 2003: 3). The chronological periods assigned to the ceramics in this study can be compared to the late Sa Huynh Culture (500 BC to AD 100 or 200) and the Early Cham period (AD 100 – 500) of central Vietnam (Dzung 2011: 4). The period from 100 CE to 400 CE can also be referred to as the Tra Kieu period, the name of one of the sites where Rouletted Ware is recorded, as discussed below. Rouletted Ware has only been recorded at two locations, at Bu Chau Hill, Tra Kieu (the site of ancient Simhapura) and at Go Cam, both in the Quang Nam Province of Central Vietnam (Dzung 2011: 12, Glover & Yamagata 1998:79, Gogte 1997: 78).

Tra Kieu was an ancient walled city in the Thu Bon River Valley and the excavations here were conducted by Glover and Yamagata in association with the Institute of Archaeology, Hanoi and the University of Hanoi (Glover & Yamagata 1998: 75 & 79). What was described as “*single small dark grey sherd with lines of triangular impressions*” was recovered, and after this initial identification, verification was sought through the use of mineral analysis. and it was concluded the sherd could be “*Indo-Roman*” (*ibid.* 79) Rouletted Ware. Prior, following the comparison of thin sections, proposed that the sherds from Tra Kieu originate from the same location as the Rouletted ware from Arikamedu (1998: 106). Layer Six, where the Rouletted

Ware was recovered at Tra Kieu, has been dated to 380 BC to *cal.* AD 225, and this is the earliest level in the sequence (Glover & Yamagata 1998: 81). The authors note that the sample from Layer Six was collected very close to where the Rouletted Ware sherd was found.

Four further sherds of Rouletted Ware were found at Go Cam on the Ba Ren River (Dzung, Glover & Yamagata 2006: 225). The sherds are only described as grey and black and referred to as Indo-Roman Ware by the authors. Go Cam is situated in an area of sites yet to be investigated (*ibid.*: 218*f*), so further excavations may reveal additional sherds of Rouletted Ware.

2.22 Thailand

In contrast to the majority of sites outside South India, there are several sites in Thailand where both the ceramics in this study, Rouletted Ware and Arikamedu Type 10 have been recorded. An example of this being the site of Khao Sam Kaeo which is located on the narrowest part of the Thai-Malay peninsula (Glover & Bellina 2011: 17*ff*). It was initially the unearthing of artefacts by local villagers that highlighted the archaeological potential, leading to the Fine Arts Department of Thailand to conduct initial surveys in the area in 1981. This was followed by a French – Thai team, who surveyed in 2003, with the first excavations taking place in 2005, however it must be mentioned that most of the examples of Rouletted Ware and Arikamedu Type 10 come from surface finds and test pits. Eighty one test pits were dug at Khao Sam Kaeo between 2005 and 2007, these provided 402 sherds of

Rouletted Ware, which included fifty eight decorated base sherds (Bouvet 2011; Glover & Bellina 2011: 17). Excavations showed that Khao Sam Kaeo was a large settlement with an industrial area.

Further examples of Rouletted Ware are recorded at Phu Khao Thong which consists of four minor sites and is situated on the Andaman coast. Fifty sherds were recorded here between 2006 and 2007 (Chaisuwan 2011: 93, 95), along with ceramics that appear to be comparable to Arikamedu Type 18 (Figure 4.21 in Chaisuwan 2011). Further examples may have been recorded at Chansen, Thailand, as detailed in the preliminary report. Bronson and Dales (1972: 35) refer to a shallow bowl “*strongly reminiscent*” of Rouletted Ware, but they dismissed this theory as they dated these ceramics to between AD 450 and 600, but comment on the resemblance (Bronson & Dales 1972: 35). It is possible that these ceramics could have spent a considerable time being circulated before deposition, and this will be discussed in Chapter Six.

2.23 Unexplained or unexpected absences

This chapter has provided an overview of the known locations where the ceramics in this study have been recovered, however, there are other locations where, based on the archaeological record, it could be expected to find Rouletted Ware, if not Arikamedu Type 10. The Level One Site in the study, Trench ASW2, supplied a considerable proportion of the ceramics in this study, but the Anuradhapura Hinterland study which followed, revealed only three pieces of Rouletted Ware (Coningham & Gunawardhana 2013:

320) and no Arikamedu Type 10, the implications of this will be discussed further in Chapter Seven.

The quote by Miksic (2003:7) “*Interestingly, no Rouletted ware has been reported from Oc Eo. This may however be the result of the early excavator’s lack of familiarity with this material*”, relates to an issue referred to above, where researchers are unable to recognise certain vessels. When considering Oc Eo, in its role as one of the key archaeological sites in Vietnam, this port site is described as a “*cosmopolitan trading centre*” (Khoo 2003: 3) during the period between AD 200 to 600. Oc Eo is situated on the south easterly tip of Vietnam, and archaeological evidence shows artefacts produced in classical or Mediterranean style which have been recovered there, a possible indicator of the importance of the site (*ibid.*). Unfortunately, Oc Eo today is a site that has suffered from looting and is heavily disturbed.

Another area which presents a void in relation to the ceramics in this study is the east coast of Africa (for example Adulis and Ras Hafun). There is evidence of South Asian ceramics being recovered in East Africa but apparently not the ones in this research (Seland 2014, Smith & Wright 1988: 138, Zazarro 2013). The presence of confirmed examples in Africa is limited to the Red Sea coast of Egypt, but as these ports were part of the distribution network that links Egypt with the Mediterranean it is possible that some of the ceramics got carried at least as far as Coptos via the Via Hadriana, as Tomber proposes (2002: 29). There are other Red Sea ports where the

ceramics may be expected to be recorded, for example Marsa Nakari, but no mention is made (for example, Barnard 2005, Seegar 2001). Their apparent absence at sites in the Eastern Desert, such as the imperial quarries of Mons Claudianus and Mons Porphyrites in addition to the Via Hadriana, emphasises the direct association of these ceramics with Indian trade and the traders on the Red Sea Coast – there was no intention of distributing these vessels (Tomber 2000: 630).

In South Asia, Wheeler's legacy could have impacted the familiarity of Rouletted Ware, and this may explain its prolific presence in the archaeological record compared to Arikamedu Type 10. Rouletted Ware has been widely documented in Wheeler's theories on Indo- Roman trade, whereas Arikamedu Type 10 was not so widely documented, therefore it may not be recognised as easily in the archaeological record.

However, in addition to sites where the ceramics in this study have not been documented, caution maybe necessary when considering places where they have been recorded. This can be difficult as even though there may be a record of a ceramic at a site, this may only be supported by a poor sketch or no image at all. Rouletting is a common feature noted on ceramic traditions from South Asia and beyond, but this study is looking to the type of rouletting described by Wheeler following his excavations at Arikamedu, so this has the potential to lead to confusion. A style of Rouletting is seen on Chinese Ceramics such as Proto Yüeh Ware which dates from the middle of

the Third Century AD, and later Tz'u-chou Type Ceramics (AD 960-1600) as seen in Figure 2.9. Rouletting is also a feature of pottery from several regions in Africa, in addition to the vessels from Egypt discussed in this thesis. Figures 2.10 and 2.11 demonstrate vessels from two different parts of Africa which have a form of rouletted decoration. Additionally, rouletting can also be a decoration on Roman pottery, and this may have contributed to Wheeler's conviction that the ceramic was of Mediterranean origin. When considering images such as Figure 2.12, it is possible to see the style of design that possibly influenced Wheeler's views and which he was already so familiar with following his excavations at Caerleon and Verulamium (Hawkes 1982: 145, 153ff).

A misidentification of Rouletted Ware occurs in Dupree's report on Deh Morasi Ghundai "*a Chalcolithic site in South-Central Afghanistan*" which is a mound situated between 16 to 17 miles southwest of Kandahar. In the top 60 centimetres of the Morasi IV level, "*a mixed upper level*" which "*Nature and man have combined to confuse*" (Dupree 1963: 113) there is a ceramic recorded, which is referred to as Rouletted Ware, being "*almost identical to the pre-Arretine wares of this type reported by Wheeler from Arikamedu and other Indian sites*". It is clear from the figures provided in Dupree's report (Plate 23) that this ceramic is clearly not the Rouletted Ware in this study. Dupree highlights that the recording of this type may suggest a connection with the Rouletted Ware of India (*ibid.*: 114).

Arikamedu Type 10 is far from unique in displaying stamped detail, stamped decorations on ceramics are a reasonably common feature; however, it is more usual to see them on the exterior of a vessel. Stamps appear on Roman pottery, where Webster (1996) proposes three possible reasons for their presence: firstly, as a “*quality control system*”, to identify an individual’s work within a group, to act as a marker when the pots were fired in a communal kiln, and as an advertisement for the individual potter. If applied to Arikamedu Type 10, it is possible that the first two reasons may apply. Whereas the stamp may have possibly been used as a means of identification, Webster’s final reason seems unlikely. It is possible that the ceramics were fired at a communal kiln, so a method of identification, and possibly a quality control procedure may have been instigated.

Stamped decoration on African Red Slip Ware (fourth to the sixth century AD) is situated on the floors of larger bases and bowls (Hayes 1972: 217). Hayes’s research detailed how the motifs changed over a chronological period allowing for several styles to be noted. This led him to state “*thus this kind of stamped decoration is as reliable an indication of date as the form of a vessel, permitting quite precise dating of even small fragments*” (*ibid.*). These are dated to between c. 440 – 500 AD, and includes a transitional phase from the earlier phase C which is c. 430 – 460 AD. In common with the Arikamedu Type 10 the “*various*” bird stamps are described as “*highly stylised*” (*ibid.*: 226) and other birds in the stamped design are interpreted as partridges and ducks. Chapter Five of this thesis will present a chronological record of the change in design on Arikamedu Type 10.

The excavation reports for the site of Beikthano in Burma reference ceramics that potentially could be comparable to both of those in this study. Firstly “*a small percentage of the pots have incised patterns which seem to have been applied in the same manner as on the rouletted black ware discovered in Arikamedu near Pondicherry on the east coast of South India*” (Thaw 1968: 28). Figure 71 from Thaw’s report appears to show a vessel with a rouletted decoration on the outside shoulder, but this is very different to the ceramics excavated by Wheeler at Arikamedu. Additionally, there are also stamped ceramics recovered at Beikthano, but they differ to Arikamedu Type 10 in design and positioning of the ceramic (*ibid.*).

Roman material has been reported as being recovered in China, and it can be proposed that the ceramics in this study may have travelled that far. As in the previous chapter the trade routes that come under the heading of “*the Silk Road of the Sea*”, encompass much of the geographical area covered in this study, although it is highly likely that goods that have reached China from this period travelled along the land route of the Silk Road. However, a Chinese text from the late second century BC does refer to glass being exported from Kanchipuram, a location where Rouletted Ware has been recovered (Suresh 2004: 136f). Neither of the ceramics in this study to date have been recorded so far to the east, if they were it would need to be considered as to whether they were deposited in antiquity or more recent times, possibly as part of a later corpus such as a collection deposited by an antiquarian.

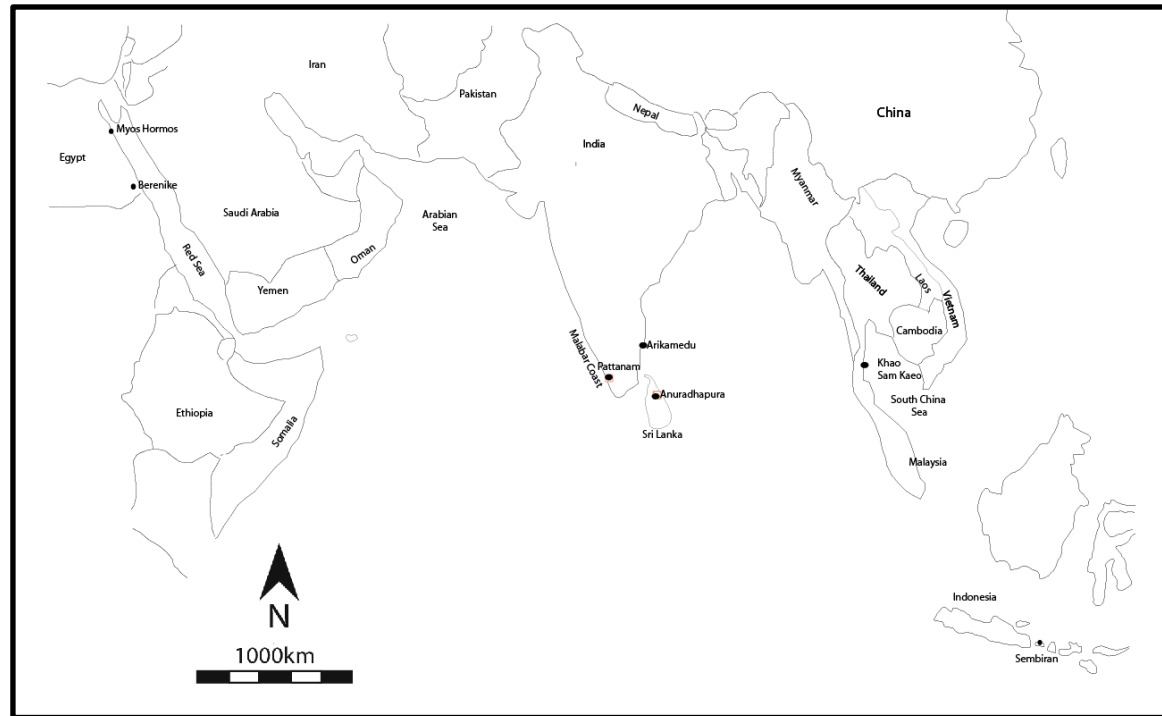
There is evidence of Chinese imported goods arriving at locations in this study. What Jayasingha describes as a “*significant quantity of pottery from seven Chinese dynasties*” has been recovered in Sri Lanka (2006). As these materials start from the Tang Dynasty it is beyond the scope of this study, however it demonstrates the extension of trade following the Early Historic period. The recovery of East Asian glazed ceramics at Trench ASW2 such as Xing and Ding Ware, Changsa painted stoneware (both dating to 9th -10th century AD) and coarse grey stoneware (8th – 12th century AD) demonstrated the importance of the site and its connections with trading networks to the far east (Seely *et al.* 2006: 91, 112f). Whereas the Yue Green Ware at Trench ASW2 originated from South East China, the Xing and Ding White Wares are from Hebei in Northern China, demonstrating the extent of the trading network by this period.

2.24 Conclusion

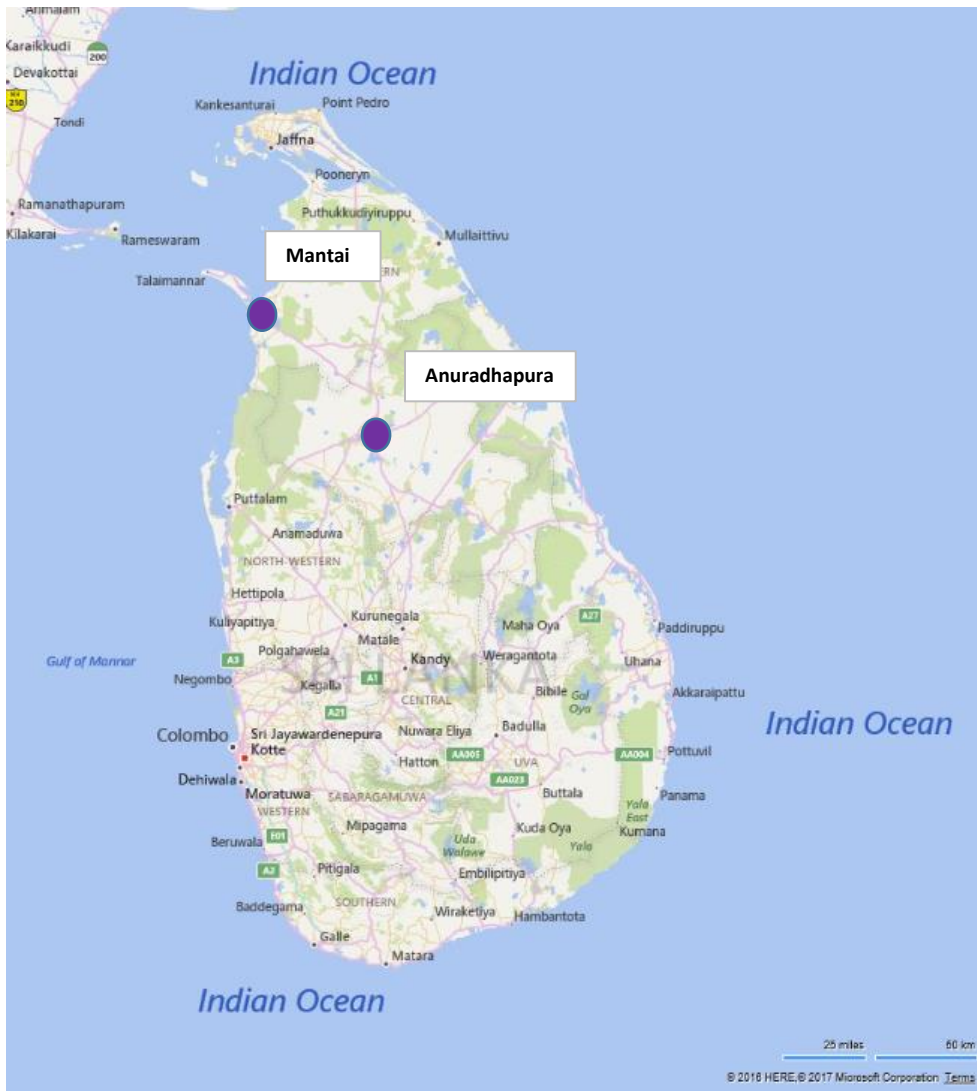
This chapter has provided a comprehensive introduction to the two ceramics in this study, and has also introduced possible locations where they have been recovered, but to conclude, the data for each site varies considerably and that is reflected in the information obtainable, and the availability of ceramics to be analysed.

From the sites explored for this research it can be noted that of the two ceramics in this study, Rouletted Ware, (including what Wheeler described as its “*poorer quality imitations*” (Wheeler *et al.* 1946: 48) at various sites) has a significantly wider distribution level than Arikamedu Type 10 and is often found on its own. Therefore, this chapter has completed Objectives Two and Three of this thesis by introducing the ceramics in this study, presenting an overview of where they have been recorded and how they have been recorded. The following chapter will identify the methodology for analysing the ceramics in this study. It will evaluate other methods that have previously been used and follow this with the methodology to be used for this present research into Rouletted Ware and Arikamedu Type 10.

Chapter Two: Maps



Map 2.1 Key sites from this research, and also a demonstration of the easterly and westerly extremes of this study



Map 2.2 Sri Lanka with Anuradhapura, the location of Trench ASW2 highlighted, and also the port of Mantai

Chapter Two: Figures

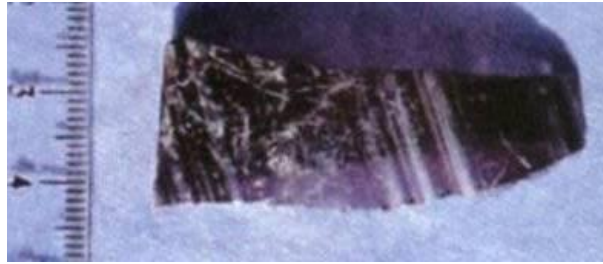


Figure 2.1 Eastern Mediterranean glass (SFN 1097) from Trench ASW2, Anuradhapura (photo: Coningham).

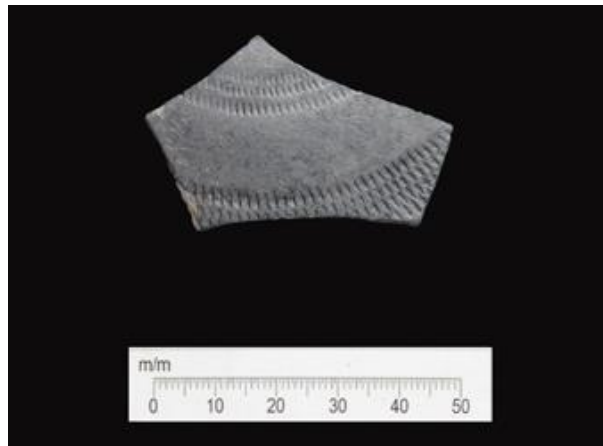


Figure 2.2 An example of Arikamedu Type 1, Rouletted Ware (sherd 602). This sherd was excavated from Trench ASW2, Anuradhapura, Sri Lanka (photo: author).



Figure 2.3 An example of Arikamedu Type 10 (sherd T35). This sherd has a visible bird stamp, grooves and 'v' symbols. It was excavated at Trench ASW2, and is from Period G2. (photograph: Coningham).



Figure 2.4 Dark blue glass paste intaglio. This Roman intaglio has a peacock design. (British Museum: Acquisition 1814,0704.2064 © Trustees of the British Museum)



Figure 2.5 Lamp with a peacock design. This Roman lamp is dated to AD 51 - 100 (British Museum: Acquisition 1856,1226.525, © Trustees of the British Museum).

Chronology of Trench ASW2



Figure 2.5i The Chronological Periods at Trench ASW2, Anuradhapura (After Coningham et al. 2013: Figure 4.13)



Figure 2.6 Rouletted sherd with elephant sketch from Alagankulam (photo: author)



Figure 2.7 Rouletted Ware with depiction of Mule with a rider (photo: author)



Figure 2.8 Rouletted Ware with a ship etching (photo: author)



Figure 2.9 Tz'u-chou Stoneware with white slip and brown overslip and carved rouletted decoration underneath clear glaze (Minneapolis institute of art: ND.: Accession Number 2001.135.3, Public Domain)



Figure 2.10 Hand built water vessel recovered from Yeji, Ghana.

Rouletting can be seen around lower body and grooved decoration is visible on the upper body and mouth. (British Museum: Acquisition Af1952,27.7 © Trustees of the British Museum, CC BY-NC-SA 4.0)



Figure 2.11 Pottery jar handle, from Bigo Earthworks, Uganda. This vessel provides another example of decoration using rouletting (British Museum: Acquisition Af1952,27.7 © Trustees of the British Museum, CC BY-NC-SA 4.0).



Figure 2.12 An example of Oxford Colour Coated Ware with an impressed design in the Wiltshire Museum (photo: author)

Chapter Three

Methodology

“...variations are inevitable in a hand-made product. Some may represent chronological or other trends, while others may be just a potter’s attempt to relieve the tedium of throwing so many pots each day”

Orton *et al.* (1993: 79)

3.1 Introduction

Chapter Two introduced the ceramics involved in this study along with a review of the relevant chemical, elemental and image analysis that has been conducted to date. This was followed by a discussion of the known distribution of the ceramics, Rouletted Ware and Arikamedu Type 10, alluding to both the spatial, and where the data was available, temporal element of this thesis. This chapter will meet Objective Four of this research - to evaluate, develop and enhance the applicable elements of the methodologies created by Shoebridge (2009) and Blair (2010) and examine other image analysis studies in order to extract the maximum amount of data from casts, published images and original photographs of Rouletted Ware and Arikamedu Type 10 available to this study.

As part of the methodology, this research requires the ability to take the impression of the rouletting design from the Rouletted Ware. It will review previous studies that have involved the taking of moulds and casts from ceramics, including an evaluation of the applicable methodologies created by Shoebridge (2009) and Blair (2010), followed by a discussion on how these

can be developed and enhanced. Taking points from these previous studies into account, the chapter will then proceed with the methodology utilised to make the casts required for this study; followed by an explanation as to how the data required from the casts will be extracted and evaluated, and used with data from other sources.

Through this research, it will be demonstrated that moulds and casts have the potential to allow closer examination of the elements of patterning and design, and the methodology employed here allows for the detail from the casts to be extracted in a uniform fashion, presenting a standardised, reliable set of data. However, consideration must be paid to the fact that some of the moulds kindly lent to this study by Professor Ian Glover were prepared over 20 years ago, this will be discussed at the appropriate points. The two ceramics in this study have the potential to demonstrate uniqueness in the craftsmanship of the design on every single vessel. As they are produced by hand, each vessel will be different – whether this is intentional or not, as emphasised by the quote at the start of the chapter. It is not just the finished vessel that will have some variation, but potentially the tools used to make the vessel if they are also hand made.

3.2 Previous research involving casts and moulds

Moulds and casts have formed part of archaeological research for many decades as demonstrated by the examples in this chapter (e.g. Flamm 1965). The literature researched for this thesis demonstrates a variety of different materials which have produced results from a range of artefacts. The ideal moulding compound can potentially allow the extraction of more data, even to the naked eye, than could be realised with an image alone, and such techniques have played a major role in high profile archaeological investigations such as that of the Gundestrup Cauldron (see Section 3.3.1). To date, moulds have primarily been used for the identification of perishable materials that do not commonly survive in the archaeological record. Hutcheson's 2008 study used moulds as a vehicle to investigate basketry impressions, while Drooker's 2001 research investigated the impressions left by fabric on pottery. The analysis of ceramics through impressions was addressed by Holmes (in Drooker 1992) and a variety of studies have been executed since, with Drooker (2001: 59) stating that "*until fairly recently, though, the wealth of data available on such sherds was extremely underutilized*". Casts which are taken with fine grain casting materials have produced results that have allowed the identification of plant and animal fibres impressed onto a sherd, as so much detail is visible under the correct analytical conditions that individual fibres can be recognised, for example (Drooker 1992: Figure 22). This following section will investigate previous examples where moulding and casting techniques have been engaged.

3.2.1 Archaeological research using silicone rubber

An early image analysis study of ceramics using moulding and casting was conducted in the 1960's by J. M. Flamm (1965). Flamm experimented with rubber silicone compounds on a variety of surfaces, which included a selection of ceramics in different states of preservation, both slipped and not slipped (Flamm 1965: 62). Silicone rubber moulds can produce very precise reproductions but unfortunately this material does present some disadvantages, and these will be discussed (Larsen 1981: 15). In her research, Flamm (*ibid.*: 62*f*) experimented with several rubber silicone compounds and found that the solid white option resulted in the production of a cast which allowed a “*greater contrast between light and shadow and enhance the readability of obscure inscriptions*” (*ibid.*: 62). However, Flamm did experience staining on porous surfaces (which she notes particularly in the case of the ceramics) and this was due to the impact of the silicone oil occurring in the compounds - both the compounds and the catalysts produced a stain. Flamm did not use a release agent, and unfortunately the use of solvents failed to remove the darkening, causing the author to warn against the use of solvents (*ibid.*: 62). Further experiments conducted on the stained pieces did result in the stains being eradicated if the object was baked at 500°C. The research does present a list of recommendations of the compounds used and concludes with the statement that “*we should like to emphasize that the silicone rubber compounds provide a quick and easy method of making duplications in the field*” (*ibid.*: 63).

Flamm's study does use silicone rubber and a catalyst, but this resulted in staining which could only be removed with great difficulty. Flamm also refers to issues with bubbles forming in some of the impressions of Cuneiform tablets, a problem also experienced by this present study (Flamm 1965: 3). Flamm attempted to overcome this problem by pressing down the compound onto the wedges on the tablets with the fingers, but this appears to have not provided a guarantee that the bubbles would not occur.

Although it is possible to argue that Flamm's study resulted in useable casts, considerable consequences were suffered by the ceramics used in her study. The presence of an oil in silicon rubber can result in a negative impact on porous surfaces, although Larsen (1981: 38) believes that the impact can be prevented with the "*use of a very thin coat of lacquer, for example methyl-cellulose or nitro-cellulose*". Interestingly, Larsen does also draw attention to silicone rubber not being a suitable compound for objects that may be required for radiocarbon dating or other analytical techniques, as remnants from the silicone can be deposited on the ceramics (*ibid.*). When developing any research method that may involve the use of artefacts, it is highly desirable that the method should be non-destructive to any part of the vessel including the slip and broken edges. Flamm's research would have been difficult to promote to institutions when considering the potentially destructive nature of the method, especially when considering the ceramics would have required baking in a hot oven to remove the staining.

3.2.2 Archaeological research using Polymer compounds

Polymer clay products are another group of materials that have been used extensively, with brand names such as “*Fimo*” and “*Sculpey*”. These products were originally designed as crafting supplies and produce a mould that does not appear to exhibit the finer details, but they initially appear to be easier to apply as they simply require kneading prior to use. However, for this material to harden, it requires baking in an oven, making it impractical for use in the field. Drooker appears to prefer “*Sculpey*” over a product she describes as “*modelling clay*” (Drooker 1992: A1), as modelling clay does not extract the fine detail that compounds such as latex can. She describes the impression that *Sculpey* gives as “*a good, fine grained impression*”, however this product can only work successfully when a reliable oven facility is close by.

In his 2010 research, Blair used a product which is similar to those detailed above - Smooth On’s Equinox 35 fast set addition cure silicon putty (Blair 2010: 54), which consisted of two compounds that needed to be mixed by hand. One of the main advantages when using this product is the speed at which it sets on the ceramic and it is also straightforward to use. A key disadvantage is that it has been seen on occasion to leave visible marks on ceramics. Blair avoided taking casts of ceramics in a poor condition, and it must be noted that when using this product, care must also be taken to ensure that it is not used close to, or on the break of a ceramic as it can remove some

of the unglazed break. The moulds using this compound were photographed using a G-XTL-IA microscope and Moticam 2.0 pixel camera using the Motic Images programme V.2 at x7 and also x15 levels of magnification (Blair 2010: 53-54), however, in addition to the detail on the ceramics, dirt can also be seen in the rouletting which could potentially distort the results.

3.2.3 Archaeological research using dental products

In her 2008 study, Hutcheson appears to favour the use of dental alginate to provide a manageable moulding product that “*transports easily as a powder, has low dusting character and requires no special apparatus*” (Hutcheson 2008: 71). A series of investigations have been conducted using dental materials, a product which was primarily designed to take tooth impressions from the patient. Two examples of research where this material has been used are Stothert *et al.*'s 1990 study which applied vinyl polysiloxane dental impression material to ceramics, and also Hutcheson's (2008) study which takes casts of ceramics using dental alginate. Both studies apply the dental material to textile imprints on ceramic vessels. If a cast is taken of the negative impression that is printed on the vessel, the positive impression is then produced. When the cast is subjected to a suitable method of magnification, a textile specialist may be able to identify the yarn and weaving techniques used (Hutcheson 2008: 70ff, Stothert *et al.* 1990: 767).

Stothert investigated prehistoric Andean ceramic figurines that display impressions of textiles (Stothert *et al.* 1990: 767). Textiles are rarely

preserved in the archaeological record of this region, however, by analysing the ceramics, there is the potential to gain data about the textiles as well (*ibid.*: 770). Stothert *et al.* used the dental impression material product with the brand name Reprosil, which is a low viscosity vinyl polysiloxane material, along with dental wax strips to provide a wall around the impression.

Hutcheson (2008), discussed the application of dental alginate on Palmetto Ware from the Bahamian Archipelago, and although this Ware is not usually decorated, it can display negative basketry impressions. Hutcheson decided to use dental alginate as it met a range of criteria including retention of design, and the ease of use in the field, however concerns are raised in relation to the effect of the alginate in the long term, with respect to stability and shrinkage of the moulds. In an attempt to combat these concerns, she took casts made of dental stone from the moulds. The product branded as Jeltrate was the alginate chosen to produce the moulds in this study for several reasons - it is light, and can be transported easily, it is a low dusting powder and does not require any special equipment, it only requires to be mixed with cool clean water. The stone casts in the study were made by using a product called Vel-mix.

In Figure 5.2 of her 2008 paper, Hutcheson demonstrates the results achieved using Jeltrate, and she noted that the cast offers a “*different visual perspective*” (Hutcheson 2008: 74), with the uniformity of colour across the cast provided by the compound revealing details not observed in the original

artefact. The sharp results achieved from many of the ceramics (although exceptions did include worn and sooted pottery) in this study allowed the identification of particularly fine details of the basket elements impressed in the clay, including the type of palm used (*ibid.*); however, Hutcheson does not detail what method she uses to extract such data.

3.3 Previous examples of moulding and casting studies

The examples below detail investigations which have also used a type of moulding or casting as part of the means of achieving an end result.

3.3.1 Case study one: The Gundestrup Cauldron

One of the most referenced studies in archaeological literature to use moulding and casting techniques was conducted on the Gundestrup Cauldron. The provenance of the cauldron, recovered in a peat bog in Gundestrup, Denmark, has been heavily debated since its discovery in 1891 (Berquist & Taylor 1987: 10ff). In order to progress observations beyond the initial interpretations of iconography and style, casts of the cauldron were made from silicon rubber which allowed for analysis using Scanning Electron Microscope (S.E.M) analysis to be carried out on the iconography without damage (Larsen 1987: 397, Berquist & Taylor 1987: 13a). This image analysis exercise was conducted on the vessel with two key objectives (Larsen 1987: 393, 395); primarily, to investigate how the vessel was manufactured, but the research would also attempt to investigate the tool

marks, matching them with marks on other vessels to determine the origin of this piece

On examination 15 different pattern punches were noted which had been used in the manufacture of the cauldron; these punches could be divided into three groups based on the analysis that each plate was made by an individual silversmith using his own pattern punches. Berquist and Taylor (1987: 13) commented how this theory parallels the previous observations of Muller, Klindt-Jensen and Olmsted who, based on stylistic observations, believed the cauldron to be produced by three different silversmiths.

3.3.2 Case study two: The experiments by Gwinnett and Gorelick

Studies by Gwinnett and Gorelick used image analysis techniques alongside experimental investigations in an attempt to recreate ancient manufacturing techniques. This included the examination of manufacturing techniques in relation to scarabs, beads and amulets from Ancient Egypt (Gwinnett & Gorelick 1993), and also Minoan and Mesopotamian Seals (Gorelick & Gwinnett 1992). In their publications, they also discussed how their results can be related to Minoan history and culture.

In their study of Minoan and Mesopotamian seals, Gwinnett and Gorelick's research shares a common factor with the two ceramics in this thesis, in that no

manufacturing tools have been found that can be directly related to the production of these vessels, therefore part of their research included trying to determine the manufacturing methods used in the production of these seals (Gorelick & Gwinnett 1992: 57). Their work has involved taking silicon impressions which were viewed through light optical and S.E.M. This was followed by an attempt to recreate the types of tools that may have been used to manufacture the artefacts, and the authors do acknowledge how both a match or a mismatch can be significant. When assessing the surface decoration on the seals, the characteristics that they looked for are also relevant to the ceramics in this present study (*ibid.*: 63), such as examining the seals to see if a common tool was used throughout the production; and if this was produced from organic matter, (which may present a viable explanation for why the tools are not visible in the archaeological record). Gorelick and Gwinnett also examined the impressions for any implications that the pieces were produced by an apprentice, such as controlled accuracy and frequent clay impressions.

3.3.3 Case study three: Bird's investigations on the sherds from Quetta

Volume Two of the excavation report from Quetta, Pakistan (Fairservis: 1956) includes a report by Bird (1956: 372 – 377) entitled “*fabrics, basketry and matting as revealed by impressions on pottery*”. In common with some of the investigations detailed above, the main purpose of this research was to look for impressions left on pottery by perishable

materials. Bird highlights the absence of such material in the region, proposing that impressions may help to fill that void.

Bird initially used latex casts, and describes a method where the “*latex product*” used can be soaked in kerosene, leading the cast to double in size (Bird 1956: 372). This soaking can be repeated until a cast is produced which is several times larger than the original. Although Bird does imply a method that is sound, he does note that should there be a flaw on any of the casts, it will be successively magnified with each reproduction, and each of the cycles takes at least a week, and that as much detail can be extracted by “*direct photographic enlargement*” (*ibid.*).

The sherds that were available to Bird were described as from “*fairly large*” vessels, although he does not mention if the sherds themselves were large (Bird 1956: 372). Larger sherds would present more of a pattern, allowing for more of the scope of a design to be seen. This is one of the issues presented by many of the sherds in this current study, they are very small, especially the Arikamedu Type 10, so whereas presumptions are made that the same style carries on around the vessel, to see the full vessel may present some variation in design, and further details such as manufacturing flaws (*ibid.*).

Bird’s research allowed him to propose that the spinning on the textiles was quite even, and detail such as yarn diameter and angles of twist can be

determined should such data be required (Bird 1956: 375). Bird does make the point that there will be a slight size difference between the textile and the sherds as the clay will have shrunk slightly in the manufacturing process. There may be a minor variation in this, and consistency is aided by specimens all being photographed at exactly the same scale with the position of the light sources kept constant. This is one definite advantage that Bird's research has over this current study, where photographs have been taken at different locations, so under different conditions. Although most photographs of the sherds from Pattanam and the Rouletted Ware sherds from Trench ASW2 were taken by the author, they were taken in the same place.

In addition to the latex casts, Bird also used a product called "*Plastoline*" which he describes as "*adequate*" but in common with the latex, there is no suggestion of any testing or release agent between the sherd and the compound (Bird 1956: 376). Janaway and Coningham (1995: 163) highlight the potential of a study such as this, especially when combined with S.E.M analysis, however, they inform the reader that an understanding of why the fabric was placed on the vessel is also important.

3.3.4 Recent work using casts and the two ceramics in this study.

More recently, research has been conducted at Durham University, United Kingdom by Shoebridge (2009) and Blair (2010). The 2009 study by Shoebridge was conducted on one of the ceramics in this present study,

Arikamedu Type 10, and primarily analysed published images and photographs. Shoebridge (2009) did have access to a small selection of casts from Anuradhapura, Sri Lanka, and the use of these casts did conform with one of the ongoing themes throughout the study, that of conducting research without the need for the artefact being studied to be present. Despite the small number of casts available, this allowed an alternative dimension of analysis to be included, as data regarding depths of grooves could now be extracted, which was not possible when only consulting a printed image. To extract the data, the casts were photographed using a varying lens against a black background.

Whereas Shoebridge's 2009 study investigated one of the ceramics in this present study, Arikamedu Type 10, the research conducted by Blair (2010) focussed on the other ceramic currently being researched for this thesis, Rouletted Ware, as discussed above. Blair's research had the aim of "*enhancing the chronological and geographical resolution with which archaeology views Early Historic Indian Ocean trade through the analysis of a corpus of Rouletted Ware*" (Blair 2010: 5). In common with Shoebridge's 2009 study, this research heavily utilised sherds from the corpus of Trench ASW2, although the actual Rouletted Ware sherds were available to Blair. Part of this research involved the investigation of a method that would allow a proposal of the provenance of Rouletted Ware through observations of experimental examples of Rouletted Ware in addition to archaeological ones (Blair 2010: 8). Blair's system for analysing the Rouletted Ware is assessed

further in Section 4.12, where his (and Coningham et al's) system for analysing the Rouletting symbol are discussed.

3.4 The method – introduction

When developing the method for this study, two primary considerations were that the method needed to provide the best results possible, but it needed to be a method that required minimal equipment and could be easily transported and used with the minimum of resources, hence the avoidance of equipment such as S.E.M or polarising microscopes. The method that was to be developed needed to be able to extract as much detail from the various designs on the ceramics as possible, but also leave no visible mark on the ceramics or damage them in possible any way. While dental putty has been an often-used method for taking impressions of ceramics, it was ruled out for two principal reasons: dental putty, and similar substances such as Plasticine or Sculpey (as used by Drooker) (1992: A1) need pressure to ensure correct application to the ceramic so that it can reach the depths of the design. If too much pressure is applied to a fragile artefact (which on initial examination may appear strong enough to withstand the pressure) it could fragment.

3.7.1 Damage to ceramics

Larsen's (1981: 38) advice when starting any project which requires taking an impression should be considered, "*before commencing a moulding project, the surface of the object should be carefully studied under a*

microscope to see if it is able to withstand the process". Respect for the artefacts in this study is one of the important criteria in the development of the methodology - museum curators are more likely to consent to the use of materials in their care if it can be demonstrated that the process is non-destructive. Therefore, no casts were taken of ceramics with damaged surfaces or where concretions could not be easily removed. However, it may be possible to take a cast of part of the design on a sherd if enough of the representative pattern can be observed. Very thin sherds would not be considered in case they could not withstand the process.

3.7.2 Preparation of the ceramics

Prior to making a mould, it was vital that an initial assessment was made on the condition of the sherd. All the sherds used in this study were cleaned prior to use using a mild detergent solution with a cotton wool swab; this allowed the gentle removal of any excess dirt (see Figure 3.1). For a study such as this which relies heavily on obtaining decorative features, it was vital that as much of the dirt as possible was removed without causing damage to the objects. Drooker (1992: A1) dismisses the need for a very clean sherd as the clay product she used exhibited a tendency to stick to what she describes as "*scrupulously clean sherds*", although she does agree that "*wads of dirt that can obscure the image of the fabric must be removed*" and she follows on from this to propose the use of talcum powder as a release agent to aid in the removal of a clay cast.

A moulding compound used on its own may not produce a cast which is useable, and could cause surface damage to the ceramic. To combat this, the use of a release agent may lessen or eliminate the impact on the ceramic. A non-scented talcum powder (with the brand name of '*Simple*') was used as a release agent for this research. Products with additives such as perfume were avoided in order to eliminate any unknown impact on the latex or the ceramic.

3.7.3 Obtaining the latex impressions

In order to find the ideal compound, several experiments were conducted, and this resulted in with the decision being made that latex was the most suitable moulding compound for this research. Dowman (1970: 82) stated that "*the choice of moulding material is simply dependant on the shape of the object to be moulded; this will dictate whether a rigid or a flexible mould is suitable*". However, there are many other factors to consider, such as the likelihood of causing damage to a sherd, and time available for a compound to set. Although not presenting the perfect solution, latex was deemed to be the most appropriate. Described by (Larsen 1981: 20) as a "*thin liquid rubber-milk*" it is not suitable material for all moulding investigations; as the ammonia content does not make it suitable for certain artefacts such as ivory, metal, and painted surfaces unless the object is suitably treated first. It is often suggested that latex is applied to the object using several thin layers, allowing each layer to dry before applying the next (*ibid.*). However, as each layer would take at least twelve hours to dry, a latex thickener was used in this study to accelerate the process. Latex can be used with a backing of

bandages to prevent tearing, but on the small sherds in this study it was not necessary (Dowman 1970: 82).

3.7.4 Application

Once the ceramic was cleaned to a suitable state and dried (Figure 3.2), it is dusted twice with the release agent as introduced above (Figure 3.3). During the experimental phase of this research when the talcum powder was omitted, a light residue was noted on the ceramic when the process was completed. Excess talc is removed between each layer to avoid any clumps or build-up which could interfere with the data being collected. Cling film was not considered an option as a barrier between the sherd and the latex as some of the details to be encapsulated were very fine, and there was a possibility of the film slipping. Graphite was considered as colouring but there was concerns about staining.

In order to highlight the detail on the casts, a white latex colourant was added (5%) to the latex, a trait which Flamm noted to help improve visibility (1965: 62). A further addition was one controlled drop of latex thickener for each gram of latex. Some of the casts from Shoebridge's (2009) study into Arikamedu Type 10 were clear, and it was appreciated during analysis how a light - coloured cast emphasises detail. The colourant, thickener and the latex were mixed to a consistency resembling emulsion paint, immediately following this a thin layer was applied to the sherds using a small paintbrush as shown in Figure 3.4. It was important to cover the decoration and have a

little space for a measurement to be written on the sherd, occasionally air bubbles were visible - but while efforts were made to eradicate these, they appear to be unavoidable and will not be significant in this research. Figure 3.5 shows the sherd once the latex has been applied, at this point it is left to dry in a well-ventilated room, with an expected drying time of approximately 45 minutes, depending on the thickness of the latex and the expanse of the area covered. The mould is then carefully peeled off the sherd (Figure 3.6) and any excess talc on the sherd can be rinsed off. A five-millimetre line was drawn on the impression at this stage, so any shrinkage can be monitored (Figure 3.7), and finally, the mould is placed in a labelled bag which is kept flat in a tin.

3.7.5 Extraction of data

The first stage in the process of extracting data was the scanning of the impression on a flatbed scanner, this was done at 800dpi to achieve a standardised image of reasonable quality. As all impressions were taken from the flat bases of the Rouletted Ware, the use of the scanner produced an impression in a short period of time; this standardisation was enhanced by the design on the sherds always pointing one way on the scanner so that the light will travel in the same direction. Once the scanner image is visible on a PC screen it is possible to manipulate the data in order to extract the maximum detail. The decoration on Rouletted Ware sits on the flat base of the vessel, so there were no issues with a curved cast. Impressions could be taken from curved vessels, but a standard method of photography, possibly with the

support of a consistent light source, would be needed to be built into the methodology in order to produce a consistent set of images (see also section 7.4.1).

The manipulation of the data to maximum effect was achieved through adjusting the appropriate levels and contrast of the image in Adobe Photoshop, giving maximum clarity of the decoration. These images were then transferred into Adobe Illustrator where they were enlarged and on occasion lightened or darkened to ensure that a clearly defined image was available. These scanned sherds provided greater definition of the designs, and some of the ceramics were drawn round, to highlight further detail. The 5mm line that is drawn onto the cast is also transferred onto the image at this stage and a clearer representation of each pattern will be achieved, see Figures 3.6 and 3.7. From this point two steps can be taken as detailed below.

Firstly, it is possible to measure points on the design and this is more relevant to the rouletted design as opposed to the Arikamedu Type 10 as it will allow designs to be compared. Once the drawing was completed in Photoshop, the background image of the ceramic which was existing on a separate layer can be withdrawn, leaving an 'electronic pencil' version of the ceramic, which is saved. Therefore, this results in a series of images as shown in Figure 3.7 that can be transferred back to Adobe Photoshop and then these layers can be laid on top of another to compare the patterns. This second step can be applied to the Arikamedu Type 10 in this study as well as the Rouletted Ware, and

should potentially highlight the similarities between the different ceramics; however, it is highly unlikely that an exact match will be made. This is due to several factors, such as the wear of the tools used while decorating as these may change shape over time, as highlighted in Larsen's research above. As nothing has been recovered in the archaeological record that can be determined to be a tool in the decorative process, it is impossible to draw conclusions about how long implements were used for, and the condition they reached when deemed fit for disposal or repair. Different craftsmen may have used the same tools in slightly different ways, for example, they may have exerted different levels of pressure which would have created a varying shape of stamp, or they may have a slightly different production method which may have resulted in slightly harder clay taking the impression, so a lighter imprint may be been made.

The published images and photographs that are used in this study were processed using an enhanced version of that developed by Shoebridge in her 2009 study. Most of the data for Arikamedu Type 10 will be from such media due to the shortage of available sherds. In an attempt to maintain accuracy, drawings and photographs will only be considered where a scale is present. The published images were scanned into Adobe Photoshop and features such as lighting and contrast were adjusted to bring the image to a state where the decorative features were at their most prominent without distorting the image. The adjusted images would then be transported into Adobe Illustrator, magnified and then drawn. It must be considered that due to the quality of some of the original images, the pixels can be blurred.

3.8 Method for comparison

To compare the sherds for each vessel a system has been developed to build a data set from which networks of communication can be proposed. The measuring system has been introduced earlier in this chapter for the two ceramics in this study, but in order to provide an overview, with reference to the Rouletted Ware, rather than provide a measure for each sherd regardless, the decision was taken to split the type of rouletting into various categories in a Level One sort, with provision built in for any sherds which were heavily eroded, or difficult to read.

The measuring system for the Arikamedu Type 10 will build on that developed by Shoebridge's 2009 study, where the different components that made up the stamped impression will be investigated as separate entities. There will be categories to account for those stamps with and without borders or frames, and also a separate category to account for sherds which have no stamp or just a slight impression.

3.8.1 Why were these methods chosen?

The methods employed in this study allow for the most data possible to be obtained in a practical manner. The impressions allow a very uniform method to be followed that will result in the maximum extraction of data, the moulding material used had to suit the requirements for a variety of practical

reasons as detailed above. The use of a mould rather than a photograph presents a uniform coloured image to work with, and all the moulds have been made and processed using the same procedure to provide consistency. A mould also allows for further research into the depth of the features on the ceramics, something that at present is beyond the scope of this study, but as the casts are produced and have a scale on them they can be reused in future studies.

This methodology provided a 'kit in a box' for taking impressions at any location should the opportunity occur. While continuous advances are made in relation to modelling from photographs, this method was not reliant on technology or ovens that had the potential to cause problems, it only needed a small amount of clean water. The adding of the thickening agent allowed the sherds to set quickly, and providing that a small tin was available to store the impressions in they could be taken back to a base location for further study. If time and permission permits, a duplicate set of sherds could be made in order to produce a set that could be used for destructive analysis.

Whereas photographs do provide a consistent record, they do not always present the consistency that will be found with the casts, but provide an acceptable form when no ceramics are available for the study. If the photographs are taken with a constant setting then they do present a degree of uniformity, but photographs taken in different places where the lighting and

angle may vary will not present such a uniform view of the ceramic which is beneficial to this type of study.

3.9 Other sources of data: Primary sources

The author had access to sherds from Trench ASW2, and also from Pattanam, however the author photographed the sherds from Pattanam to avoid any damage. A few previously made impressions were available from Shoebridge's 2009 study of Arikamedu Type 10 from Anuradhapura, from Bali, and also a selection of Rouletted Ware impressions from South India.

As casts were not made of the sherds from Pattanam, photographs were taken at the Kerala Centre for Historic Research with the use of a backlight to highlight the impressions, the photograph's have been adjusted in Adobe Photoshop and make a valuable contribution to this study. There are some other original photographs in this study, mainly of sherds of Rouletted Ware from Arikamedu.

3.10.1 Other sources of data: Secondary sources

This thesis aims to encompass extensive chronological and geographical parameters; therefore, it has been necessary to supplement the primary data sources with secondary ones. These secondary sources are primarily from publications such as journals, excavation reports and edited

volumes. Since Wheeler's original recording of Rouletted Ware and Arikamedu Type 10, they have appeared in many publications, but the photographs have been of varying quality – there are several reasons for this. Some of the photographs were taken over 70 years ago and technology has changed, and also the budget available for the publication may have an impact on the quality of the reproduction in the final publication.

3.11 Conclusion

This chapter has explored the possibilities available for taking impressions of the ceramics in the study, and provided examples of different case studies. The methodology that will be used in this current research has also been introduced, along with the reasons for choosing the compounds used, therefore meeting Objective Four of this thesis.

The case studies considered in this chapter provide evidence that needs to be considered in the present study, such as in his case study on the Gundestrup Cauldron, Larsen highlights the issue that tools used in his study were reground (1987: 396). Therefore, it is possible that a rouletting wheel may produce a different pattern over time, or a stamp that may impress slightly different details through regular use. Gorelick and Gwinnett (1992: 57) suggest that when investigating the use of tools in archaeology, a mismatch between a mark and a tool is just as important as a match. This can be related to this study of Rouletted Ware and Arikamedu Type 10 as there are no

manufacturing tools recorded in excavations for these Types. Therefore, other artefacts may need to be considered as potential stamps.

The following chapter, Chapter Four will meet Objective Five of this thesis by investigating the distribution and chronological changes of Rouletted Ware. It will highlight sherds which demonstrate unique features and sherds that can be used as chronological markers. This will be followed by Chapter Five which will present the distribution and chronological changes of Arikamedu Type 10, therefore meeting Objective Six of this thesis.

Chapter Three: Figures



Figure 3.1 Cleaning of a sherd of Rouletted Ware in preparation for the application of latex (photo: author)



Figure 3.2 Rouletted Ware sherd 602 from Trench ASW2 (photo: author)



Figure 3.3 Application of the release agent (photo: author)



Figure 3.4 Painting the latex onto the sherd (photo: author)

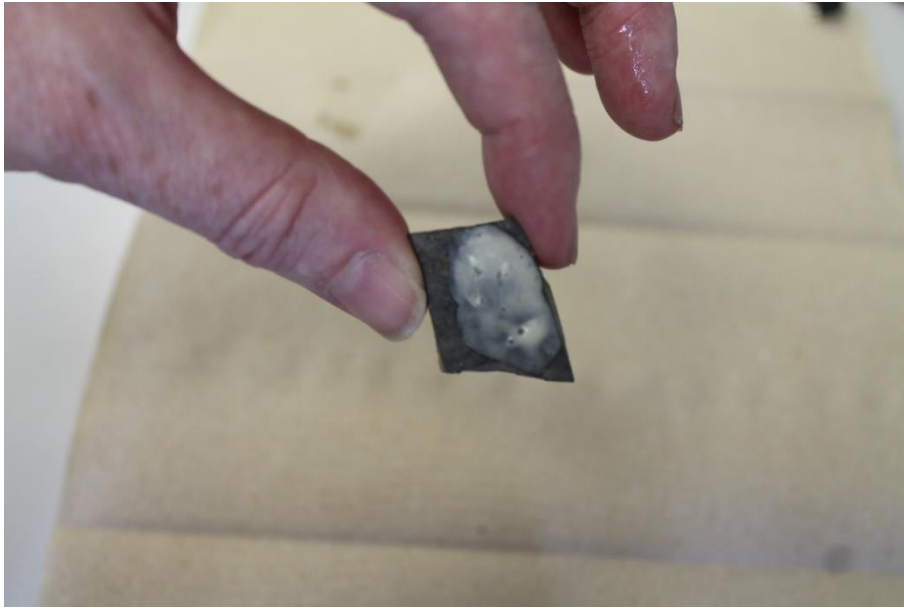


Figure 3.5 A sherd with the latex applied (photo: author)



Figure 3.6 Carefully removing the impression (photo: author)

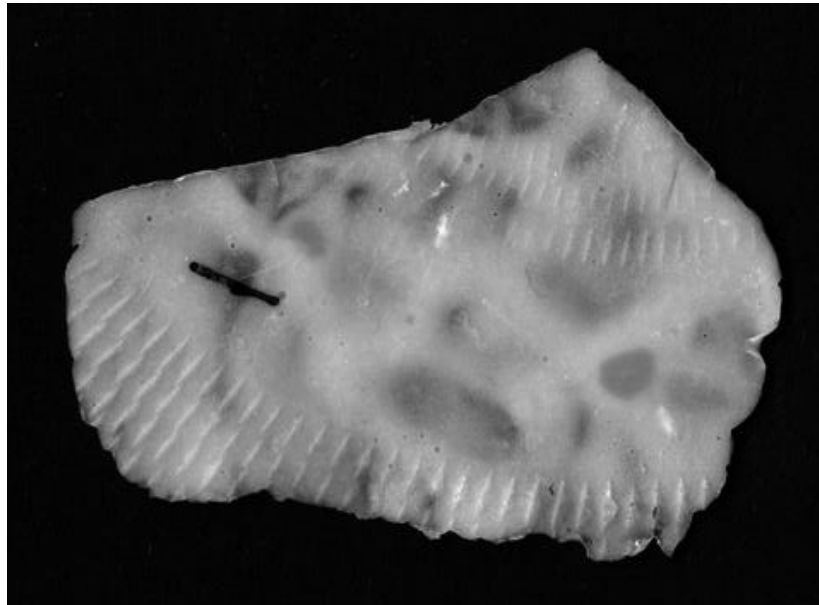


Figure 3.7 Impression of Rouletted Ware sherd 602 from Trench ASW2
(photo: author)

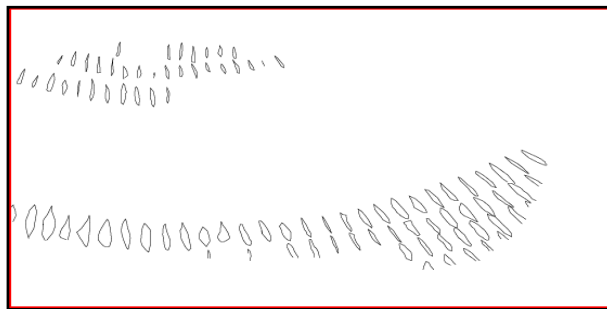


Figure 3.8 Drawing of the indentations on Rouletted Ware sherd 602 from
Trench ASW2

Chapter Four

Rouletted Ware

“They” (styles) “are not fixed, static entities, rather styles have dynamic and individual aspects. Variations are found within styles not only because a range of alternatives exists, but also because there is some flexibility in their applications”

Rice (1987: 390)

4.1 Introduction

Chapter Three, introduced the methodologies involved in this current research, focussing on the taking of impressions of the decorative features. Following on from this, Chapter Four will investigate the analytical method applied to one of the ceramics in this research, Arikamedu Type 1, also known as Rouletted Ware, therefore achieving part of Objective Four of this research. Chapter Four, will investigate the spatial distribution of the vessel and the factors that create the design at two different levels, and also where data is available it will include the chronological distribution. In the above quote, Rice indicates that varieties of designs may be recovered, a trait that will be assessed in this chapter in regard to Rouletted Ware. This chapter will highlight the wide variety of designs, whether this is in the rouletted indentation itself, or in the way the rouletting is grouped together to produce a higher-level design.

Chapter Three detailed how data has been extracted from the designs of the ceramics using the latex impressions. This has produced a range of casts

which provide an extra clarity of data which has been able to supplement the analysis described and discussed in this chapter. The geographical boundaries of the study have been divided up as follows to allow for easier analysis as seen again in the table below. The data linked to the Rouletted Ware sherds can be seen in Appendix One(i), and the data for the Arikamedu Type 10 can be found in Appendix One(ii).

Region	Region code
Level 1	
<ul style="list-style-type: none"> • Trench ASW2, Anuradhapura 	6
Level 2	
<ul style="list-style-type: none"> • Arikamedu 	13
<ul style="list-style-type: none"> • Pattanam 	12
Level 3	
<ul style="list-style-type: none"> • Anuradhapura (Not ASW2) 	7
<ul style="list-style-type: none"> • Bangladesh 	3
<ul style="list-style-type: none"> • Cambodia / Vietnam 	10
<ul style="list-style-type: none"> • Emirates 	2
<ul style="list-style-type: none"> • India: North of the Godavari River 	4
<ul style="list-style-type: none"> • India: South of the Godavari River (excluding Arikamedu and Pattanam) 	5
<ul style="list-style-type: none"> • Indonesia 	11
<ul style="list-style-type: none"> • Sri Lanka (Not ASW2, not Anuradhapura) 	8
<ul style="list-style-type: none"> • Thailand 	9

Table 4.1 The region codes representing the spatial divides in this study

4.2 Level One ceramic sort

A high-level approach has been adopted to initially categorise the rouletting design on the ceramics in this study. This primary phase involves the inspection by the naked eye to divide the rouletting on the ceramics into distinct categories. Some of the sites in this study (primarily the Level One site, Trench ASW2) demonstrate a rigorous chronology due to the quality of stratigraphic recording, whereas the data for some of the other sites is very limited, either due to the lack of published information or the level of recording, and this will have an impact on the extent of analysis that can be conducted. This initial phase involved the rouletting being categorised as show in Table 4.2 below.

Initial Level Sort	Description
IN	Interlocking
INB	Interlocking and border
IS	Individual scatters
ISB	Individual scatters and borders
IL	Individual lines
ILB	Individual lines and border
EX	Exceptions
IG	Individual continuous groove
ID	Indeterminable
CG	Continuous
CGB	Continuous groove with border

Table 4.2 Initial categories of sorting (examples are below)

4.3 Introduction to the initial level sort codes in this study

In order to aid the understanding of the above chart, sections 4.3.1 to 4.3.5 present an interpretation of the left-hand column, the initial level sort codes. The term 'border' has been used in a category when there is a noticeable change in the outer or inner edge of the rouletting. At this stage of analysis, it has not been taken into consideration as to whether a border may

be an intentional feature or otherwise, and also that depending on where the break of the sherd is, borders may be missing.

4.3.1 Interlocking (IN) / Interlocking design with border (INB)

An interlocking design shows where there appears to be no gaps between the individual rouletting indentations which form the pattern on the ceramic. Sherd 533 from Trench ASW2 shown in Figure 4.1a shows where the rouletting does appear to interlock and form a fan effect, although the latex impression shown in 4.1b does highlight the individual rouletting. In Figure 4.1b a change in the pattern on the outer edge can be noticed, forming a border.

4.3.2 Individual scatters (IS) / Individual scatter design with border (ISB)

The category ‘individual scatter’ has been applied where there appears to be no set pattern in the rouletting, there is no format to the lines and no regularity, but the rouletting indentations are uniform. As with any of the initial sort codes, it should be acknowledged that when a code is applied to smaller sherds it is applied with caution, as the full impact of the pattern cannot be seen. Sherd 491 in Figure 4.1c demonstrates a rather scattered design, which can be emphasised in the latex impression in Figure 4.1d.

4.3.3 Individual lines (IL, ILB)

The term ‘individual lines’ is applied when there are clear lines of vertical rouletting indentations formulating the design on the ceramic, this design can also display the addition of a border on either side of the rouletting. It will be seen as this chapter progresses how the IL and ILB code are the most predominant initial level sort codes. Examples of an IL code are sherds 498 and 554 as seen in Figures 4.1e-h, and the ILB traits can be noted on sherd 523 in Figures 4.1i and 4.1j.

4.3.4 Individual Grooves (IG, IGB)/ Continuous grooves (CG, CGB)

Some sherds recorded as Rouletted Ware appear to depict continuous grooves rather than a series of indentions as seen on the categories above. Where the quality of a photograph is questionable, there may be some indentations, but this is not possible to clarify at this level of analysis. This design can also display the addition of a border. Examples of this trait can be seen in sherd 586 from Trench ASW2 in Figures 4.1k and 4.1l and also from Wheeler’s excavations at Arikamedu (1946: plate 2.23va). This category is visible in Begley’s excavation report – Figure 4.259 in the report does have a continuous groove, but some rouletting is present in the design in the border (Begley 1996b: 243).

4.3.5 Exceptions – EX

The category ‘exceptions’ accounts for the rouletting on sherds which do not fit into any of the other initial level categories. Sherd 536 from Trench ASW2 presents just one example (see Figures 4.1m and 4.1n) - this sherd displays gouged lines and possibly a border or this may be part of the decoration. Sherds in this category predominantly demonstrate unique features, and raise the question as to where boundaries can lie as to what can and cannot be classed as Rouletted Ware, an issue which will be discussed later.

4.3.6 Initial Level sort codes summary

The results of this initial level sort as shown in graphs throughout this chapter, demonstrate that sherds with individual line (IL) or individual lines with borders (ILB) are the most commonly seen category. Whereas at this stage it is not possible to deem as to whether the borders are intentional (i.e. decorative) or constituted part of the manufacturing process, it may be possible to pose further suggestions as to the reason for the borders later in the process.

This initial sort demonstrates the diversity of the range of designs in the layout of the rouletting across the chronological and geographical parameters of this research, while focussing on the fact that the most diverse range has been recovered jointly at Arikamedu and also at the sites to the south of the

Godavari river (Region Five), which may suggest two things. Initially, it may suggest that as this was the place with the most manufacturing styles, it is the area where the most ceramics are produced by either a diverse range of potters producing one design, or potters who are each producing a variety of designs, or that this region was a key distribution centre for most of the ceramics. However, possibly all the options may have applied- a high level of production alongside an organised distribution network.

The CG category is a factor which may also contribute to the quest to identify the location where the Rouletted Ware was manufactured. It can be noted that on Roman Samian Ware which display a circulatory design, there are guidelines visible on some sherds. These would have allowed the potter to follow the guideline to place a design in the correct position, a point which was also highlighted by Blair (2009: 69). If this is part of the manufacturing process, then it can be expected that these traits may be more likely to be seen in the regions where the ceramics are produced.

In summary, the codes in the initial sort have allowed this research to demonstrate the high level of variety in the style of design. The Level Two sort of the ceramics will investigate the rouletted impressions that are the design element of the ceramics and assess where different indentations, (i.e. impressed dots or spikes) appear as discussed in Chapter Two and shown in Figures 4.1a onwards at the end of this chapter. This will provide an overview

of any geographical trends which can then be investigated further. Absence of the decorative traits on the ceramics is just as important to consider as well.

4.3 Level Two ceramic sort – Design Codes

Having considered the initial method for sorting the ceramics, a second level of sort has been introduced to allow a further level of analysis should the data available permit. This second level incorporates the initial sort category (for example IL or ISB) which bases the sort on the linear features of the rouletting, however it also takes into consideration the shape of the rouletting indentation on the ceramic vessel. Therefore, each combination of linear feature and shape of indentation has a code. For example, the common initial sort code of IL, when matched with a rouletting indentation of a triangle, has the Design Code (DC) of DC83, and one of the less common initial sort codes, the individual scatter (IS) when that is matched with a triangle roulette indentation would have the code of DC43. The complete list of Design Codes is included in Appendix Two of this thesis. Codes have also been allocated to include sherds where elements of the design are difficult to decipher, an example of this is DC90, which represents an individual line (IL) linear feature, and the rouletting design may be a triangle - but possibly the sherd has a concretion on some of the rouletting or the sherd is too eroded to make any firm conclusions.

4.4 Level One site- Trench ASW2

In Section 2.10 of Chapter Two the City of Anuradhapura was discussed with particular reference to the extensive chronological record of Trench ASW2. Following on from this, it has been discussed how Trench ASW2 will form the ‘base’ (Level One) site from which the other sherds in this study can be compared in a quest to investigate spatial and chronological links. Initially the sherds from Trench ASW2 will be compared with the Level Two sites in this study, Pattanam and Arikamedu, and then the methodology will be expanded to encompass all the other evidence presented for this research.

Figure 4.2 displays the results of the initial sort at Trench ASW2. It demonstrates how sherds from the site are spread right across the initial sort categories, the only missing categories are ISB – individual scatter with borders, which is only recorded in Region Five, and CG and CGB, but sherds from the individual groove (IG) category are present to compensate for this. What is clearly demonstrated from the Trench ASW2 initial sort graph (Figure 4.2) is how the individual line (IL) and individual line with border (ILB) categories are considerably more prominent than the other categories at this level, with the next popular category being those sherds which could not be identified.

To develop the analysis further, the initial sort data can then be split down further, and using the information available for this research it can be split down into period, phase, and also context. Figure 4.3 presents the distribution

of the initial sort by period. This extra detail in this graph shows that the IL and the ILB categories are distributed across the periods at the site where Rouletted Ware is recovered. Sherds classed as individual scatter (IS) only appear in Period D, those with the interlocking (ID) design are only noted in Period F, and the appearance of the individual groove category can only be seen in Period G5, and with the exception of Period G4, there are always sherds classed as unidentifiable. Figure 4.4 shows the spread of the initial sort codes across the site by phase. Figure 4.5 shows the sort by Design Code divided by Period.

These initial level investigations demonstrate how the different styles of design are distributed by different chronological parameters throughout the site of Trench ASW2. When considering the earlier periods from which sherds in this study are analysed, at G5 it can be noted how the spike is the most popular design in this period with an individual line design (DC84), there are further spike designs - the DC164 category is an unidentifiable linear design accompanied with a spike roulette. Spikes do appear in one sherd of the ILB category, but this is just one of four ILB sherds.

The sherds are recovered across various contexts in Period G5, most commonly appearing in Context 416NE but there is no common pattern for the linear design in the sherds found there, spikes can be seen on two of the sherds namely 514 and also 511, and spikes and triangles can be seen on another of the sherds (546), with possibly a triangle design on the fourth sherd

(520). This context is on the site of a collapse, (Coningham 1996c: 169). Context 416NE forms part of Phase XCI, but when considering Phase LXXXVII, it is this phase within Period G5 which has the most Rouletted Ware sherds. This phase has six, with the common factor that three - 554, 556, 579 or possibly even five of the sherds with the addition of 574 and 580 are displaying the individual line pattern and the spike design, the other sherd being of unidentifiable linear design had an extended rectangle rouletting design. But five out of the six sherds are displaying spike rouletting, although this is varied.

Rouletted Ware maintains a presence in Period G4, and the decorated sherds in this context incorporate a high percentage of sherds of an individual linear design (IL), - with just a couple of the individual linear with border (ILB) and a design which is classed as an exception (EX). Again, out of the decorated sherds in this context, the spiked design appears on four of the six sherds 558, 575, 613, 560, therefore it sustains its popularity in this period. When assessing the distribution across the phase and the contexts, there is a scatter and not more than two decorated sherds appearing in a context. The contexts where two sherds were recorded were 479 and 487NE. Context 479 is recorded as a posthole, whereas 487NE is the same as context 470 which is an old land surface, and where another sherd was recorded with the Individual linear design, and an 'hoof' rouletted imprint.

Period G2 does see a slight increase in the number of decorated sherds, the IL design is still the most popular, especially when accompanied by the spike indentation, appearing on seven out of the thirteen sherds for this period. As with G4, the sherds do not appear to be recovered from one particular context and are reasonably well scattered across the phases, with the most sherds (six) being recovered from Phase LXXI, three (614, 618, 621) being from the Context 635NW, which is a fill of slot 637.

The diversity within the linear pattern and the rouletted designs increases in Period F. Whereas the sherds with the individual linear features (IL and ILB) are still the most popular, there has been an increase in variety with more sherds that have either the design code EX (exception) and the design which interlocks (IN and INB), there is also an increase in sherds where the linear pattern cannot be recognised. There are also ovals and diamond shaped rouletting appearing. The decorated sherds in this study are most commonly found in phase XCII (10 sherds) whereas phases XCI AND XCIII contain four and five sherds respectively. Within phase XCII, context 365NW contains four sherds , which all display different linear features and different rouletting.

Period D presents a change in the recorded stratigraphy of the site as it is representative of what Coningham (1999b:) describes as “*a series of intrusive features - robber pits*”. The sherds from this phase are much fewer than the previous period and the individual linear feature design remains the most

common. However, as with Period F, there a variety of sherds present here which were not recorded in Period G2 or G4. Two sherds from the ‘individual scatter’ category, which are the only representation of this linear style in the entire range, and some sherds displaying the exceptional linear design are present. There is a wide variety of rouletting designs in the single phase (XCV) in this period, and they are scattered throughout the contexts, probably as an impact of the nature of the features in this period. The final figure in this section, Figure 4.6, demonstrates the distribution of the Design Codes in this study across the site.

4.5.1 Level Two site: Arikamedu

The site of Arikamedu was introduced in the previous chapters, and an overview of the site is given in Section 2.8 in Chapter Two. This site, along with the material from Pattanam on the Southwest Indian coast, will form the Level Two sites in this research. Whereas some sherds have been seen by the author for both sites, casts were not taken for this research, therefore the finer details that can be resourced from using the casts were not available. The resources available to include in this study from Arikamedu consist primarily of published images of varying quality (and which have differing levels of supporting information), a small number of original photographs, and some casts taken in polyvinyl siloxane as previously mentioned. Although these casts do show a great amount of detail and the author of this research does greatly appreciate the use of them in this study, it is to be noted that there is no scale on the casts, and as the author is unaware

of the conditions that the casts have been kept in it is not possible to attempt to determine the shrinkage rate of the compound used. Therefore, these impressions will be consulted for their designs, but will not be measured. As mentioned in Chapter Three, it also needs to be considered that when published images and photographs from museum collections are used, they are likely to be the more interesting images, which will present sherds with clear designs but not necessarily a true representation of a site.

When considering the highest-level sort, which will investigate what linear patterns are spread across the site, the results for Arikamedu can be seen in Figure 4.7. In total, 79 images of sherds were used for this study, all the sherds are from the excavations by Begley or Wheeler, with actual images of sherds from the 1947-8 excavation by Casal not being available (only published drawings were seen (Casal: 1949)). On initial observation, in common with Trench ASW2, the linear categories of IL and ILB are by far the most common, in fact slightly more common when compared to the rest of the sherds that can be seen at Trench ASW2. 66% of the sherds from Trench ASW2 were of the individual linear or individual line with border category, whereas the percentage from Arikamedu is 77%. The sherds that have an unidentifiable linear design are the next most common category at this level of sort, and then there is a very small percentage for the other categories, in several cases just represented by a single sherd, with only the exception category representing three sherds. The continuous groove category and continuous groove with border category which is seen at Arikamedu is not present in the sherds in this study from Trench ASW2, and

whereas the interlocking sherd design with border is represented at Trench ASW2, it is not recorded at Arikamedu.

The sherds investigated in this study are from several different excavations, and this is reflected in the fact that they have different stratigraphic systems. To address this, published dates have been used when available, but a lot of the data was presented without such information. The graph seen in Figure 4.8 emphasises the range of Design Codes across Arikamedu, this graph includes all the sherds, those which come from contexts which have proposed dates (such as the excavations by Begley) and the sherds from the excavations by Sir Mortimer Wheeler. There is a rather low-level distribution across the graph, with just DC103 (individual line border with triangle rouletting) standing out across the site, with DC83 (individual line with triangle) being the second most common sherd. Wheeler (1946: 48) does comment that he found triangles to be the “*most common*” of all the rouletting designs, and that they “*occur in all strata*”, a trait which is clearly reflected in Figure 4.8.

Of the sherds where dates are available, it is possible to draw comparisons with the period that presents the closest match with Trench ASW2. On reviewing the excavations by Wheeler, Begley (1996a: 21) believes that the Northern Sector excavated by Wheeler was originally “*settled in during first century BC*”, however, Begley does add that this date may be even earlier, and that the site sector was occupied throughout the first century, possibly even into the early part of the second century AD (*ibid.*). Whereas this does

not provide a direct match with ASW2 chronological periods, it can be seen that this sector overlaps with Periods G and H from ASW2, although no sherds from Period H form part of this research. Period F at Trench ASW2 appears to be slightly later than the dates given for the Northern Sector at Arikamedu, but when Period G sherds and the sherds from Wheeler's Northern Sector are compared, the results can be seen in Figure 4.9. Also included in this figure are sherds from what is described as the pre-Arretine phase of the Northern sector and these were dated by Begley (1983: 461-466) to between 150BC and the first quarter of first century AD.

A total of twenty sherds from Arikamedu and forty-eight from Trench ASW2 fitted this category, so the percentages in Figure 4.9 present the total percentage of that Design Code from within the area being investigated. This chart offers interesting results particularly as the Level One site in this study (Trench ASW2), and its geographically closest Level Two site (Arikamedu) can be seen to highlight a diverse range of designs. The only shared codes in this study are the DC103 code and DC104. The most common Design Code for Arikamedu north sector is DC83, which is an individual linear design with a triangle, and the most common code from Period G, Trench ASW2 is DC84 representing an individual line with a spike, this is supported by some of the Rouletted Ware having two bands and spikes.

Period F which runs from AD 200 to 600 AD (Coningham 1999: xix), may display some similarities, although this is very much the twilight period for

Rouletted Ware at Trench ASW2. Consideration must be given to ‘travelling time’ for the sherds – how long they took to reach their location of deposition. The result of the comparison between the Arikamedu Northern Sector and Period F are shown in Figure 4.10. The graph in Figure 4.10a shows how DC 103 and DC104 maintain their position as the design which is commonly found across both sites, and DC84 (individual design with triangle) has plummeted in popularity at Trench ASW2, raising the question of were the designs now being transported elsewhere from the manufacturing place?

The diversity of sherds in the graphs in Figures 4.9, 4.9a and 4.10 does present issues when trying to show common factors across certain chronological periods. The Northern Sector from Arikamedu presents few similarities with Periods F or G from Trench ASW2, which were selected as the closest chronological matches. To investigate the possibility of any issues with Begley’s theory about the date of the Northern Sector, the sherds were compared with sherds from Period D at Anuradhapura to investigate if any similarities could be seen here. The results of the comparison with Period D are shown in the graph in Figure 4.10, it must be reconsidered that there were only nine sherds from Period D in this study, and highly likely not to be situated in their original context. The Design Code DC103 remains the most popular code across both of the sites.

4.5.2 Level Two site: Pattanam

The site of Pattanam on the west coast of the South Indian peninsula forms the second Level Two site in this research. As discussed in Chapter Two, due to the lack of evidence it was originally believed that the Malabar coast was void of Rouletted Ware, however the extensive excavations carried out at Pattanam by the Kerala Centre for Historical Research (KCHR) directed by Professor Cherian since 2007 have supplied a significant quantity of the data for this study, for which the author is extremely grateful. Rouletted Ware sherds from excavations in 2007 and 2008 were kindly made available, although not all the sherds from the 2008 excavations were analysed due to the authors time constraints. It must be noted that although the sherds from Pattanam were seen and photographed by the author, due to the fragility of the sherds, impressions were not made, therefore, well- lit photographs were taken. From the 2007 excavation, 28 sherds are included in this study, and from the 2008 excavation, 39 sherds were considered suitable. The graph in Figure 4.11 presents the results from the Level One sort from the sherds that were included in this research.

In common with the other sites investigated so far, the individual line (IL / ILB) sherd can be noted to be by far the most frequently occurring in this selection, however the difficulty in interpreting some of the designs (even at this initial level) is reflected in the high proportion of unidentifiable (ID) sherds seen on the graph. Although some of the sherds made available to this

study have come from dated contexts, the sherds will be investigated by initially dividing them into trenches. This slightly different approach is due to the difficulty in interpreting the sherds, and from this initial interpretation each trench will be investigated individually. Figure 4.12 presents the results of the analysis of the rouletting design across the sherds from Pattanam, many of the Design Codes are unique to this site (for example DC246, DC247, DC248) which accommodates for where rouletting is eroded or damaged.

4.5.2.1 Pattanam 2007

The two Figures, 4.13 and 4.14, demonstrate what appears to be a diversity of sherds from the Pattanam 2007 excavations. However, from the initial level sort the majority of the sherds have the category ID. These issues that are described in the Level One sort can be seen to be reflected in the Level Two sort; of the twenty-eight sherds in this graph, it can be noted that only four of the Design Codes appear twice – some being the more common Design Code DC83 (on sherds 434 and 354) which is a regular linear feature with triangle and DC84 (on sherds 143, 124 and 102)– a regular linear feature with spike, DC164, being an unidentifiable linear feature with a triangle and this appears on sherds 105, 119 and 356. Design Code DC163 is also depicting a triangle but as part of an unidentifiable linear feature. Again, it can be noted that several of the codes depicted are completely unique to this site

4.5.2.2 Pattanam 2008

Figure 4.15 represents the initial sort of the 2008 sherds, and in common with the 2007 sherds it can be noted how the unidentifiable linear features (ID) represent a considerable proportion of the sherds in this study, but in common with all the other sites, it is the individual linear (IL) sherds that represent the largest proportion in this Level One analysis, accompanied by the ILB. Spikes are a popular rouletted feature at this site although this may possibly be due to the impact of erosion on sherds that originally featured a triangular rouletting indentation.

Sherds which are frequently occurring at this site have also been common features across most of the sites discussed in this study, and this is depicted in Figure 4.16. DC164 representing the unidentifiable linear design with a spike, and DC84 representing individual linear design with spike, and the presence of the spike rouletting can also be noted in the double grooved sherds (DC84 DC84). Apart from these clear peaks in the graph, there is a scatter of different sherds across the site, again as with the 2007 sherds, some erosion and concretions have presented a challenge when attempting to interpret the features. Whereas both of the sites do provide valuable data for this study, the issues highlighted with reference to the condition of some of the sherds will be considered while the analysis is being conducted throughout this study.

4.6 Miscellaneous India sherds

In addition to the sites of Arikamedu and Pattanam which are discussed above, other data from sites in India has been collated in order to present a range of evidence for analysis from across sites where the ceramic has been recorded. Whereas 54 sherds from Indian sites from outside Arikamedu and Pattanam were initially deemed suitable for the Level One sort, some of the sherds were harder to analyse during the next level of sorting, mainly due to the size of the images in publications and the quality of the image. To reflect the geographical divide that has been put into the Indian sherds, the graph in Figure 4.17 shows the divided Level One sort

As seen with the results from previously discussed sites, the individual linear feature stands out by far as the most popular in this Level One sort, and where this graph does exhibit different features to those from Pattanam, Trench ASW2, and Arikamedu is where it displays a high percentage of interlocking (IN) design sherds, a feature not seen in such a great proportion at the other sites, if at all.

The graph in Figure 4.18, which displays the results of the Level Two sort, unfortunately demonstrates that the Design Code DC171 has the greatest percentage. This Code represents sherds which are of both unidentifiable linear feature and unidentifiable rouletting pattern, highlighting one of the problems with a study such as this which is incorporating published images of varying quality. However, as with the other regions investigated above,

DC83 and DC84 are more commonly recorded, and DC103 is also a linear feature with triangles, but where a border can be seen. Interestingly, DC243 only appears in this region (a spike design with a groove). The available dates from the sites used in this region (North and South India) is very limited and inconsistent, therefore the designs codes will not be presented in a graph, but will be considered later.

4.8 Sri Lanka (excluding ASW2)

In addition to Trench ASW2 at Anuradhapura, Sri Lanka, Rouletted Ware has been found at other sites across the island. This includes sites located within the city of Anuradhapura, and coastal sites such as Tissamaharama and Kantarodai. As with locations previously discussed, this section relies on the use of published images, predominately those from Schenk's excavation at Tissamaharama, and utilises data from Begley's 1967 paper which includes Rouletted Ware from Kantarodai. In common with the section above, due to the variable quality of the images, the unidentifiable sherds (ID) category is one of the more commonly occurring ones, as seen in Figure 4.19. However, following the regular pattern that has been seen through the preceding locations, the linear (IL) design is the most common. At least two, possibly all three of the sherds that are classed as 'Exceptions' (EX) demonstrate a pattern where although it is a rouletted design, there is a more complex pattern, than just regular rouletting.

As with the other regions investigated there is no consistent pattern with the Level Two sort from the Sri Lankan (excluding Trench ASW2) sites. Although a difference can be noted in the Design Codes that appear on Figure 4.20, unfortunately again, DC171 has an impact. The second most common code to appear, DC83 has appeared throughout the other regions looked at so far, and DC111 represents sherds which have an individual linear design, but the rouletting shapes are indeterminable. DC163 unfortunately also represents a code where some of the data cannot be read, in this case the linear design is hard to distinguish, but the rouletting is triangles.

4.9 Southeast Asia

The twenty-five sherds from this region that are in this study do present the least number of categories so far in the Level One sort, and the result of this initial sort can be seen in Figure 4.21. In summary, this graph shows predominantly linear features that are individual and often have a border. This graph, to date, displays the least categories with the IL (individual linear feature) and has the ILB (individual linear feature with border) category as most popular. When looking at the categories here in a wider geographical context, the categories are not unusual, with the only exception here being an individual scatter sherd that was recorded in Thailand.

The Level Two results for Southeast Asia as seen in Figure 4.22 demonstrate the predominance of the individual linear design with a triangle feature

(DC103, DC83 and DC83 and DC83a appearing together) with no other category coming close, the nearest being DC111 which represents again, sherds with individual linear designs and borders, but with an undistinguishable rouletting design.

4.10 Sherds from other locations

Excavations from other locations have produced sherds of Rouletted Ware which can be included in this study, namely Bangladesh, United Arab Emirates and Egypt. However, due to the limited quantity of images, graphs have not been produced and the sherds are summarised in Table 4.3.

	Initial Sort	Design Code
Berenike	EX	DC135
Berenike	ISB	DC63
Berenike	ILB	DC103
Myos Hormos	IL	DC91
Mahastangarh	ILB	DC104
Wari-Bateshwar	IL	DC83
Wari-Bateshwar	IL	DC84
Sumhuram	ILB	DC235

Table 4.3 An analysis of Rouletted Ware from regions with less than five sherds in this study

The sherds from these locations follow the patterns of the previous regions with the individual linear designs being the most common, however there is a variety in designs, but triangles are the more common rouletting indentation (present in half of the sherds), with spikes appearing twice.

4.11.1 Linear designs

While the overlapping feature on the sherds does appear to be a common feature on the Rouletted Ware. Other features do occur regularly and have an impact on the linear design of the sherd. In this section these traits will be investigated, and it will be discussed later as to whether, on further investigation, they can provide any information to support networks and chronological trends, or if no similarities in these areas can be realised, data of just as equal importance has been identified.

4.11.2 Wave design

‘Wave’ designs can be noted at locations outside the Level One and Level Two sites in this study, but they are not centred on one particular site, and are distributed to the extremities of the geographical boundaries. Chaisuwan (2011: 94) shows a clear example (sherd 704). The closest location to a Level One site where they have been recorded is Abhayagiri, Sri Lanka (2078), therefore in close proximity to Trench ASW2. This design is also visible on sherds recorded at Tissamaharama (2052), Mantai (2097) (both also on the island of Sri Lanka) and further afield at Berenike (14), Western Java (692), Phu Khao Thong (704 and 717), and Sisupalgarh (744), all considerable distances from the proposed production source as discussed above.

4.11.3 Fan design

Whereas the above section depicted a ‘wave’ design in the linear feature of the rouletting indentations, similarly, a ‘fan’ effect is visible across several of the sherds, for an example of this see Figure 4.25 from Trench ASW2. This trait appears at the Level One and Level Two sites in the study. The Level One site of Trench ASW2 contained sherds 585 and 533 which demonstrate the fan pattern. The Level Two site of Arikamedu demonstrates this trait through sherds 86 and 92, and this feature is also visible at Pattanam (for example on sherds 467 and 1079). Beyond the Level Two site the fan design has also been recorded at Tissamaharama (sherd 111).

4.11.4 Elongated spike

In addition to the linear designs above, a rouletting design which appears to take the form of an elongated spike is visible on a range of sherds, and in common with these sherds above, this feature is scattered across the geographical realm of this study. An example of this feature can be seen in Figure 4.28, but the application of this term to a sherd without a scale should be done with caution. The only time this particular feature makes an appearance at any of the Level One or Level Two sites is where it possibly appears at Pattanam on sherd 1651. The elongated spike feature can also be seen at Phu Khao Thong (715) but from the image it is difficult to distinguish as to whether it is one extended rouletted feature, or where several overlaps of rouletting have produced one long spike. The remainder of the sherds

displaying this feature can be seen across the Indian mainland, with two of the sherds being from north of the Godavari river, and one from the south.

4.11.5 Gouged sherds

A noticeable design feature which appears on some of the Rouletted Ware sherds in this study is a rouletted design which appears to have been impressed onto the clay with a heavier impact than what is most commonly seen, as seen in the sherd 20 in Figure 4.248 of Begley's 1988 article. This feature only appears at a few sites, but does raise questions as to whether any different tools were used in manufacture, or they were possibly made using a new rouletting wheel which had no signs of wear. With the exception of a sherd recovered at Phu Khao Thong (726) the sherds that exhibit this feature are from South Indian sites and Kantarodai (123). To display the depth of this feature effectively a sherd should not have been subjected to excessive erosion, as this could reduce the gouged effect, and the depth may not be appreciated if the surface of it has been lost.

4.11.6 Graffiti

When examining sherds in this study graffiti is only visible on two of the sherds from Arikamedu, but this feature does not seem to appear on any others in this study. The graffiti comprises of one sherd (sherd 98, Wheeler 1946:52, XXXB) displaying some lettering, and another sherd which may

display a fragment of a sketch of a flower (sherd 67, Wheeler 1946:52, XXXB).

4.11.7 Grooves as a design feature

Plain grooves, which may act as a guideline can be seen on some of the Rouletted Ware in this study. The grooves can be seen on their own (for example on sherd 73 - Begley 1996b: 244, 4.258) or where they are part of a design. Sherd 768 from Chandraketugarh (upper sherd on Figure 10.22, Begley: 1996b), has a clearly visible groove in addition to a row of triangles. It can be proposed that these lines are parameters between which the design was to be situated, and possibly this was the choice of certain potters or workshops to manufacture using this method, alternatively, it may have been a procedure used in training apprentices. This feature can be seen clearly at Arikamedu (for example sherds 73 and 93 – Begley 1996b: Figure 4.259, 243 & Figure 4.258 244) and also at Trench ASW2 (Sherd 586) where it is just simply a groove. This feature can also be seen at Karaikadu (749), Tamluk (780) and Pattanam (1385), but examples can be seen from several sites in this study where the groove (used as a possible guideline) can be seen in addition to the rouletting design. Sherds 52 and 691 from Batujaya (Manguin and Indradjaja 2011: 124) display a triangular rouletting design and both sherds display very similar guidelines. Similar features can also be seen at Karaikadu (751), and Pattanam for example (242).

An interesting sherd from Tamluk (778, IAR 54-55: Plate xxxvii) appears to display a spike design, but the design border is a very distinctive groove, possibly to contain the design. Distinctive grooves can also be seen on sherd 1183 from Pattanam, which although eroded, does appear to display a design but also some quite deep grooves. The presence of grooves instead of rouletting is discussed further in section 6.25.

4.12 Previous pilot studies: Blair 2010

Blair (2010) investigated the Rouletted Ware corpus from Trench ASW2 for a MA dissertation. The dissertation had the aims of tackling issues related to trade and exchange in South Asian archaeology through the means of experimental archaeology and visual interpretation of analysis of rouletting decoration, this was supplemented by published material and casts (Blair 2010: 6)

For this research, although Blair primarily focused on the Trench ASW2 sherds, he did extend the research to include the vessel rims in addition to the indentations on the Rouletted Ware. This focus on the corpus allowed a more detailed structure of analysis, whereas this current study has had to design a methodology which has the ability to encompass a variety of published images of varying quality. It is because a high proportion of the Rouletted Ware data in this current study comes from published images it is not possible to produce a conclusive study of the rim sherds as seen in Blair's research. In order to analyse the rouletted indentations Blair (2010:154), constructed a

“typology of impression shapes that were found on Rouletted Ware”, allocating a letter code to the various rouletting indentations, and then he also established a *“Typology of configuration of Rouletted Ware”* (*ibid.*: 158) which he used to analyse the linear designs of the sherds.

It is interesting to note in Blair’s analysis of the *“Element distribution”* by period, Blair has not included his element code ‘K’ in his graph, when clearly in Appendix E the sherd is mentioned but without any acknowledgment of the design. The methodology does not inform the reader how it accommodates sherds that have two different kinds of rouletting indentations on them. This may not necessarily always be an issue as on occasion multiple rows can display the same category of indentation however, the methodology needs to be able to accommodate such sherds when the two sets of rouletting can be quite different, as seen for example in sherd SFN 6376.

When investigating the results produced by Blair (2010) noticeable differences can be seen in how the indentations have categorised between this current study and the research by Blair. An example of this is where what Blair has classified as a Parallelogram, this study has often classed as a triangle. There is also a variety where this current study has the category of a ‘spike’ and this is very similar to Blair’s Isosceles triangle. The most controversial difference is between what Blair has described as an ‘oval’ which in his guide to the elements (Table 4.4) is depicted to be a reasonably rounded figure, but when viewed appears to present a very slim rouletting

indentation, comparable with the Isosceles triangle / linear impression as detailed in his study. Considering that Blair gives such in-depth consideration to the impression shapes in the study (for example he has three categories of triangles) the category of oval does appear to encompass a considerably wider range of shapes than some of the other categories. Table 4.4 demonstrates the system used by Blair.













Type	Description	Sketch
A	Parallelogram, sub-triangular with short fourth side.	
B1	Triangle, sub-equilateral, point facing outwards.	
B2	Triangle, sub-equilateral, point facing inwards.	
C1	Teardrop, rounded base narrowing to rounded point which faces outwards	
C2	As C1 with point facing inwards	
D	Diamond, widest at the middle narrowing more or less equally to pointed ends	
E	Oval	
F	Small circle, normally very shallow and faint	
G	Elongated isosceles triangle	
H	Linear impression, varying levels of width and pointedness	
I	Bisected oval	
J	Circle, deeply impressed (only at Arikamedu)	
K	Grooves	

Table 4.4 Blair's "Typology of impressions shapes" (Blair 2010: Figure 6.34, reproduced with permission)

The oval design used by Blair has been used to cover a range of shapes, demonstrated by Sherd 595 which can be seen in Figure 4.25. The rouletting on this sherd is classed as a spike in the current study, and also by Coningham *et al.* (2006: 149), whereas it is classed as an oval by Blair. These interpretations are repeated on sherd 529 which is shown in Figure 4.26. The rouletting on this sherd is described as oval by Blair and as a spike in this current study. Coningham *et al.* (*ibid.*: 147) also class this sherd as a spike design. However, it can be noted that with regard to sherd 505, as seen in Figure 4.36, there is agreement between Blair, Coningham *et al.* and this current study in that this particular sherd does display oval rouletting on the vessel. But what is encapsulated by this current study and Coningham *et al.*, but not necessarily by Blair (2010) at this stage is the variety of rouletting designs that are visible on this sherd. Sherd 505 is described as oval rouletting by Blair, and also by this current study which does also note that in addition to the ovals, grooves are also visible on the sherd, and raises the question as to whether this sherd may be a training piece? This question is proposed because it appears that the original design of the ovals has been overrun with the grooves, and this could be due to one of several reasons, either the craftsman wanted to produce it like that, or it is the result of a mistake – perhaps the grooves were meant to be at the periphery of the oval design rather than overrun the features, and may be on other parts of the vessel. Alternatively, the sherd could possibly have been used to practise different designs on. In the current study this sherd is classed as an exception, and Blair has classed the linear feature as category 5 which represent sherds classed as “*other; where the pattern of decoration changes from row to row*”

(Blair 2010: 158), but this does not stipulate that the rouletting changes from row to row. Coningham *et al.* (2006: 146) class the roulette type as oval / line / tri (146), and makes a note of the “*unusual mixture of decoration types*”.

Element (Blair)	Rouletting (Current study)
Teardrop	Diamond Possible triangle
Oval	Hoof Oval Spike Circular
Linear	Spike
Parallelogram	Triangle / diamond Diamond
Triangle	Triangle
Diamond	Small circle spike
Isosceles triangle	spike

Table 4.5 A comparison between the classification used between Blair's 2010 study and the current research

The table above compares terms from Blair's 2010 study and the current research. It can be seen how there is a variation in the terms used in the interpretation of the rouletting designs on the sherd. Blair may have found the establishment of a classification system more straight-forward as the

majority of data he worked with were sherds in excellent condition from Trench ASW2. However, it has been noted that Blair's oval rouletting is often interpreted as the spike, and the Isosceles triangle has also been interpreted as such. Sherd 517 is classed an isosceles triangle by Blair, a spike in this current study, and a spike by Coningham *et al.* (2006: 148), differences in opinion over this sherd may be emphasized by the sherd having a row of tiny spikes under the larger feature. On reviewing Blair's table "*Chronology of element types at ASW2*" (2010: Figure 6.36) it can be noted that the 'oval' element is the one that appears right throughout the chronology of Trench ASW2. However, the issues regarding this element are discussed above.

4.14. Level One and Two analyses, in summary

The tables in Figures 4.28 and 4.29 present the spread of the Level One (linear feature) sort and the Level Two (Design Codes sort) across the entire expanse of this study. In Figure 4.28, the percentages are representative of how that particular Level One characteristic features in the sherds in this study from that region, with the exception of the regions that have ten sherds or less contributing to the study,

When considering the Level One sort, the sherds with linear features are by far the most common across the regions in this study. IL, individual linear, and ILB, individual linear feature with border, between them are found at every region in this research. While it is interesting to see what sherds are present right across the realm of this study, the categories that are not quite

so common can be used as chronological and geographical markers from the Level One and Level Two sites and compared with the other locations.

The Level Two data (Figure 4.29) presents a greater range of data than what was seen in the Level One chart (Figure 4.28), and this represents in total the variety of Design Codes that are present in each region. Although the data is considerably more scattered than in the previous table, it is clear that as in Level One, there are common features present right across the realm of this study. Design categories DC83 and DC103 are present at all the sites with more than ten sherds in this study, and also in Bangladesh and Egypt.

Sherds with Design Codes DC84 and DC104 present a very similar distribution to DC83 and DC103. These sherds represent an individual linear feature with a spike rouletting design (DC84) or with a border (DC104). DC164 also appears across Level One and Two sites, in addition to some of the others, this code represents an unidentifiable linear feature, but with a spike rouletting design, adding support to the popularity of the spikes. DC171, which represents completely indeterminable sherds, is not recorded amongst the sherds in this study that come from Trench ASW2, leading to the proposal that the casts provided extra clarity, however, sherds from Trench ASW2 do make a considerable contribution to the DC164 category.

4.14.1 Design category average

In an attempt to propose where the sherds were manufactured, calculations were made based on the average amount of Design Code per sherd per site. The sherds that were allocated a code where the Design Code was questionable, have also been included in this analysis.

Site	Sherds in study	Amount of Design Codes	Average sherd per design
Arikamedu	79	45	1.76
ASW2	76	39	1.94
India – North of the Godavari	23	15	1.53
India – South of the Godavari	28	14	1.64
Sri Lanka (excluding Anuradhapura)	26	7	3.74

Table 4.6 Calculation of the amount of Design Codes per sherd, and sherd per design in this study

It is proposed that a site with a greater diversity of sherds would be the point of manufacture, with sherds a distance away exhibiting less diversity (as well as fewer sherds). Of all the sherds in this study, very few are from the same vessel, raising the question how much Rouletted Ware was actually in circulation? . Table 4.6 above has not taken the sherds from Pattanam into account due to the difficulty in identifying some of the sherds. Table 4.6 demonstrates the average sherd per design is highest at the sites from Sri Lanka which exclude Trench ASW2, this is a figure which is probably also influenced by the number of unidentified sherds (out of the 29 sherds in the site 6 are unidentifiable). In a review of the above Table 4.6, the table below (4.7) shows the results where Design Codes with any elements of query have been removed, and the results are based on looking at each row of rouletting rather than each vessel.

Site	Number of row (or part of) of rouletting	Amount of Design Codes	Average design per sherd
Arikamedu	70	37	1.89
Trench ASW2	68	31	2.19
India – North of the Godavari	16	9	1.78
India – South of the Godavari	19	6	3.16
Sri Lanka (excluding Anuradhapura)	16	12	1.33

Table 4.7 Calculation of the amount of Design Codes per row of rouletting, and sherd per design in this study

As previously mentioned, it is proposed that the site with the wider range of sherds could be proposed to be the closest to the manufacturing source for these ceramics, and the further the site from the distribution point, the more limited quantity and variety of sherds would be recovered.

The table above show that the area of India which is north of the Godavari river (Region 4) has a lower amount of Design Codes per rows of rouletting, however there is a wide variety of designs there which are really quite different to those which are found in other regions, so it is quite difficult to consider them in the same way as the Level One and some of the Level Two regions in this study. Due to the quality of some of the images from Sri Lanka (excluding Anuradhapura) the results from this region are also questionable and will be discussed later.

Whereas it has been proposed by Ford *et al.* (2005: 918) that only further intensive survey of South East India would recover production sites for Rouletted Ware, no kiln production sites for the ceramic have ever been recorded. It was therefore expected that when considering the theory that a wide variety of sherds would be recovered close by the production area, this would be reflected in the sherds recorded in the area south of the Godavari river, and this does not appear to be the case. What is noticeable is that Design Codes DC83 and DC103 (Linear design with or without border and triangle rouletting) are common in this region, with these two codes between them making up over half of the sherds which can clearly be identified. Although there is variety in the rouletting it can be suggested that this trend is possibly the result of local demand. Rice (1987: 255) questions as to whether the location of ceramic sherds in the archaeological record directly reflects

distribution and use, judging by the distribution of sherds in this study, a positive answer can be given to that question.

Sherds from the Level One site of Trench ASW2 rest in the middle of the range in Table 4.7, whereas it is the sherds from Arikamedu which demonstrate the most variety of designs across the site, therefore proposing that along with the data discussed above, Arikamedu is the location in this study which is most likely to be the closest to the main production site for this ceramic.

4.14.2 Design demand – sherds that are an exception

The sections above highlight that consumer demands could be one of the reasons for the variety in the rouletting and there was not a standard design. Manufacturers may have been sympathetic towards the demands of the customer, or alternatively they were exploiting the demand to increase income. If the manufacturers were prepared to meet the demand of the customer, this may suggest that there was some form of competition, which may infer that there was an alternative available. There has been no other Fine Ware found in such quantities as Rouletted Ware.

In addition to the standard initial level sort, there are exceptions (classed as EX) which have been recorded and these may be as a result of customer demand, unique through error, or through the choice of the potter. Some of

the exceptions are of a composite design, for example sherds 505 and 546 from Anuradhapura, and also sherd 766 from Chandraketugarh. Sherd 768 from Chandraketugarh is also of a composite design, but the features are not what would normally form part of the standard decoration. From the small sherd that is available to this study, the design features can be compared with Arikamedu Type 6 or Type 141. None of the sherds from Southeast Asia have been classed in the initial sort as exceptional. The sherds from the Pattanam excavations provide four sherds that have been classed as exceptional, and two of them display an interesting groove feature which may be a guideline as discussed above. Sherd 242 from the Pattanam 2007 excavations appears to show where some of the rouletting has run over a guideline, and this is possibly also the same detail that can be seen on sherd 1849 from the 2008 excavations at the same site. The designs classed as exceptional from Sri Lanka (excluding Trench ASW2) are a little more difficult to interpret due to the quality of the images they are extracted from, but sherd 2058 from Mantai does appear to display a larger border than other sherds, however this may or may not be intentional, and the rouletting perhaps should have been closer together.

4.15 Conclusion

This chapter provides a wealth of data and analysis in relation to the Rouletted Ware in this study. Through partially meeting Objective Four in this thesis, Chapter Four has provided a series of chronological and spatial markers which can pave the way for the matching of these markers at comparable temporal and geographical locations, fuelling proposals for networks of communication. The data gathered in this chapter will be used alongside the data gained from the next chapter, Chapter Five, which will focus on the second ceramic in this study, Arikamedu Type 10. A similar method to that used in this current chapter will be applied to investigate the Arikamedu Type 10, but there will be some changes to accommodate the differences between the two ceramics.

Following on from Chapter Five, Chapter Six will combine the data from Chapters Four and Five. Chapter Six will evaluate the chronological and spatial markers for both Rouletted Ware and Arikamedu Type 10, and propose networks along which the ceramics may have travelled, and it will also assess the designs of the two ceramics for any similarities.

Chapter Four:

Figures


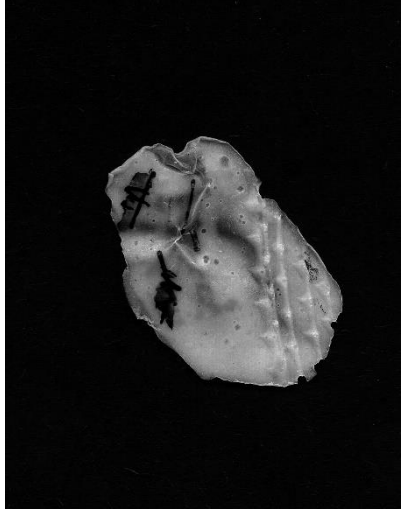


Sherd	Latex impression (where available)
 <p data-bbox="316 1077 614 1115">Figure 4.1a Sherd 533</p>	 <p data-bbox="842 1077 1268 1182">Figure 4.1b Impression of sherd 533</p>
 <p data-bbox="316 1930 614 1968">Figure 4.1c Sherd 491</p>	

Figure 4.1d Impression of sherd
491



Figure 4.1e Sherd 498

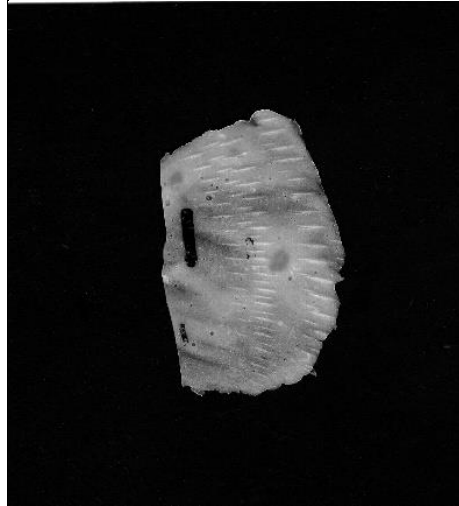


Figure 4.1f Impression of sherd
498

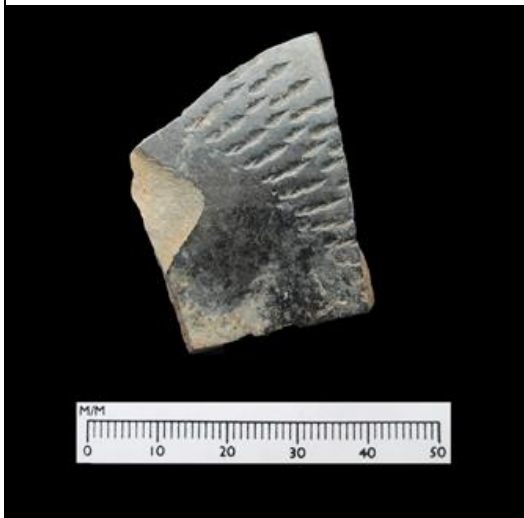


Figure 4.1g Sherd 554

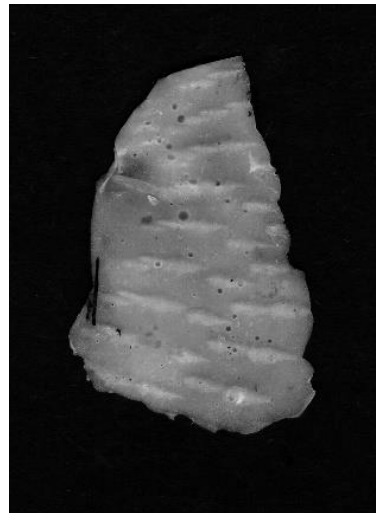


Figure 4.1h Impression of sherd
554



Figure 4.1i Sherd 523

Figure 4.1j Impression of sherd 523

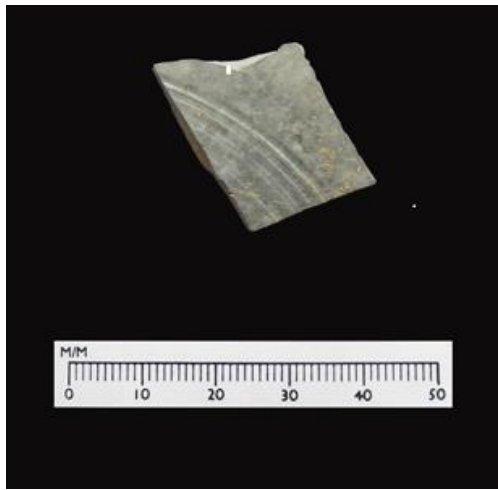


Figure 4.1k Sherd 586

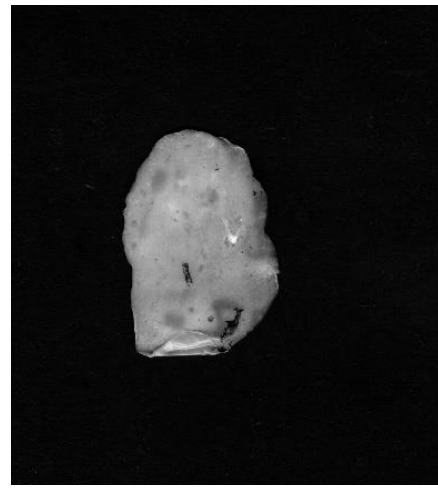


Figure 4.1l Impression of sherd 586

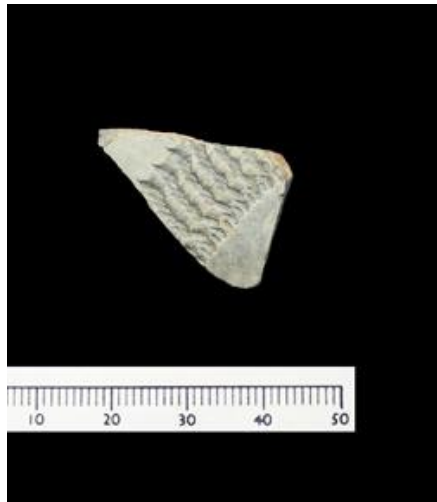


Figure 4.1m Sherd 536

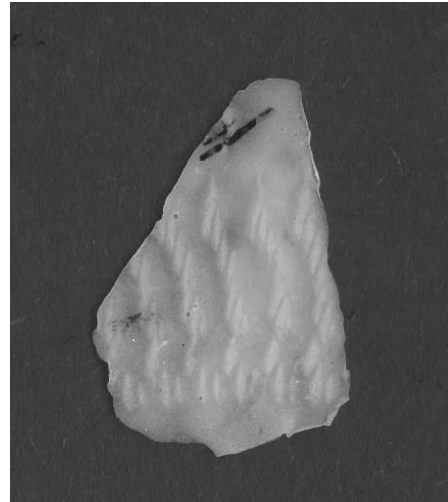


Figure 4.1n Impression of sherd 536



Figure 4.1p Sherd 501

Due to size and location of the design on this sherd, an impression was not made.

Figure 4.1 Sherds demonstrating the Design Codes used in this thesis.

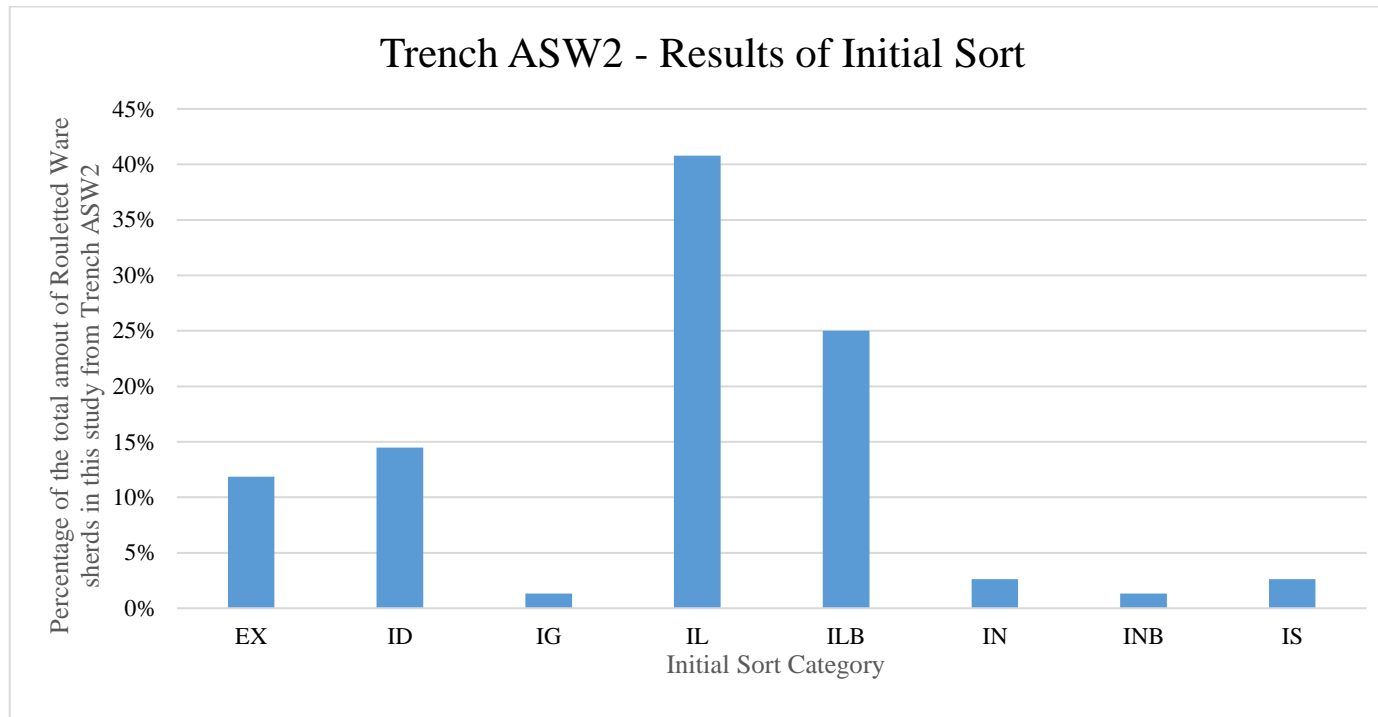


Figure 4.2 Result of Initial Level sort for Trench ASW2, Anuradhapura, Sri Lanka.

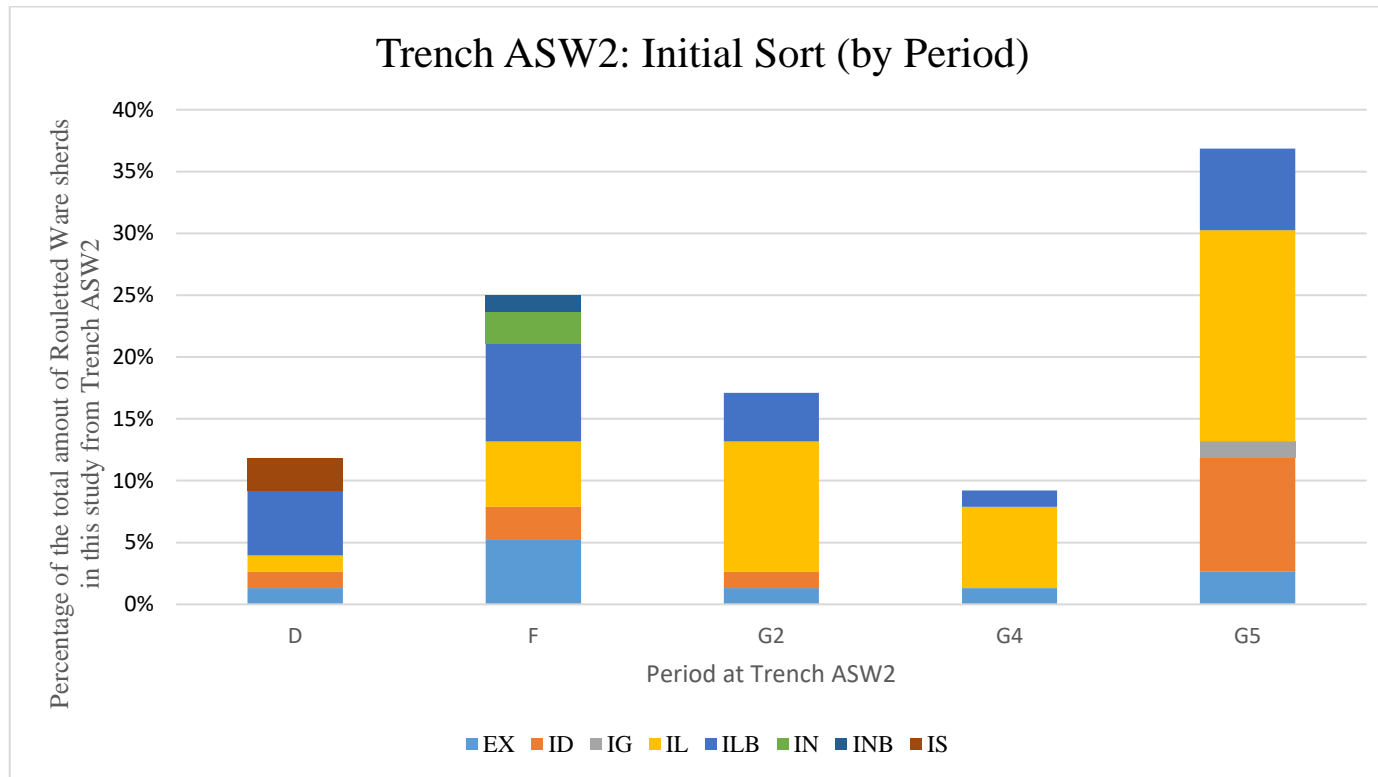


Figure 4.3 Result of Initial level sort by period for Trench ASW2, Anuradhapura, Sri Lanka

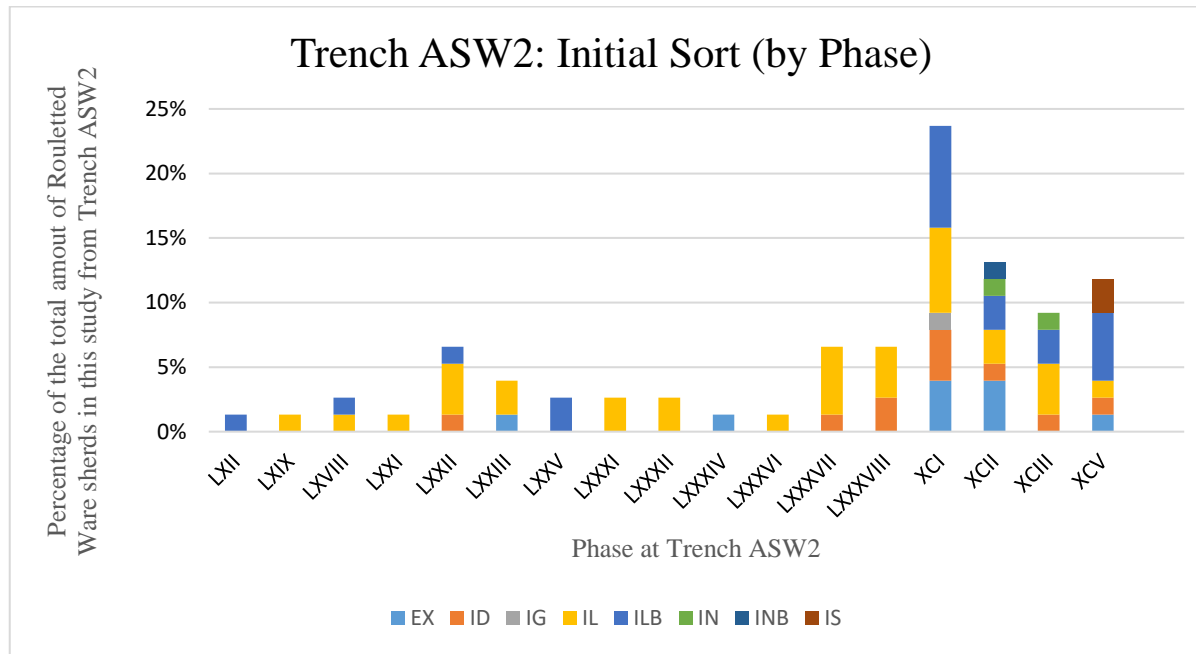


Figure 4.4 Result of Initial level sort by phase for Trench ASW2, Anuradhapura, Sri Lanka

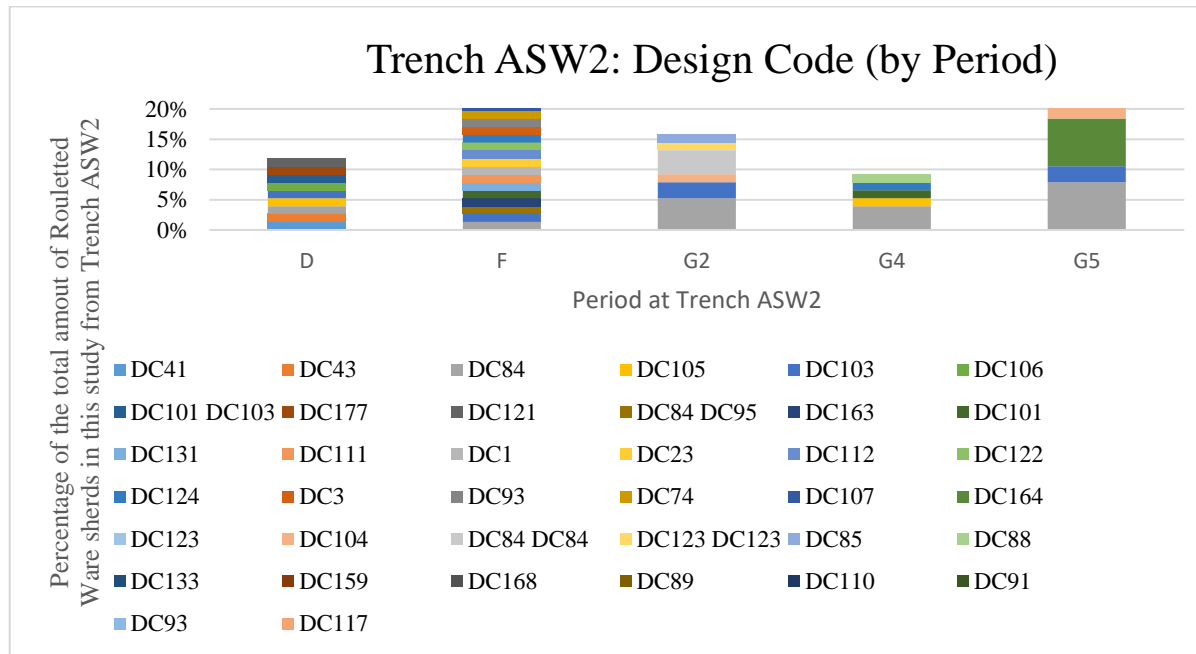


Figure 4.5 Result of Level Two sort by Design Code, divided by period for Trench ASW2, Anuradhapura, Sri Lanka

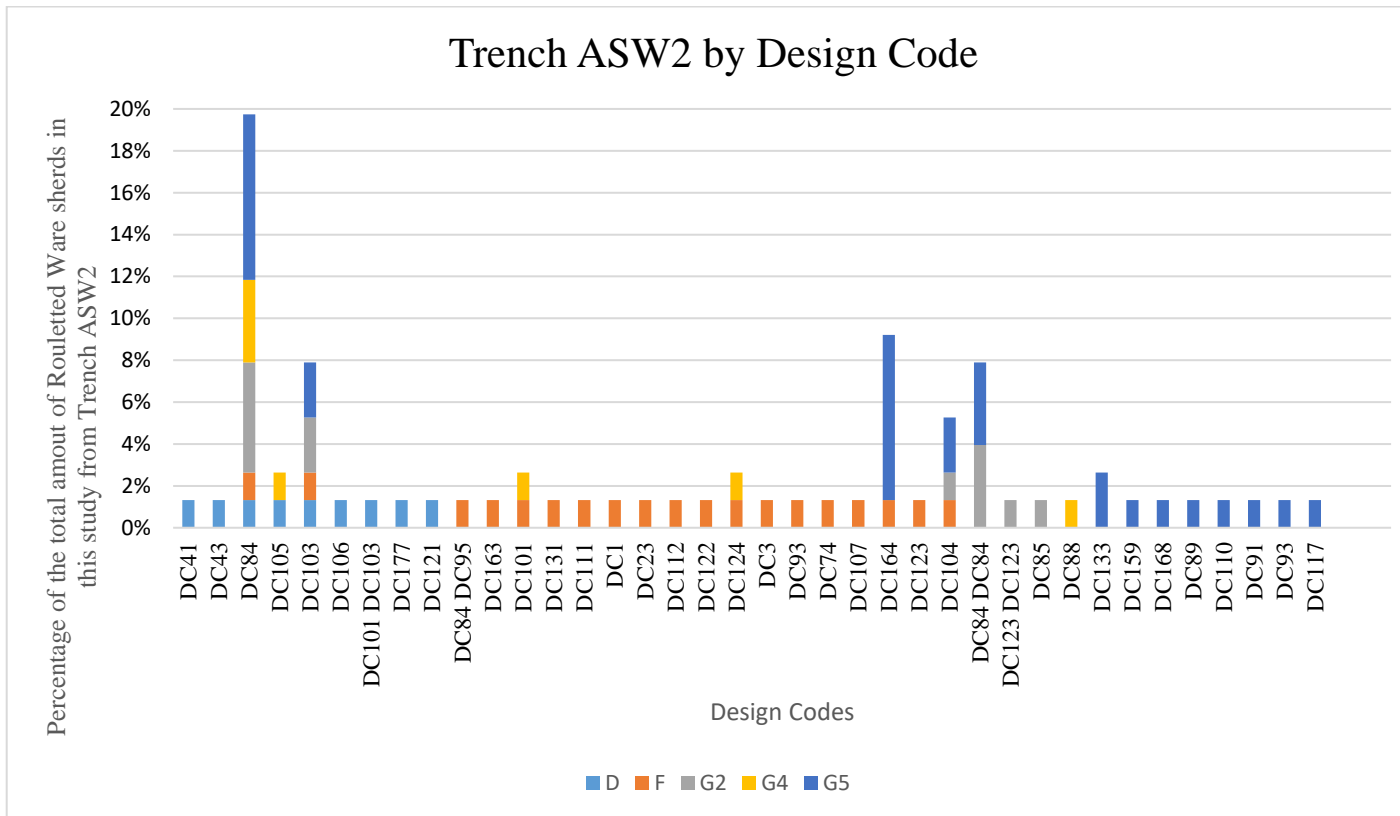


Figure 4.6 Result of Level 2 across the site of Trench ASW2, Anuradhapura, Sri Lanka

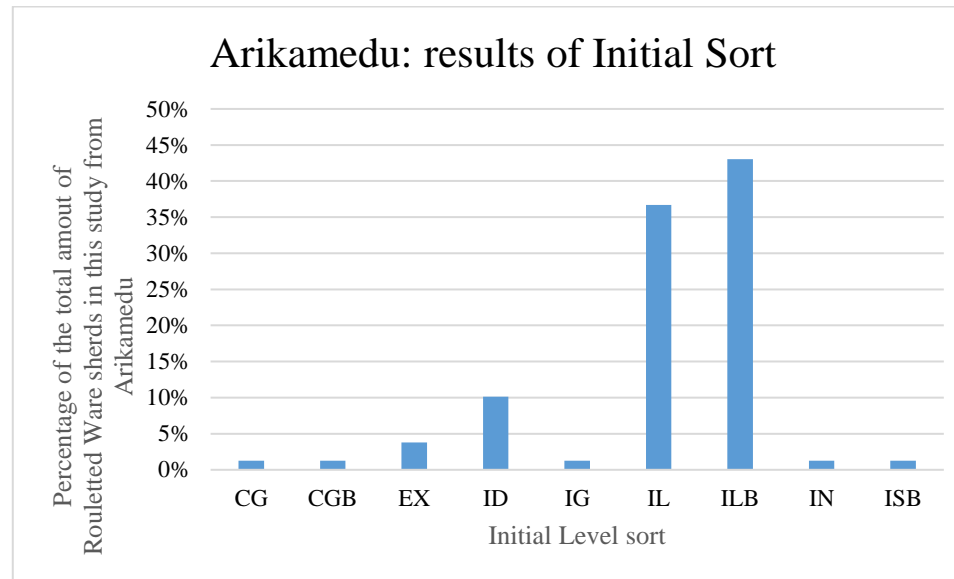


Figure 4.7 Result of Initial Level sort across Arikamedu

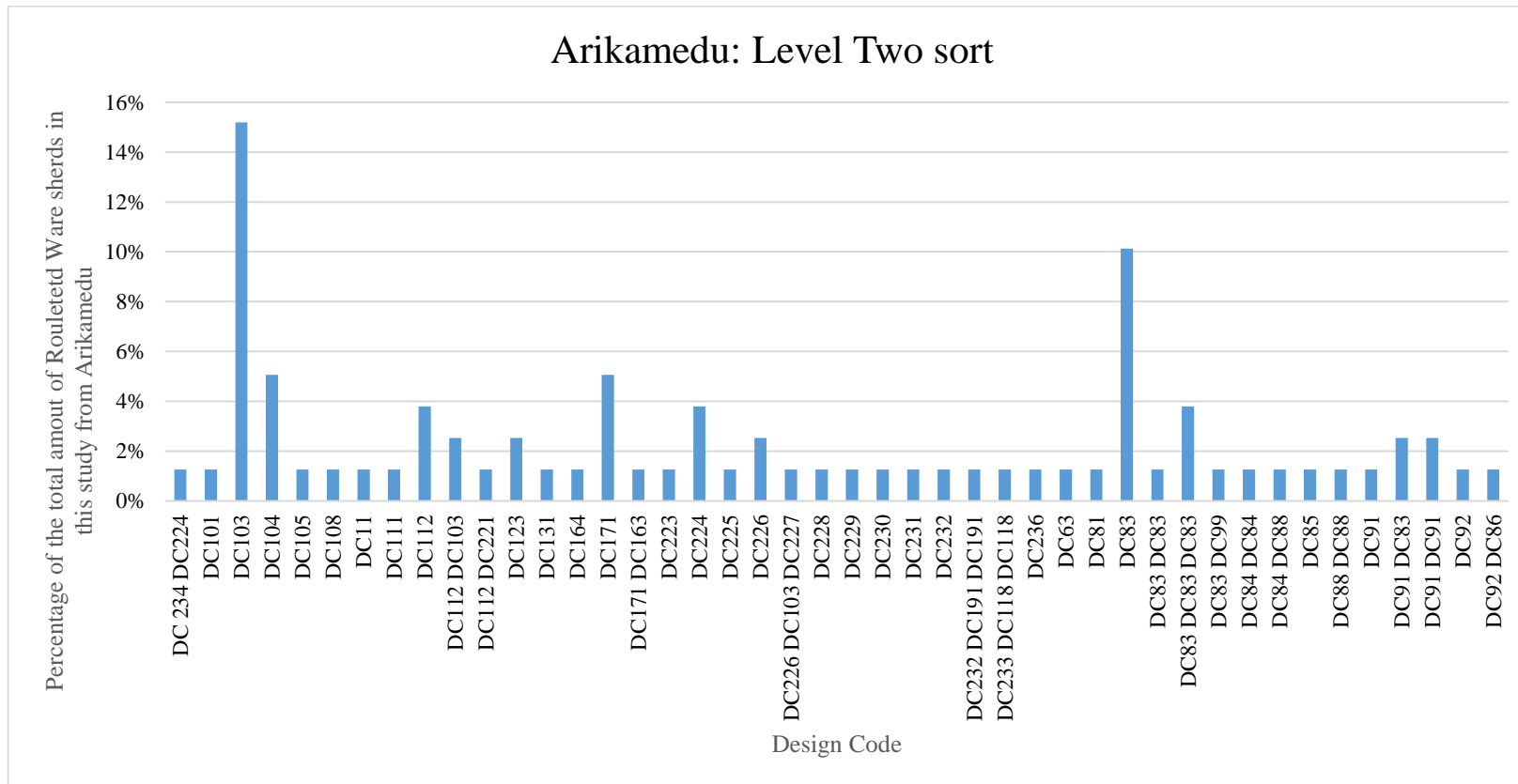


Figure 4.8 The distribution of Design Code (Level 2 sort) across Arikamedu

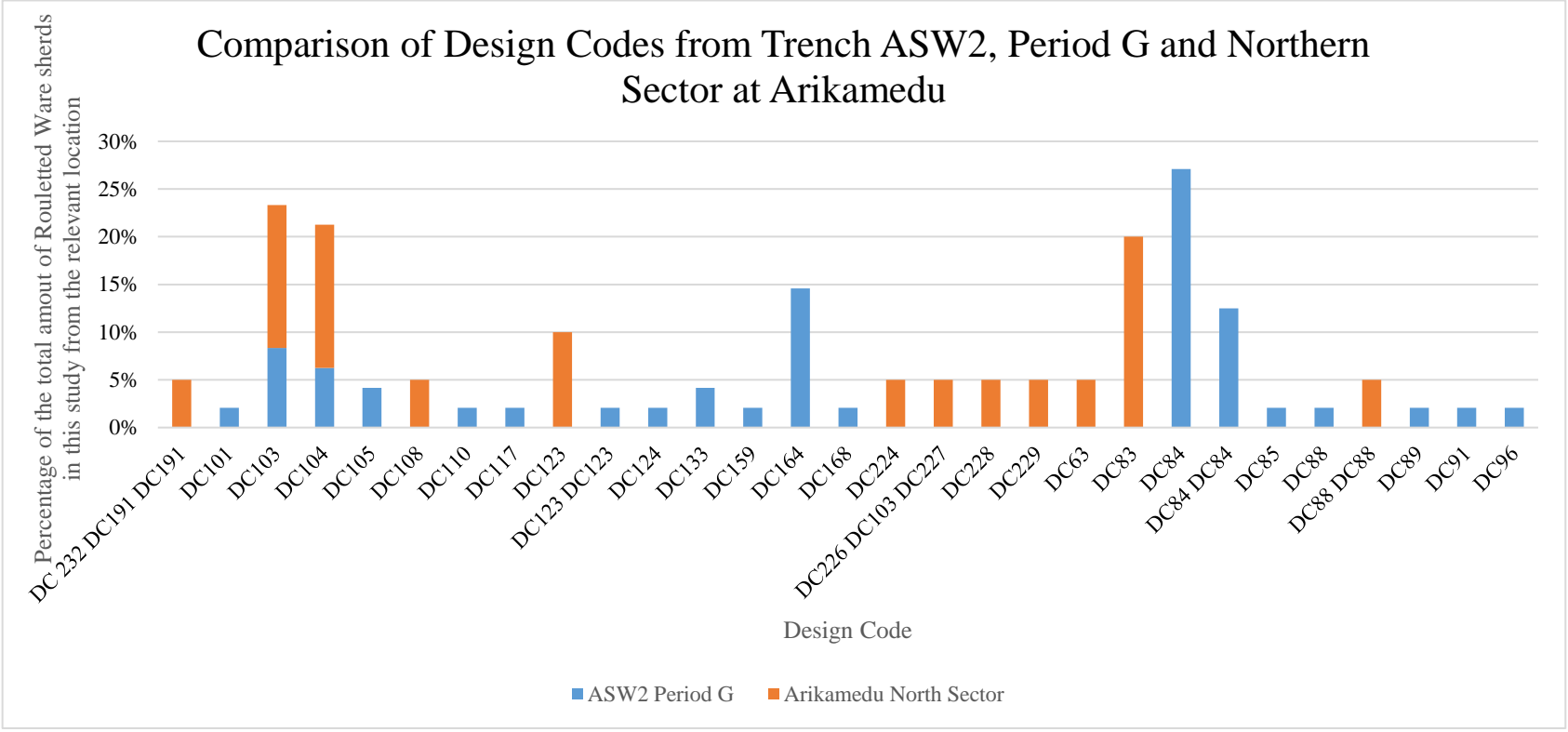


Figure 4.9 Comparison of Design Code from Trench ASW2, Period G and Northern Sector at Arikamedu

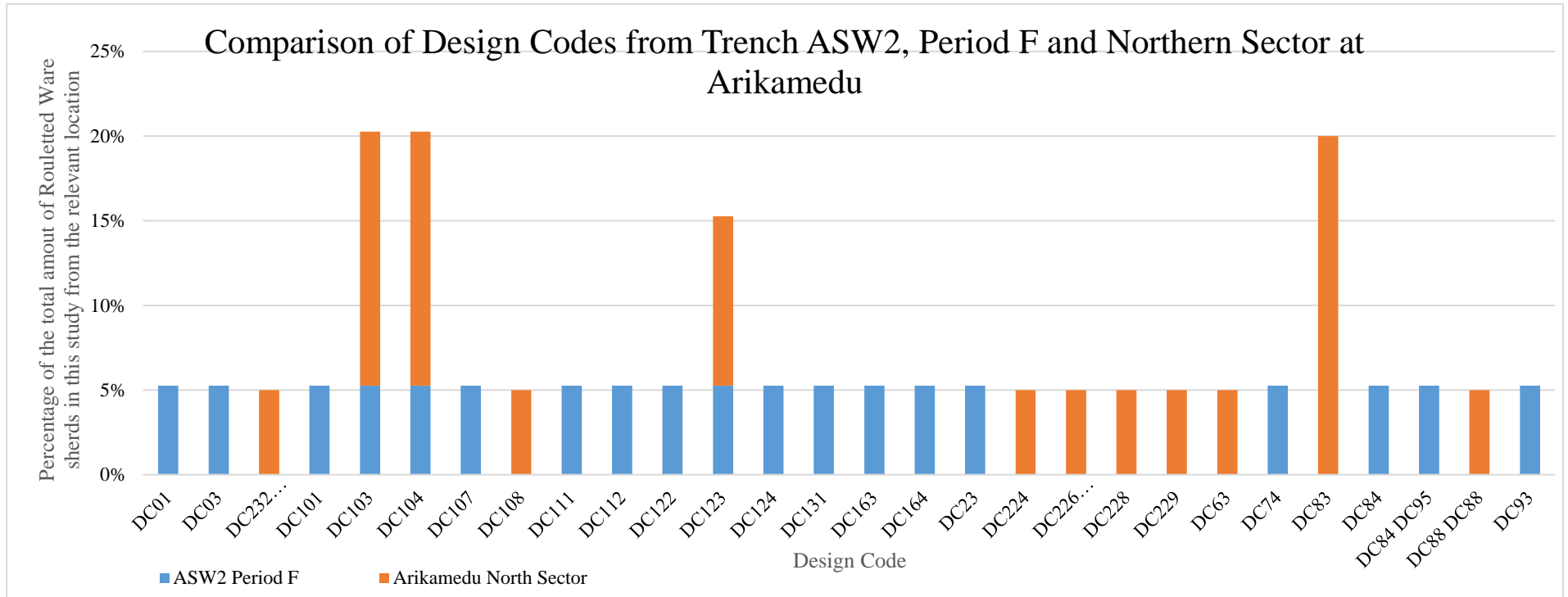


Figure 4.10 Comparison of Design Code from ASW2, Period F and Northern Sector at Arikamedu

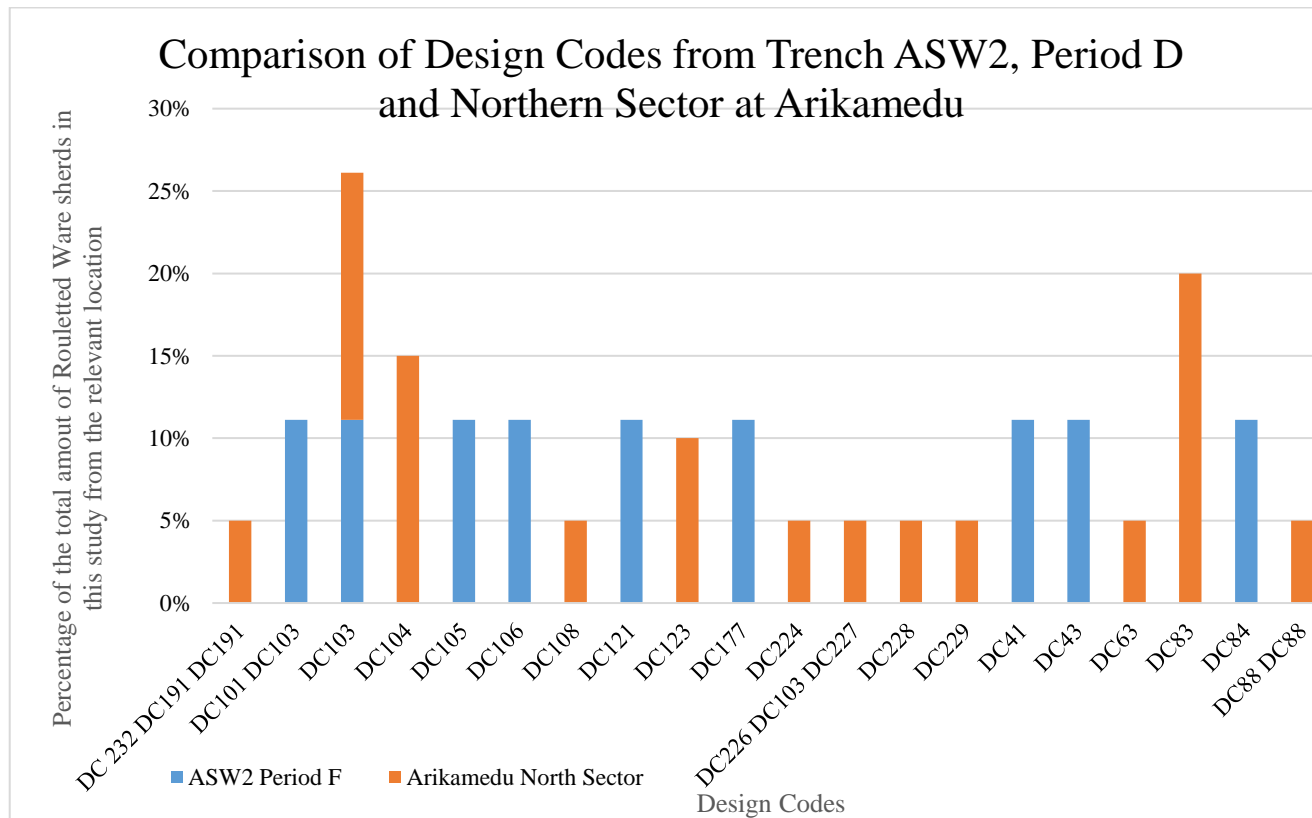


Figure 4.10a Comparison of Design Code from ASW2, Period F and Northern Sector at Arikamedu.

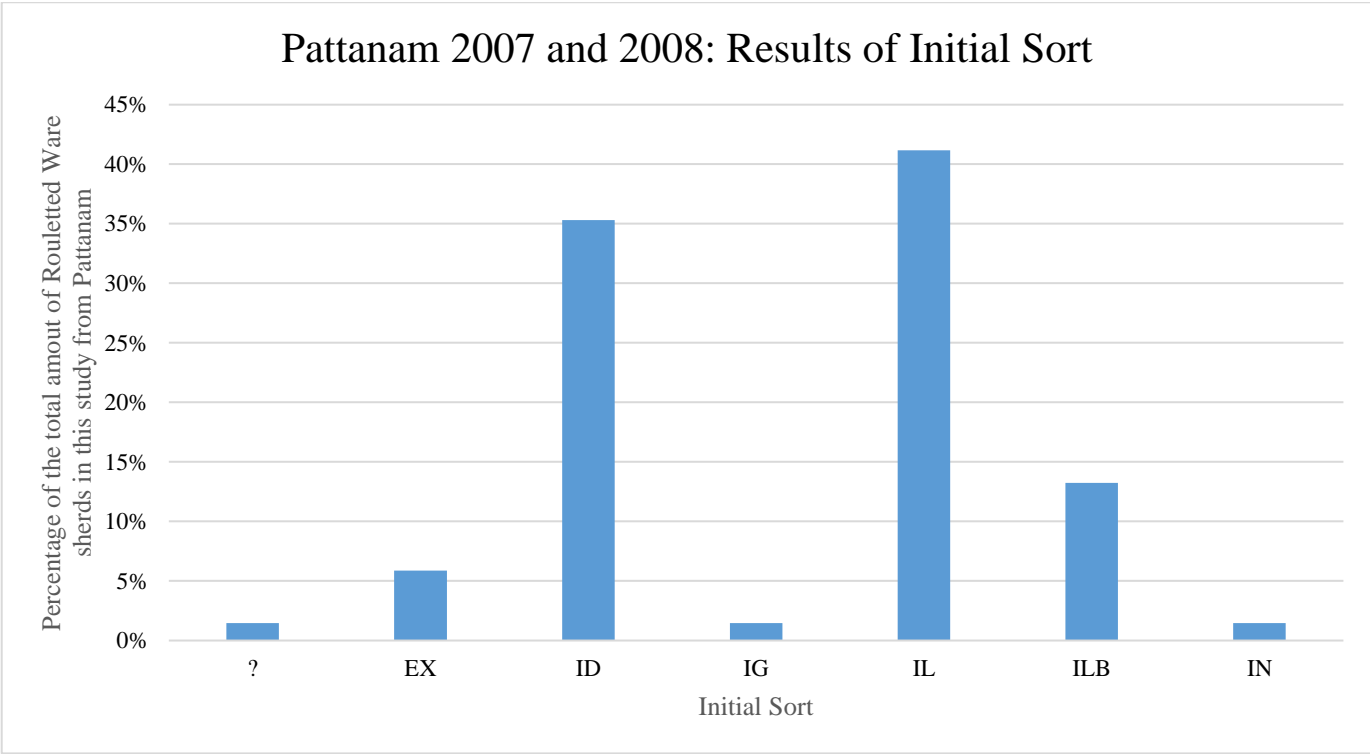


Figure 4.11 Pattanam 2007 and 2008: results of Initial Sort

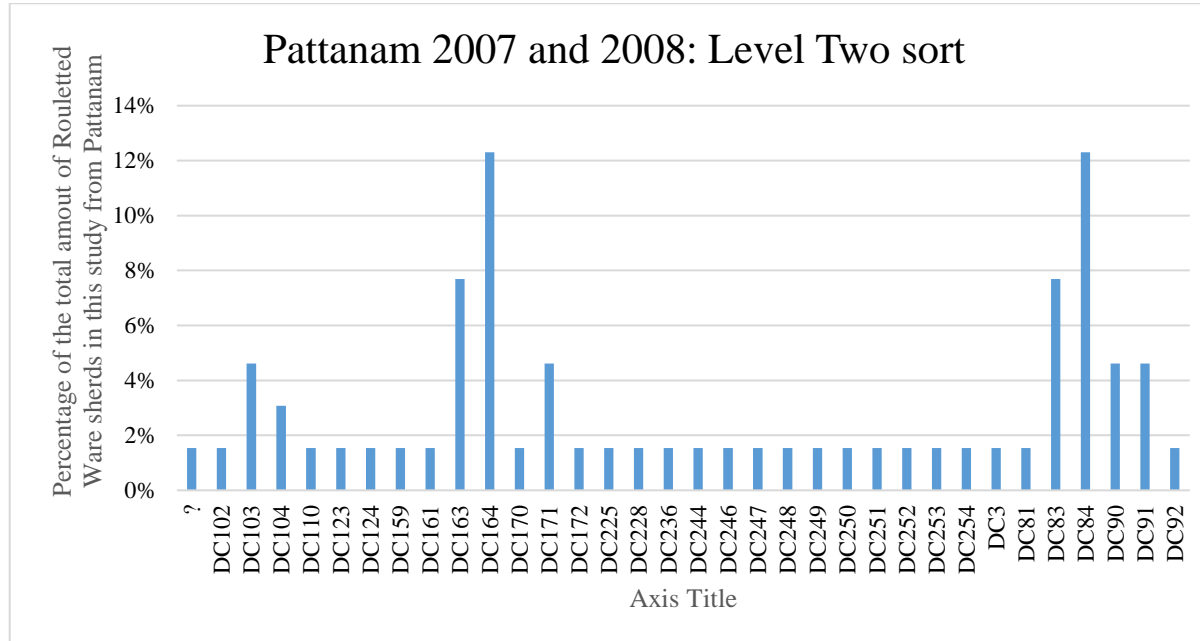


Figure 4.12 Pattanam 2007 and 2008: results of Level Two sort

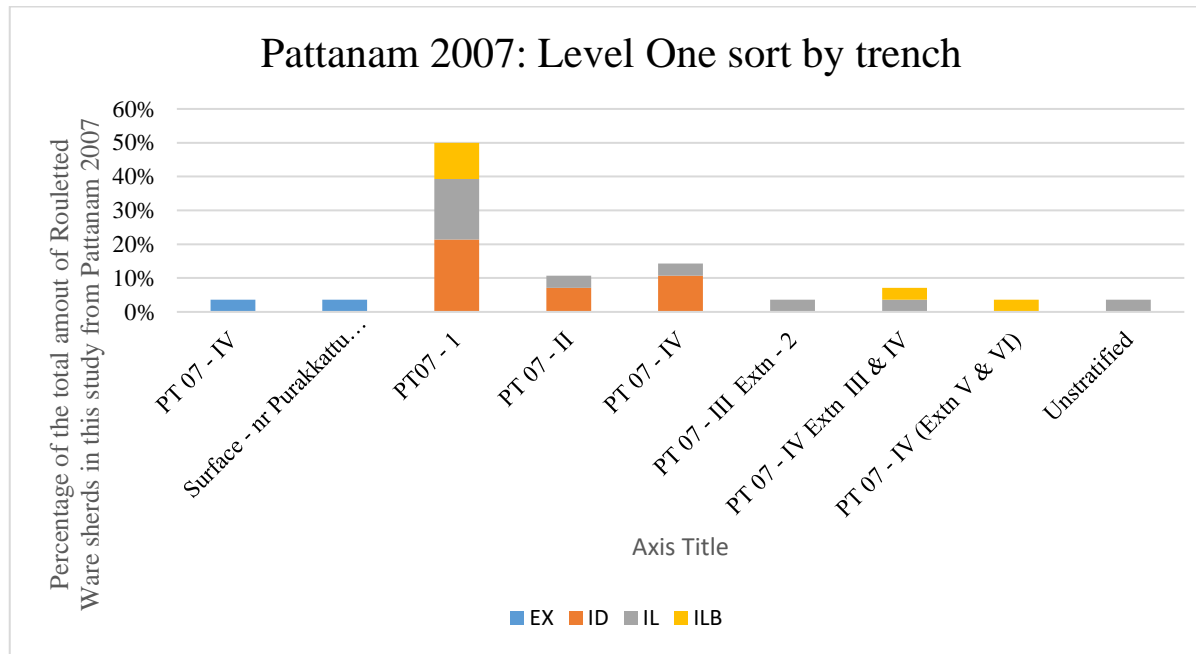


Figure 4.13 Pattanam 2007 Level One sort by trench

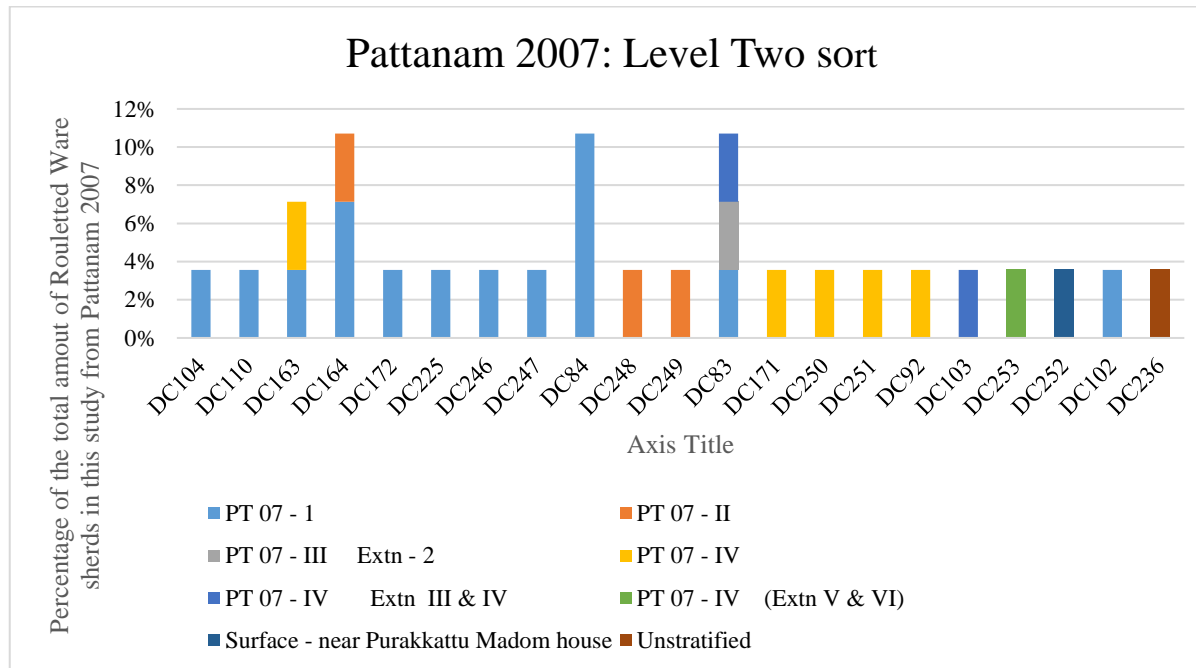


Figure 4.14 Pattanam 2007 Level Two sort by trench

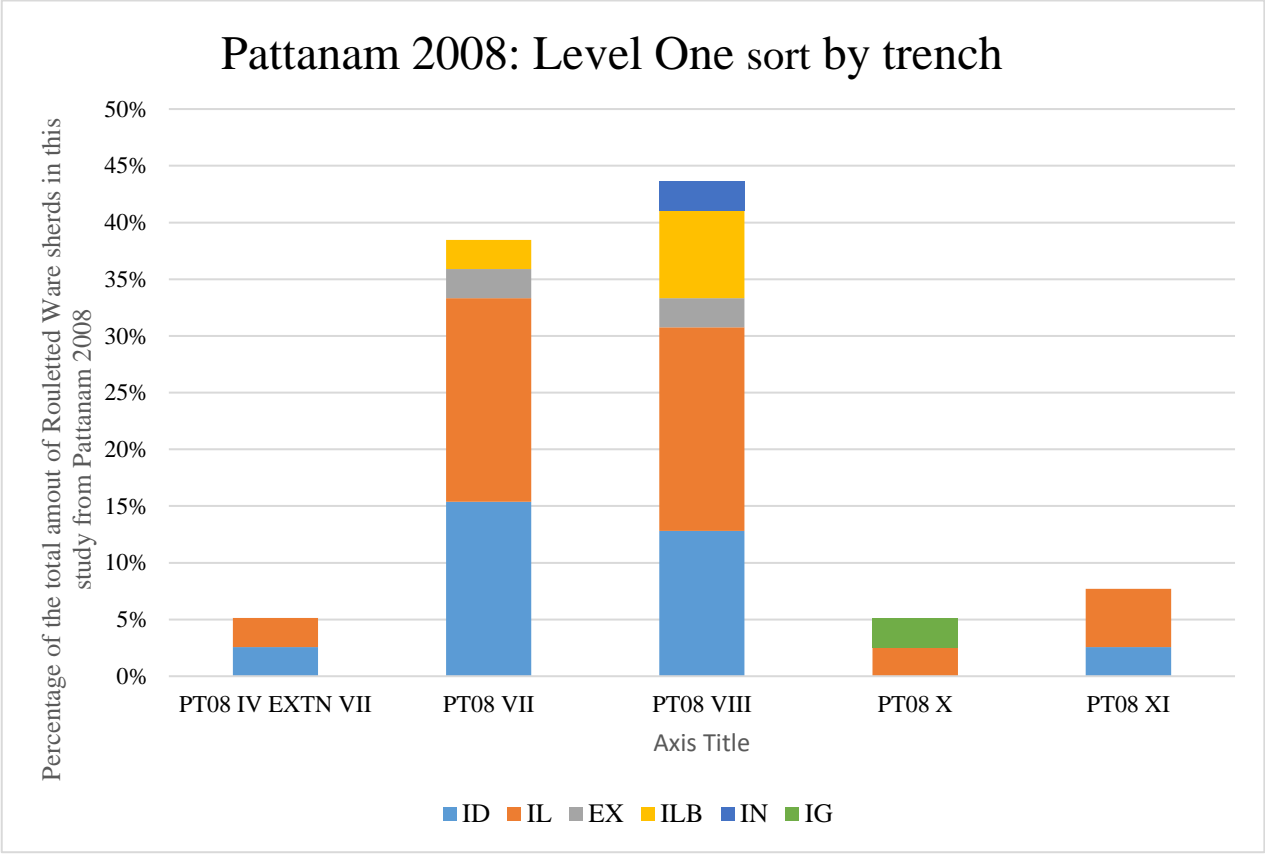


Figure 4.15 Pattanam 2008, Level One sort by trench

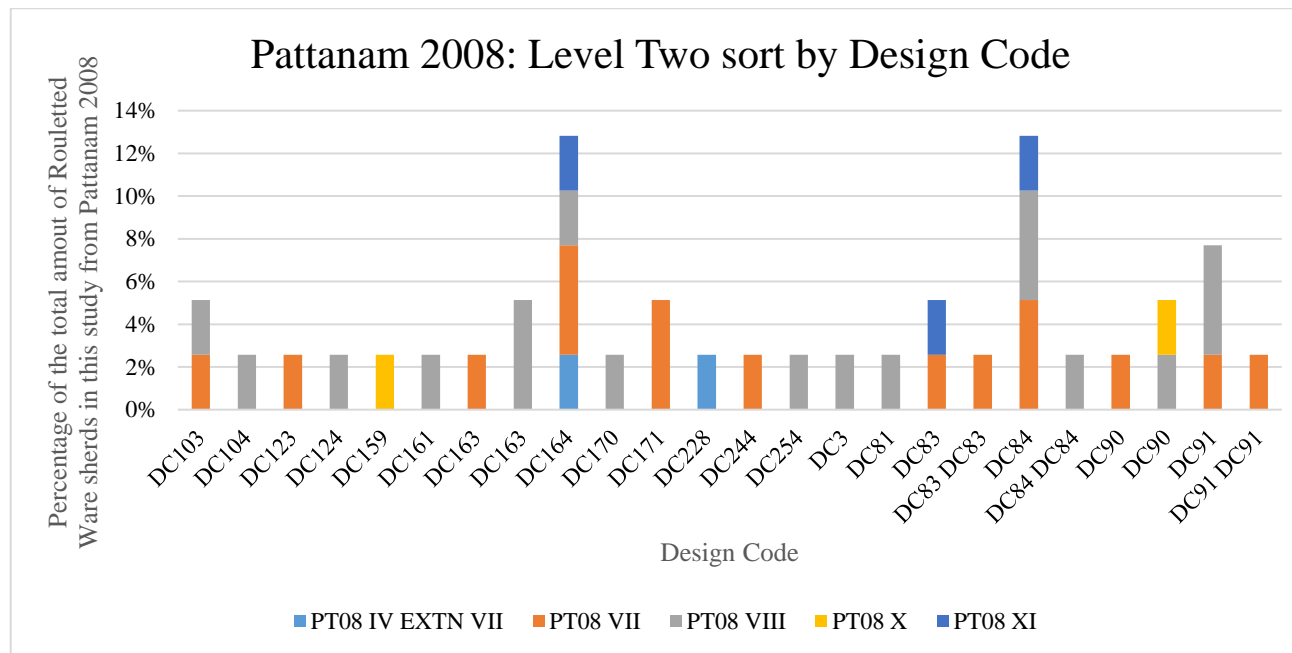


Figure 4.16 Pattanam 2008, Level Two sort by Design Code

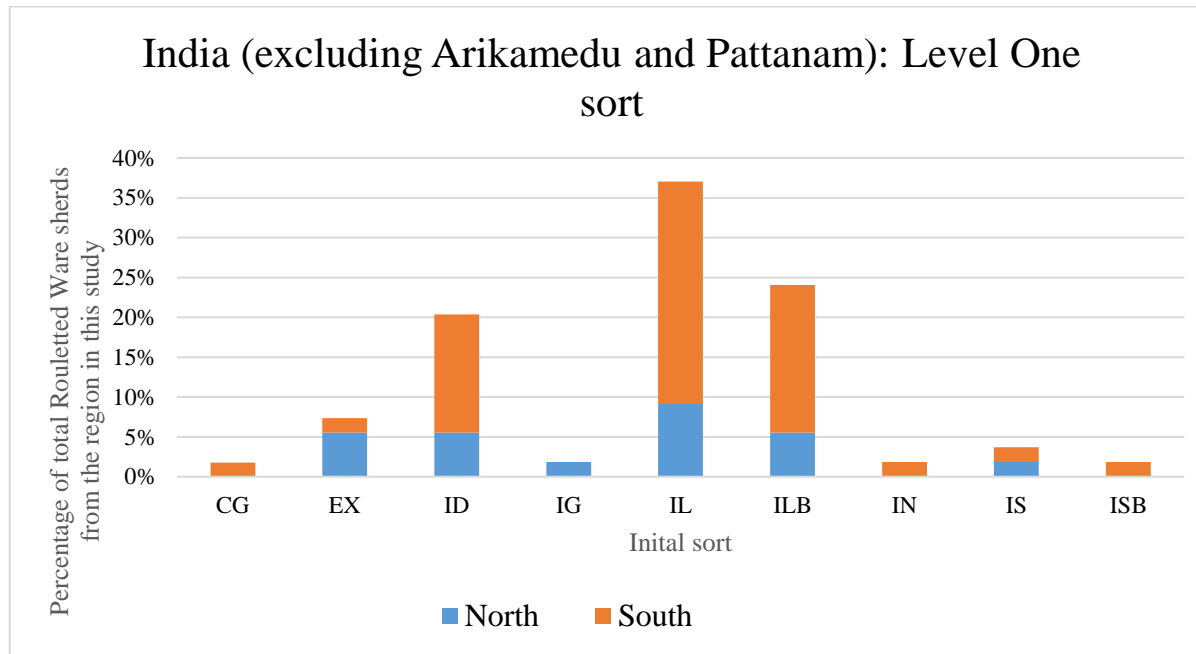


Figure 4.17 Level One sort: India (excluding Arikamedu and Pattanam), north and south of the Godavari River

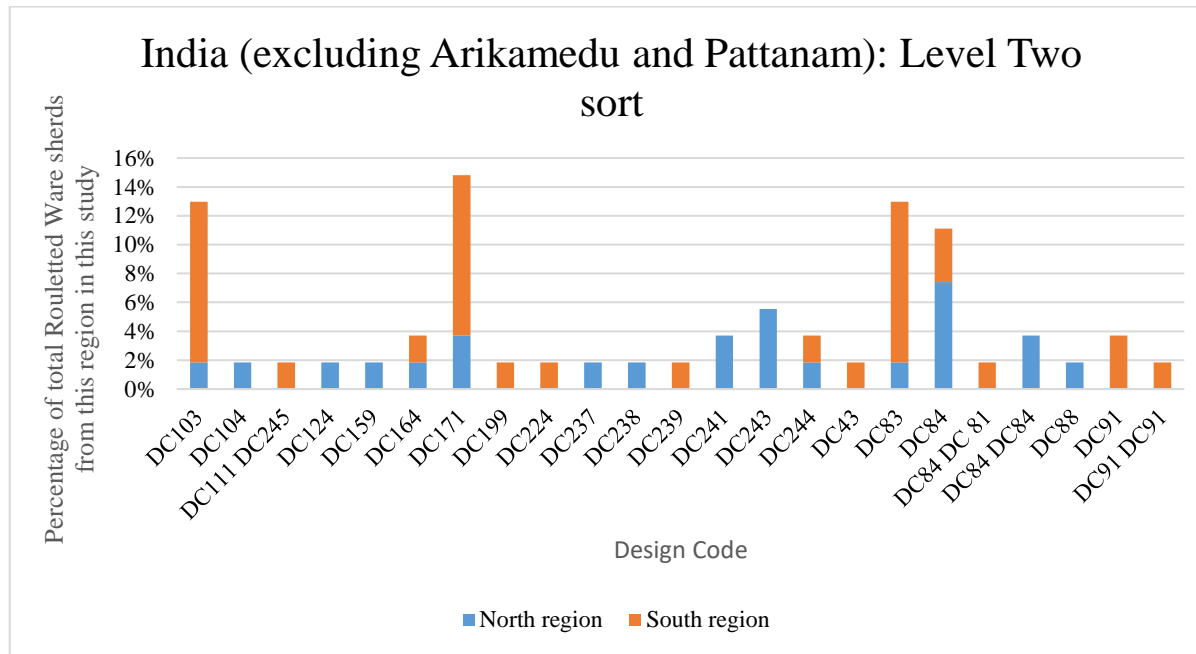


Figure 4.18 Level Two sort: India (excluding Arikamedu and Pattanam) north and south of the Godavari River

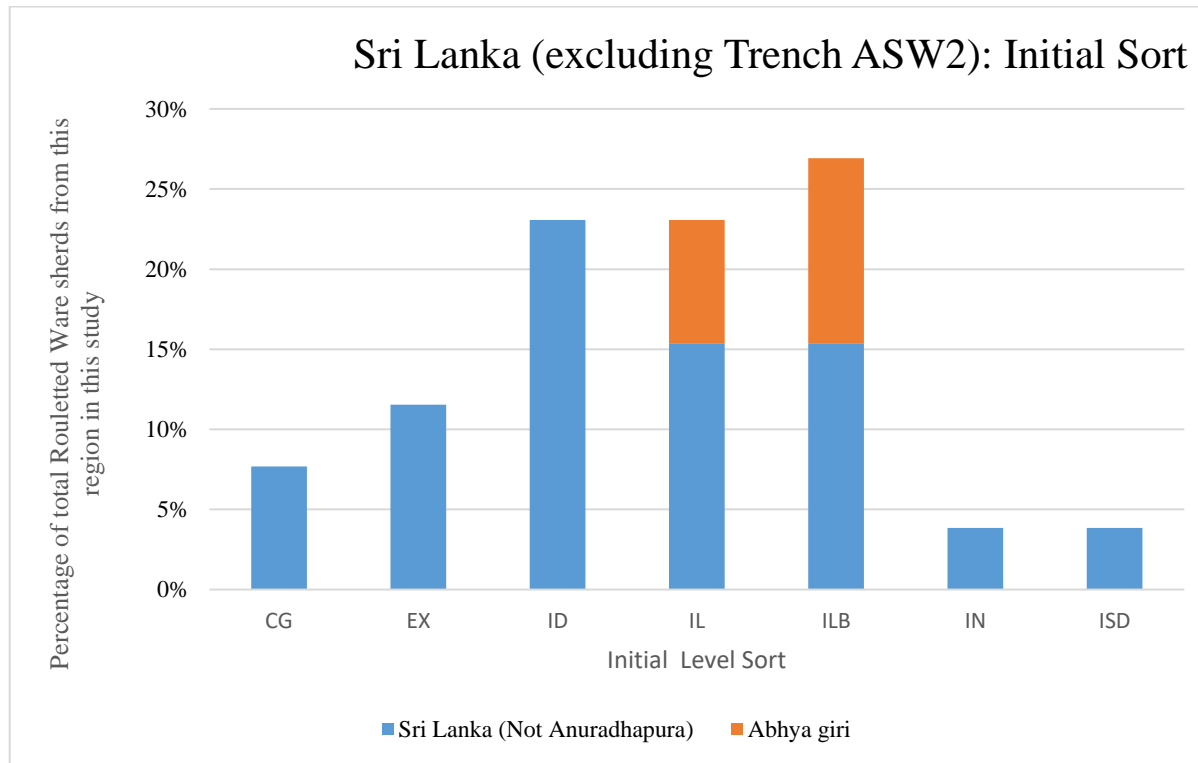


Figure 4.19 Sri Lanka (excluding Trench ASW2) Level One sort

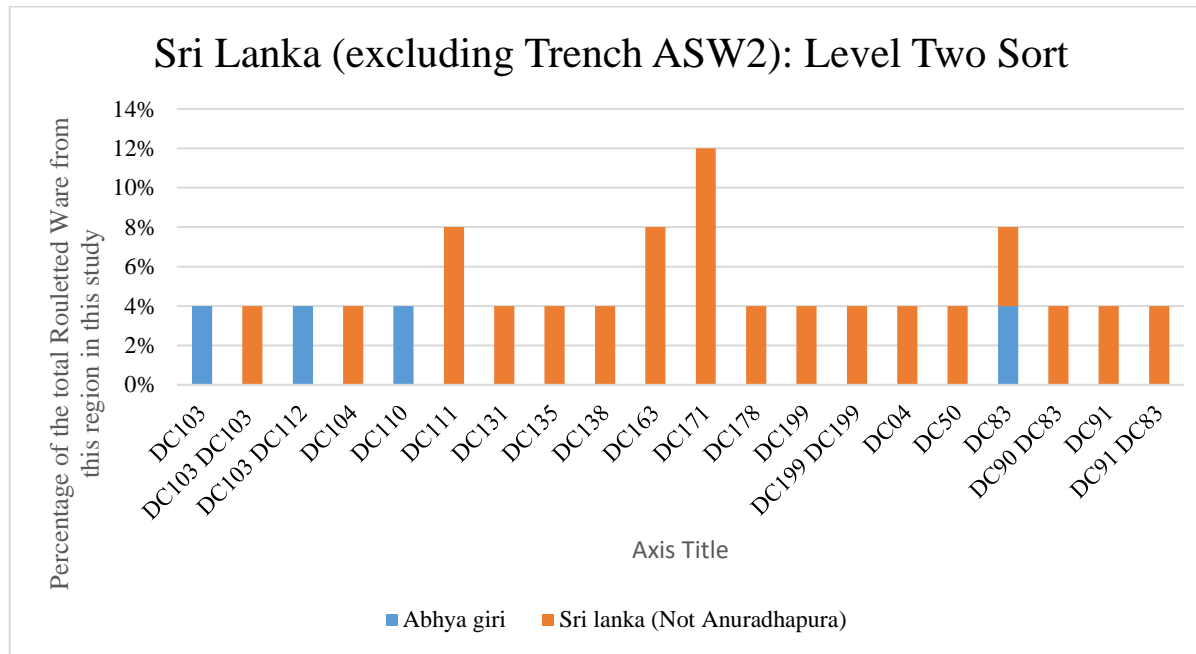


Figure 4.20 Sri Lanka (excluding Trench ASW2) Level Two sort

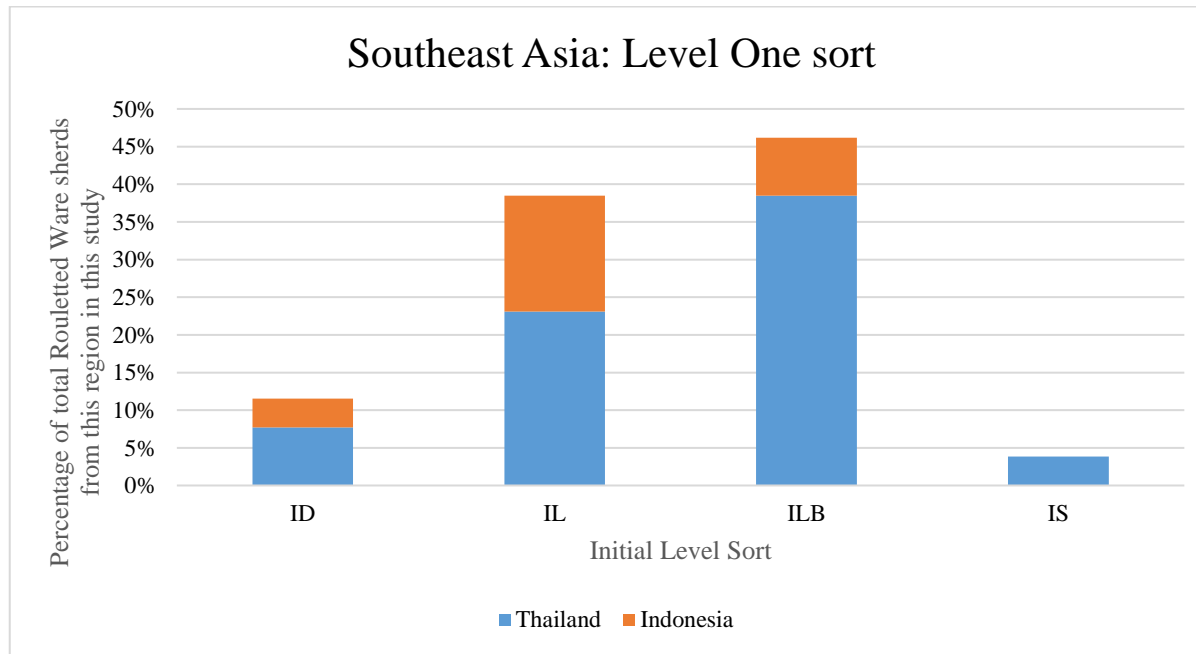


Figure 4.21 Southeast Asia Level One sort

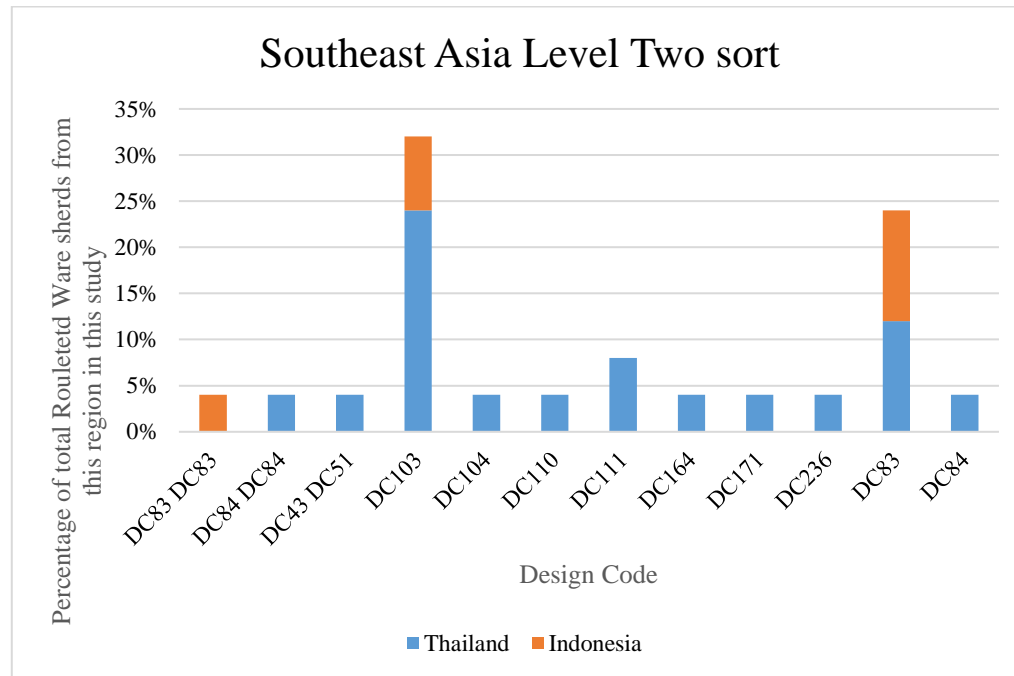


Figure 4.22 Southeast Asia Level Two sort



Figure 4.23 Sherd 533 from Trench ASW2 at Anuradhapura. The individual linear feature here is of the fan design.

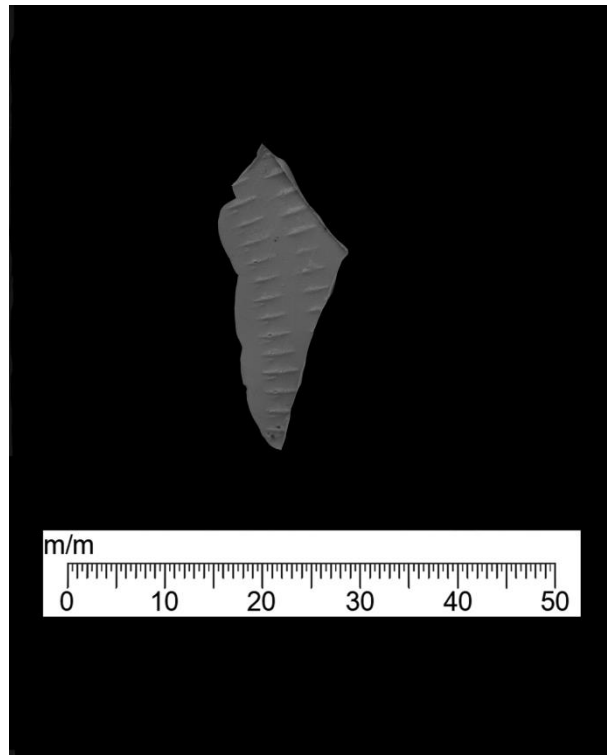


Figure 4.24 Sherd 754 from Uriayur, Tanjore. This impression demonstrates the elongated spike design.

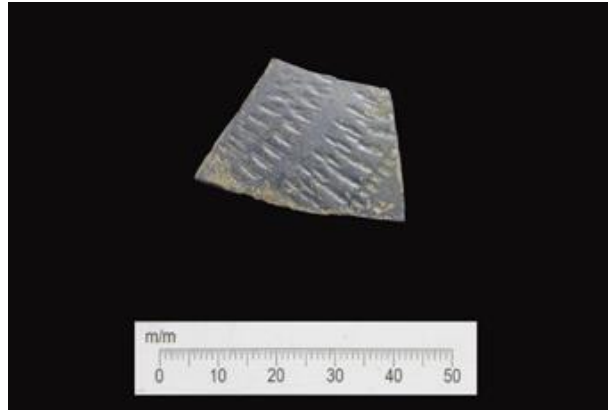


Figure 4.25 Sherd 595 from Trench ASW2



Figure 4.26 Sherd 529 from Trench ASW2



Figure 4.27 Sherd 505 from Trench ASW2

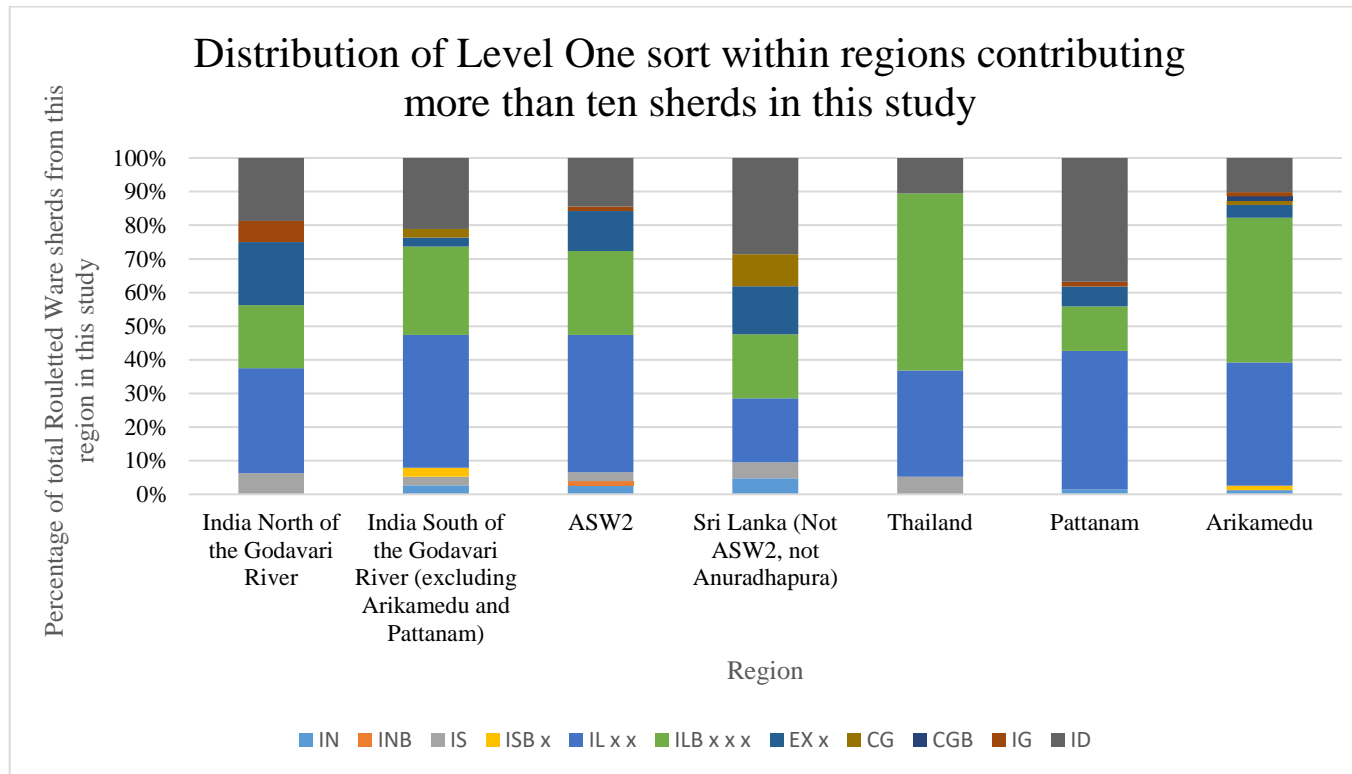


Figure 4.28 Distribution of Level One sort across regions where there are more than ten sherds in this study

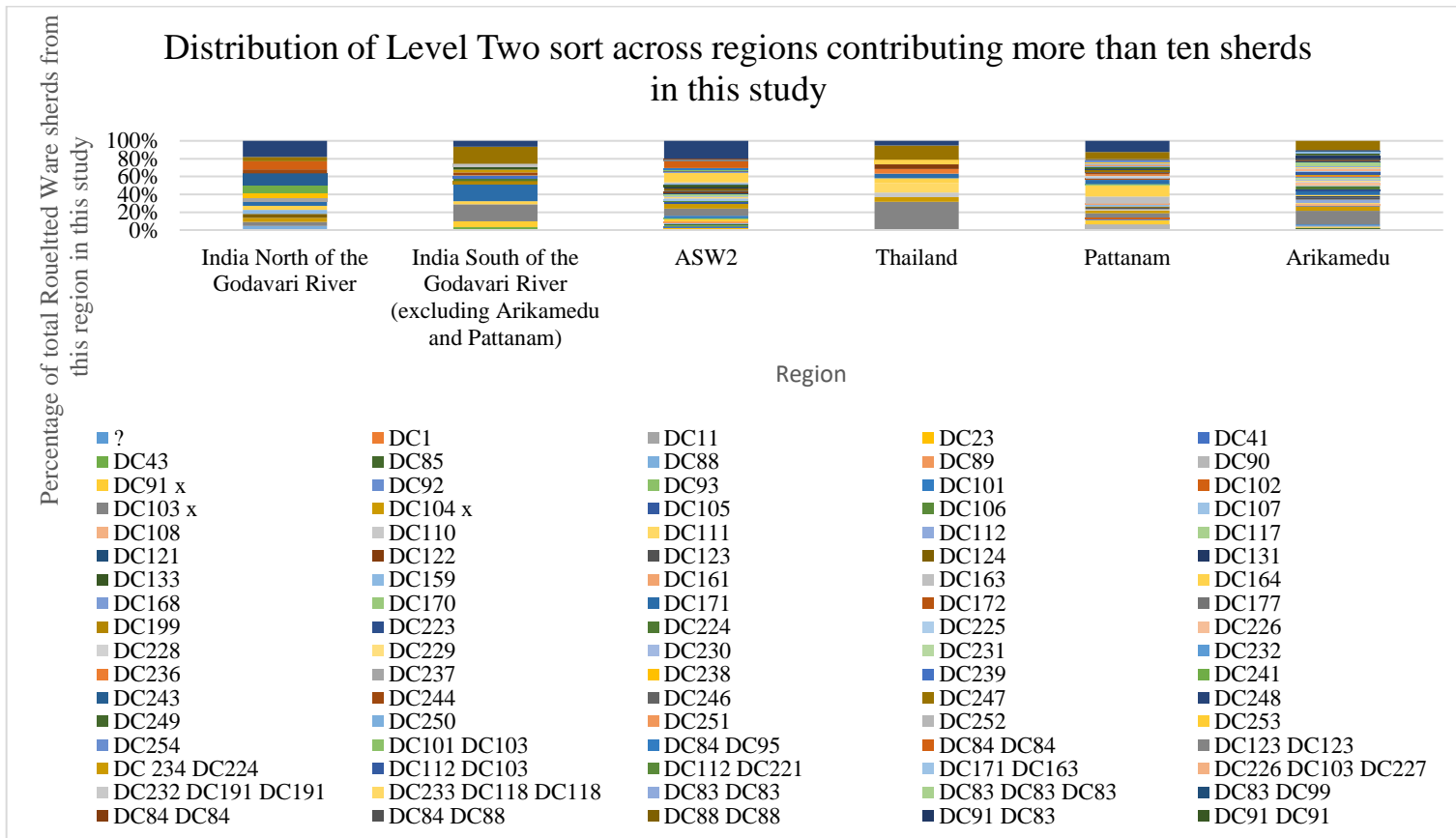


Figure 4.29 Distribution of Level Two sort across regions where there are more than ten sherds in this study

**Revisiting Rouletted Ware and Arikamedu Type 10:
Towards a spatial and temporal reconstruction of
Indian Ocean networks in the Early Historic**

Joanne Ellen Shoebridge

Volume Two of Two

Submitted in accordance with the requirements for the degree of
PhD

Department of Archaeology
Durham University

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Volume Two

Chapter Five

Arikamedu Type 10

“Since the shape of the bowl and its decoration is distinctive, its occurrence elsewhere ... is of special interest for the study of trade networks. So far the known distribution of Form 5 bowls is limited.”

Begley (1996b: 231)

5.1 Introduction

The previous chapter discussed the analysis of the Rouletted Ware in this study, and the interpretation of the data gained. The aim of this chapter, is to conduct a comparable investigation- but this time with reference to the second ceramic in this study, Arikamedu Type 10, therefore meeting part of Objective Six of this thesis. A previous study has been conducted into the designs on these vessels by Shoebridge (Shoebridge 2009, Shoebridge & Coningham 2011) and this will be considered during this chapter.

This chapter will start by summarising the description of Arikamedu Type 10 given in Chapter Two. This vessel, which takes the shape of a cup or bowl, was originally recorded by Wheeler at the site of Arikamedu (Wheeler *et al.* 1946: 59). Wheeler did not fit Arikamedu Type 10 into his model of Indian Ocean trade as he did with Rouletted Ware, he classed Arikamedu Type 10

as a local product rather than an import. However, the research potential of this vessel has been noted especially by Begley (1996b: 229) who (while referring to the type as her Form 5) stated that due to the limited distribution it may be “*possible to determine patterns of direct communications from their spatial distributions*” and that the type is “*increasingly more important for the study of trade networks on the eastern coast of India and southeast Asia*”, this is a statement which does depend on factors which will be discussed later in the ‘Future Projects’ section in Chapter Seven. Ford *et al.* (2005: 911) stated “*unfortunately little work has been done on Type 10*”, a statement which this research is addressing. There are similarities in the fabrics of the two vessels, but only limited comparisons in the decorative traits – the most noticeable common factor being that the decoration is presented on the inside of the vessels. While the rouletting pattern is the key feature seen on Rouletted Ware and discussed in the previous chapter, a different, and extended range of characteristics can be noted on the Arikamedu Type 10, namely birds, borders or divider patterns around these birds, symbols in the shape of a ‘v’ and also a series of concentric grooves on the interior base and wall of the vessel.

Previous research conducted by Shoebridge (2009) investigated a limited selection of Arikamedu Type 10 and could draw conclusions with reference to possible distribution links within East India, and between Sri Lanka and the island of Bali, Indonesia. This present study will expand the data set to include examples from new sites and further examples from sites previously mentioned in Shoebridge (2009).

The method of investigation of the Rouletted Ware was detailed in the previous chapter, Chapter Four. There will be some similarities between the two methods, but with reference to the Arikamedu Type 10, sherds it must be considered that the majority of the data available has been obtained from a combination of published images and original photographs, with just two casts available (not made by the author). As discussed earlier, images from an excavation or collection may not be a representative sample. When only a few sherds are published, those which display only the grooves or a slight indentation, are unlikely to be featured. A sherd of Arikamedu Type 10 with the stamp absent can provide as much data to analyse as one with the presence of a stamp. A lot of the published images sourced have very limited contextual information, so primarily with the exception of the Trench ASW2 data; it is mainly geographical investigations that will be executed initially. As with the Rouletted Ware, care has also been taken to ensure that the same sherd has not been analysed twice. This is a task that can be difficult on occasion with varying standards of recording and photography.

Arikamedu Type 10 has been recorded under a variety of different nomenclatures. In the report of the 1989 – 1992 excavations Vimala Begley recorded it as Begley Form 5: “*Bowls with stamped motifs*” (Begley 1996b: 229), and she used this naming convention in the quote which opens this chapter. In this quote, Begley makes the valid point about the uniqueness of Arikamedu Type 10, and indirectly highlights the potential of the type.

Wheeler *et al.* (1946: 59) refers to the vessel as Type 10 in the Arikamedu excavation report.

There were examples quoted in Chapter Two where a selection of ceramics had been recorded incorrectly as Rouletted Ware. This research has been unable to find examples of vessels that appear to have been recorded incorrectly and published as Arikamedu Type 10. This could possibly be due to familiarity with the vessels by those recording them, but it could also be due to the similarities in the fabric between Arikamedu Type 10 and Rouletted Ware, leading to sherds being catalogued incorrectly. Incorrect cataloguing is something that cannot necessarily be solved by a study such as this, as images are not always available and can be difficult to interpret. As many examples of Arikamedu Type 10 as possible have been viewed for this research, however, it must be considered that some may have been written into archaeological literature as “*stamped ware*”, a term which could also include ceramics such as Wheeler Type 141. The same geographical boundaries apply that were used in the previous chapters, and also the same categories of site (Level One, Level Two, and Level Three - see Chapter Two, Table 2.1).

5.2 Level One ceramic sort - Initial stages of sorting

It is from this stage that the methodology starts to vary from that used with the Rouletted Ware. There will still be an initial sort stage and a second sorting stage, and the vessels will be sorted by Component Codes rather than Design Codes. These Component Codes comprise of the different decorative features on the ceramics, building on those used by Shoebridge (2009). The initial sort will consider how many of the characteristic features appear on the ceramics. Following the recovery of Arikamedu Type 10 at Trench ASW2, Coningham (2006: 159) looked at the features on different sherds and identified a structure to accommodate the different decorative features as shown in Table 5.2, allowing commonalities to be identified. This current research has developed further categories to allow for a more extensive analysis and expanded this to account for variation in all the features, not just the birds. Coningham *et al.*'s 2006 publication used the following coding system.

Type	Description of bowl
10A	Grooved decoration present but there is no stamp, this category is comparable to 10k in Wheelers report.
10B	Grooves and stamps are displayed, but any further detail is indecipherable.
10Bi	Described (Coningham 2006: 159) as “ <i>classic more natural portrayal, with a well-proportioned body, large round-ended beak, and large eye represented by a pellet</i> ”. This bird is often seen carrying some sort of vegetation in its beak.
10Bii	Stamped, but with a stamp displaying more stylised characteristics, has a longer body with no visible eye. The beak is curved and points downwards, and the feet appear like claws.
To accommodate other features present	
10Biii	As 10Biii but more stylised. Can be compared to Wheeler Type 10a.
10 B+D	As Type 10B, but with a complete frame around each stamp.
10B+F	As Type 10B but with a complete frame around each stamp.
10B+V	As Type 10B also displays a ‘v’ stamp impression.

Table 5.2 Classification of Arikamedu Type 10 features as used in the Trench ASW2 report (after Coningham et al. 2006: 159)

In previous research by Shoebridge (2009), further analysis was carried out by breaking the design down into different components, and looking for geographical similarities. The features that were looked at were the bird’s

heads, the ‘v’ symbols, and the borders; this data will be reviewed and expanded for this current study.

5.2.2 Introduction to the Component Codes in this study

In order to evaluate the Arikamedu Type 10 features available, the various components that formulate the decoration will be investigated at two different levels. This section will introduce the terms used to describe the features that the ceramic sort will be based on. As mentioned in Chapter Two, no obvious manufacturing tools for these ceramics have been recorded, nor have any potential kiln sites. There are examples of artefacts in the archaeological record which may have been used to decorate these ceramics, although not all may have been specifically designed for this purpose. The stamps used to make the impression on the Arikamedu Type 10 may have been comparable to the stamps from Sonkh (Hartel 1993: 333) and objects similar to the comb recorded at Adam (IAR 1996: Frontispiece, 68) may have been used to create the grooves on the vessels. In Begley’s excavations there is an artefact described as a “*bone stylus or cosmetic stick or stick for painting designs on textiles*” (Begley & Sidebotham 1996: 63). This object was recorded in Trench AV90-1 024, dating to approximately the first half of the first century AD – therefore when Arikamedu Type 10 would have been in circulation. The presence of the wooden comb or stylus at Arikamedu does demonstrate that wooden objects can survive there in the archaeological record, therefore if wooden tools linked to the production of either vessel in this study were on the site, they may have been recoverable.

5.3.1 The grooves

Of all the features on Arikamedu Type 10, the constant presence is the grooves. Two bands of grooves are situated on the interior walls of the vessel, along with a set on the base, as seen in Figure 1.2, (and visible on sherd T75 from Arikamedu, Begley 1996: 256, Figure 4.283). On the interior wall of the vessel, situated between the two sets of grooves the stamp will be impressed (if there is one). The grooves will be discussed further in Chapter Six, in the same section as the grooves which on occasion appear on Rouletted Ware.

5.3.2 The stamp

The stamped impression that can be noted on many of the sherds of Arikamedu Type 10 is probably the most recognised feature on these vessels (as seen in Figure 1.2). The stamps take the form of a bird, which usually appears to be a peacock with varying levels of stylistic interpretation. These impressions appear to be regularly spaced around the interior wall of the vessel between the set of grooves. The different components of the bird will be investigated further in this chapter.

5.3.3 Vegetation

In addition to the bird, some of the stamps show the bird with something either held in, or close to its beak, this was described by

Coningham *et al.* (2006: 159) as “*some sort of foliage*”, and may look like a small twig or a few berries.

5.3.4 The ‘v’ symbols

The ‘v’ symbols are another key characteristic on Arikamedu Type 10, but they are not as frequent in appearance as the bird stamps mentioned above. These symbols appear in different forms, some of them are well formed, while some have a rougher appearance. If they are present they are situated below the lower grooves on the vessel wall, and in common with the bird stamps, appear to be evenly spaced out.

5.3.5 The border

This feature, which is usually an oval outer around the stamp, referred to by Coningham *et al.* (2006: 160) as a “*lozenge*”, may not be an intended artistic characteristic of the vessel. It is the mark left by the impact of the stamp when it is impressed onto the vessel, but it does not always carry the bird design with it. This effect could be caused when the stamp is placed using uneven pressure or an uneven stamp.

5.3.6 Decorative borders and dividers

Situated around or between some of the birds on the interior of Arikamedu Type 10, a selection of borders and dividers are visible. While

the borders can go around three or all four of the sides of the birds, some sherds exhibit single decorative dividers between each stamped feature. Some of the borders can be seen to overlap onto the groove feature or be underneath the bird stamp, providing detail on what order the vessels were decorated.

5.3.7 Initial Level sort codes summary

The initial sort of the Arikamedu Type 10 used sherds from Trench ASW2 in Anuradhapura to form a baseline. All the sherds with visible features in this study have been analysed, and the features that they exhibit have been put into a spreadsheet (Appendix One (ii)). Following the sort of the Trench ASW2 ceramics, this initial sort was cascaded down to the Level Two sites of Arikamedu and Pattanam, and then a comparative view across the Level Three sites was made. Both the Level Two and the Level Three sites will be the subject of a second level sort.

In addition to the full analysis (i.e. where all the components match) there will also be comparisons made of the individual features. This is a vital part of the analysis as many of the sherds are fragments and only display a selection of the featured components – for example part of the border and the bird's head, then below this there is the break. As with the Rouletted Ware in the previous chapter, it needs to be remembered that these are small sherds that are being considered in this research, and for the Arikamedu Type 10 there is a considerably limited amount of data available in comparison to the

Rouletted Ware. Begley (1996b: 229) emphasises this point in reference to her excavations at Arikamedu, “*unfortunately, only small fragments were found in our trenches, and in small numbers but in both sectors*”. At present this research is only considering the Arikamedu Type 10 which has the area where the stamp is present (or should be present), due to lack of available data it is not considering further data such as depth of grooves (a brief analysis of this can be seen in Shoebridge 2009).

5.3.8 Classification of features

In research by Shoebridge (2009), certain features of the sherds were classified to try and identify similarities. The tables below are based on this research, but have been expanded to include more categories.

5.4 Level One Trench ASW2

Once the components of the Arikamedu Type 10 impressions were labelled, the Level One sort could start. All the components that make up the impressions have been coded and will be discussed shortly, however, the result of the sort for the Level One site of Trench ASW2 is shown below in Table 5.3.

Catalogue Number	Border	Body type	Feet	‘v’ Symbol	Foliage
T37	B1	IO	F3	V9	G1

T38	B5	IO	F3	V9	G2
T61	B5	MO	F3	V9	G2
T36	B1	IO	F3	V9	G2
T60	B6	MO	F3	V9	G2
T34	B5	IO	F1	V9	G1
T35	B5	IO	F4	V2	G1
T76	B5	MO	F2	V9	G3

Table 5.3 Level One sort at Trench ASW2

Although there are some common features across the range of sherds from Trench ASW2, the diversity is rather obvious. In the Trench ASW2 report there are eight sherds of Arikamedu Type 10 making up one third of the circumference of a vessel, but none of them contain a stamp (Coningham *et al.* 2006: 161). It is appreciated by the author that there are variations within the categories that the components have been divided into, but this will be addressed later.

5.5 Level Two sort – Pattanam and Arikamedu

When the Level One sort is expanded to the Level Two sites of Pattanam and Arikamedu, the same practice was carried out to see if there are any sherds which share the whole set of components, therefore warranting further investigation at this stage. Again, it is noticed that although there are individual categories that are shared, there are no two sherds (either in the photographs / published images or the drawings) that share exactly the same categories.

5.6 Level Three sort

As no similarities were found between the Level One and the Level Two sites during this initial sort, the analysis was expanded to the sherds from the Level Three sites in this study to see if there were any sherds which shared the same categories of features. The results of this investigation showed that no two sherds shared the same component category features.

This research is based on the analysis of a selection of sherds, with the exception of the analysis of the sherd recovered at Arikamedu by Begley (1996b: Figure 4.2863) which contains three clear stamps, most of the sherds in this study just have a single stamp or on occasion possibly two. One of the consequences of using a selection of sherds like this is that it cannot be determined as to what is on the part of the vessel that is not available for the study, there may be another sherd from the vessel in a different museum collection, or the sherd may have not been photographed due to space requirements or deemed unappealing so not published. Possibly a second sherd from the same vessel was not recognised when it was recovered, or alternatively the vessel may not have been fully excavated. A possible further reason was that when a pot was broken (intentionally or unintentionally) the sherds were deliberately separated for different reasons. Therefore, with some of the characteristics that are looked for – particularly the ‘v’ symbols, if the break in the sherd is above where the ‘v’ impression would be, it is impossible to ascertain as to whether that feature was present.

As the presence of the ‘v’ symbols cannot always be determined, a similar scenario can be extended to discussions considering the vegetation that appears on some of the sherds. Sherd T34 clearly displays a feature which has been classed as vegetation by this study to the right of the bird (on a sherd which does show a modern repair), and the bird was described as holding “*some sort of fruit, perhaps grapes in its beak*” (Coningham *et al.* 2006: 160).

As there is such a wide variety of designs it is not possible to formulate an expectation of what should be present if certain other features are, especially with a limited data set. It is fair to propose that the general condition of the sherds, and the quality of some of the available images, has led to the adaption of the component categories in this study such as F4 (see below). Investigation into categories such as F4 needed to consider that there may possibly be a feature present on the bird- but the factors described prevent a clear judgement being made. As the borders / dividers often appear very close to, or almost overlapping the bird, it is highly likely that if the bird is present, the border would be visible as well.

From the paragraphs above, using the ‘v’ symbol as an example, if the category for the ‘v’ symbol is removed from the initial sort, not a great deal of difference is noted at this level – sherds T73 and T22 display the same components and features which justify further analysis in the next level, but for example with sherds T27 and T30, they may share the same components, but with the exception of the ‘v’ symbols there are no other stamped features

visible on the drawing (T27) and cast (T30). Therefore, rather than consider for each component what could happen if one part was missing, the research will now move onto the Level Two sort.

5.7 Secondary Ceramic sort

As with the Level Two ceramic sort for the Rouletted Ware in the previous chapter, the results from the initial sort of the Arikamedu Type 10 need to be analysed further to allow for more in-depth investigation. In common with the Rouletted Ware Level Two sort, this second level sort will incorporate all the Arikamedu Type 10 data, but the categories do need to be different to accommodate the varied traits of the ceramics, and these will be identified as Component Categories.

The Level Two sort of the Arikamedu Type 10 will consider, amongst others, the features that Shoebridge (2009: 83, 85-88) highlighted. Shoebridge identified various parts of the birds, including the bird's heads and the 'v' symbols. In both Shoebridge 2009, and this present study, each bird has been drawn in Adobe Illustrator, which has allowed the different components to be picked out and analysed separately, but this time more details will be individually analysed. Shoebridge's research led to conclusions being drawn which included a proposed link between Anuradhapura and Bali (Shoebridge 2009: 131).

5.7.1 Bird Heads






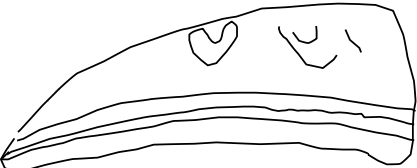
Type of head	Component Code	Example
Hook	H1	
Small beak	H2	
Triangle beak	H3	
Round head with pronounced eye	H4	
Non-descript	H5	
No head	H6	

Table 5.5 Arikamedu Type 10. Components: bird heads

5.7.1.1 Heads: Level One site- Trench ASW2

As introduced in Chapter One, the site of Trench ASW2 with its extensive chronology forms the only Level One site in this research. On observation in Figure 5.1, it can be seen how one of the bird head categories, H4, represents exactly half of the stamped sherds from Trench ASW2 and is spread across the chronological periods. Category H4 represents the rounder headed bird with the circular eye. The remaining sherds are all split amongst different categories; each one possibly suggesting a local characteristic, or the work of a particular potter.

Disregarding H5 as it represents the sherds that can be described as “*non-descript*”, chronologically scanning the distribution of the bird heads at Trench ASW2 demonstrates that H4 is only absent in Period G3. The later period of G5 sees the appearance of H3, the triangular beak sherds which do not appear anywhere else on the graph.

5.7.1.2 Heads: Level Two sites

Of the Level Two sites in this research, Arikamedu and Pattanam, varying amounts of data were contributed, as represented in Figure 5.2. The site of Pattanam, had several sherds, two of which were suitable and joined, and one of the sherds displayed a stamp, these have been included in this part of the research. With reference to the site of Arikamedu, the excavations from Begley and Wheeler have both provided a variety of photographs and illustrations that can be used in this study. There is a slight change from the data seen in the Level One sort in the representation of different types of bird heads, rather than just having one dominant category, the analysis is split between H2 (Small beak) and H4 (Round head with pronounced eye), with the remaining sherds being represented by two sherds of H6 (head not visible) and a singular sherd of H1 (hook). The sherd from Pattanam is classed in the H4 category, so sharing this component with many of the sherds from the other Level One and Two sites, other components are also common, and these will be discussed later.

The sherds from Arikamedu are taken from what has been selected to put into the excavation reports, where it is likely that the clearer and more complete images are represented, however the percentage of non-descript sherds is eleven percent less than the sherds from Trench ASW2 in this study. The only available example in this study from Pattanam is classed as Component Code H4 – rounded head with pronounced eye, from Trench PT08 VII strata 60, which is quite a mixed sediment and debris layer, but does

also include Rouletted Ware. When considering the sherds from Arikamedu, a reasonably diverse range can be seen, the notable missing Component Code here is H3, which appears at a later stage at Trench ASW2 (Figure 5.1). As discussed above, it could be proposed that the most diverse range of sherds would be from close to the production point (sherds of each design are made and then dispersed over the distribution area), but the notable omission here is the H4 design, while the H1 is present, which is not seen at Trench ASW2.

5.7.1.3 Heads: Level Three sites

When considering the evidence presented by the sherds that form the Level Three sites in this study, this data is limited by the number of sherds and that not all of the sherds have impressions. There is a variety of different bird heads common across the regions as shown in Figure 5.3, with noticeably the H2 feature being present, noted in sherds from Alagankulam, South India which is relatively close to Arikamedu, and also in Thailand. With reference to the sites from India, namely Alagankulam, Chandraketugarh and Adam, H1 is seen on the photograph and the drawing that is available from Chandraketugarh. A different design is presented from Alagankulam, where one of the sherds displays what appears to be both a male and a female peacock. Unfortunately, there is part of the peacocks missing from the sherds from Tissamaharama and North India, so it is difficult to make judgements as to what these designs would have been.

5.7.2 Borders and dividers





Border or divider		
Ladder border	B1	
Plain border	B2	
Open sided border / wave border	B3	
Unidentifiable border	B4	
No border	B5	
Lozenge imprint	B6	
Not visible on this part of the sherd	B7	

Table 5.6 Arikamedu Type 10. Components: borders and dividers

5.7.2.1 Borders: Level One site- Trench ASW2

As seen above with the heads from the Trench ASW2 sites, there is one category that stands out with the borders –B5 (see Figure 5.4), this represents stamps that do not have any border or divider feature at all, which presents an interesting (almost) continuous feature for this site, there is just an omission in Period G3. With the exception of the appearance of B1 in Period G2 and G3, this is the only continuous trait that appears between any period.

5.7.2.2 Level Two sites

As with the bird heads above, the analysis of the borders is extended to the Level Two sites of Arikamedu and Pattanam as shown in Figure 5.5. The most commonly seen Component Code is the B6 code, which is the code for the presence of the lozenge. While the drawings in Wheeler’s excavation report are presumed to be accurate, it is not possible to verify them for this research; therefore, it must be considered that the presence of a lozenge on these sherds may be questionable, it could be a style of border, or artistic interpretation. Two of the sherds in the Level Two category simply do not have the part of the sherd present where it would be expected to see the border (B7), and another two of the borders cannot be identified, with two sherds clearly having no border. There is limited published dating evidence available for these sherds, and this will be discussed later. The B6 code which appears later at Trench ASW2 is the more commonly recorded border /

divider feature at Arikamedu in this study, with sherds of B4 recorded which do not appear at Trench ASW2. Again, the diversity of sherds presented in the study from Arikamedu support the claim that it is close to the point of production. Unfortunately, the Arikamedu Type 10 in the study from Pattanam cannot contribute to this Component Code.

5.7.2.3 Level Three sites

As with the Level Three analysis of the bird heads, Figure 5.6 presents a scatter of Component Codes across the borders and dividers in the various regions represented in the graph. This is possibly emphasised by the presence of some sherds from photographs where it is difficult to distinguish if there is a stamp present or not, and these sherds have been coded separately, and blank sherds have not been included. It is probably the quality of the available data which has led to B4, unidentifiable border, being one of the two most common codes here, with B5 (no border), appearing as often, which also could be the result of poor visibility on the images. There is however a sherd with a clear representation of a lozenge, and one with a well-defined border (B3).

5.7.3 Bird Bodies

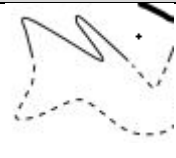
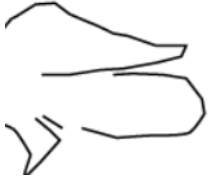

Type of body	+O= Outline only +D= With detail	
Male	M	
Female	F	
Indeterminable	I	
Indentation	N	
Blank (no body, no impression)	B	
Not visible on this part of the sherd	T	

Table 5.7 Arikamedu Type 10. Components: bodies

The appearance of the peacock in Indian art will be considered further in Section 5.11, but it will be discussed in this chapter how the peacocks are

depicted on the Arikamedu Type 10. Coningham *et al.* (2006: 159) discuss how some of the birds can be described as stylised, while some are represented from a more natural perspective. The analysis techniques used in this study and Shoebridge (2009), allow for the sherd to be enhanced using Adobe Illustrator in order to bring out the features present on an original image such as a photograph or print. It has been noticed that even simple adjustments such as turning the image the right way up from a photograph of a sherd taken on an angle can put the detail into a more comprehensible perspective. On analysis, it is clear that all the stamped features are birds – the type has also been documented as having some stamps recorded as fish (Coningham *et al.* 2006: 159, Begley 1996b: 229). When these vessels were originally recorded by Wheeler *et al.*, it was deemed that the stamps represented either fish or birds, but it was noted that of the birds, “*apparently the peacock*” was also included (1946: 59). It appears to be considerably more common for the bird to face to the right than to the left.

Figures 5.7 and 5.8 shown the difference in appearance in peafowl between the male (peacock) and female (peahen), which leads to the conclusion that sherd T23 from Alagankulam probably displays both peacock and peahen, making it unique in this research. As many of the sherds only contain one imprint of a bird (or just part of an imprint) the bird that is visible may have been accompanied by other designs, which could have shown more sherds displaying both male and female peafowl. Most of the sherds in the study that do have the bird present have been classed as peacock, as opposed to peahen, due to the plumage at the rear of the bird.

Most of the sherds that depict a bird impression portray just one almost complete impression of a bird. The question can be raised as to whether the sherds were deliberately broken in such a way because the sherd with the bird on was required for another purpose – possibly used as a type of counter or token? Evidence of reuse and recycling of the two ceramics in this study will be discussed in later chapters, however with Rouletted Ware it is possible to see evidence of repairs in antiquity, this is not a trait that has been noticed with the Arikamedu Type 10 in this study. Also, there is no evidence of reuse of the Arikamedu Type 10 in the form of a disc, as seen with the Rouletted Ware. However, it is appreciated that these variances are only found in very limited numbers of Rouletted Ware, therefore, if comparable numbers of repaired and recycled sherds of Arikamedu Type 10 were produced, they would have been in considerably reduced numbers, and be a very rare find in the archaeological record. It can be suggested that due to the number of single sherds found at the sites, there are still many more to be located through excavations or review of collections.

5.7.3.1 Level One site- Trench ASW2

The data from the Level One site of Trench ASW2 shown in Figure 5.9. presents two categories with a slight bias towards the IO component category – where it is unable to determine whether the bird is male or female. The only other category represented in the stamps at Trench ASW2 is MO,

which is the male bird stamp with an outline. It is difficult to draw further conclusions from this graph.

5.7.3.2 Level Two sites

As with the section above, the bird's bodies are again quite difficult to interpret for this level, with the IO component category being the most popular as shown in Figure 5.10. This is closely followed by the MO component category - a male bird with an outline, and then a single sherd each representing MD – a detailed male sherd and a sherd which does not have that part of the bird on it. The Arikamedu Type 10 sherd from Pattanam is categorised as an indeterminable outline.

5.7.3.3 Level Three sites

Figure 5.11 shows there is a definite trend towards the IO category with Level Three, and this is primarily the result of the poor visibility of the sherds in many of the examples. However, this category does contain one of the most visibly unique sherds in this study – sherd T23 from Alagankulam, as discussed above, and fortunately this does appear to be a photograph so the evidence can be deemed to be indisputable. In addition to some of the sherds in this category not giving a clear enough impression, not all the sherds have a stamp. In common with many of the other Component Categories, this category would benefit from the expansion of the data set.

5.7.4 Bird feet




Feet		
Short legs	F1	
Long drifting legs	F2	
No feet / feet not visible	F3	
Indeterminable	F4	
'v' shaped feet	F5	

Table 5.8 Arikamedu Type 10. Components: Birds Feet

5.7.4.1 Level One site- Trench ASW2

The position of the break of the sherd, the effect of erosion, and the quality of available image can present difficulties when trying to distinguish particular features. This is especially relevant when identifying the finer

features of the impression such as the feet and the vegetation on the sherds which is discussed below. The Component Category F3 is the most strongly represented code from the data from Trench ASW2 (Figure 5.12), which represents a bird with no feet, or where the feet are not visible, the category F4 of which there is one sherd represents the indeterminable category. Therefore, of the bird stamps from Trench ASW2, one of the birds has the long drifting legs, while the other has short legs, and the rest have no legs or are undeterminable.

5.7.4.2 Level Two sites



A considerable variety of bird's feet can be seen across this category (Figure 5.13) which includes the Level Two sites of Arikamedu and Pattanam. The most common category is the bird with the short legs, then the rest of the available sherds are distributed among categories F2 to F5. The clarity that has allowed this variety of sherds to be seen may be due to the high proportion of data being taken from the drawings in the Arikamedu excavation report.

5.7.4.3 Level Three sites

On initial inspection, the Level Three sort (Figure 5.14) does seem to present some diversity. There are two Component Categories that stand out, namely F2 (long drifting legs), which does present an indication of the style of a design, but unfortunately the second code is feet not visible. The

characteristic long drifting legs is common across the geographical regions in this level, making it widely distributed.

5.7.5 ‘v’ Symbols

Symbol			
Symmetrical single ‘perfect’ ‘v’	V1		
Asymmetrical Single ‘perfect’ ‘v’	V2		
Symmetrical Single ‘Rough edged’ ‘v’	V3		
Asymmetrical ‘Rough edged’ ‘v’	V4		
Multiple Symmetrical single ‘perfect’ ‘v’	V5		
Multiple Asymmetrical Single ‘perfect’ ‘v’	V6		
Multiple single ‘Rough edged’ ‘v’	V7		
Multiple Asymmetrical ‘Rough edged’ ‘v’	V8		
Break of sherd is above the ‘v’ symbol	V9		

'v' symbol not present	V10	

Table 5.9 Arikamedu Type 10. Components: 'v' symbols

Although the 'v' symbols are not a component which formulates part of the bird stamp on the Arikamedu Type 10, they will be analysed in the same way. Examples are not available for every option listed in Table 5.7, but they have been built in to cater for them arising in the future. Examples in this study allow the assumption to be made that when the 'v' symbols are present, they are situated between the base of the vessel and the middle set of grooves.

5.7.5.1 Level One site- Trench ASW2

In the 'v' symbols from the sherds from Trench ASW2 there was very little data to analyse (Figure 5.15) as many of the sherds had been broken in such a way that it was impossible to deduce if any 'v' symbols had been present. The position of these breaks has been discussed above, and if the breaks had been deliberate it suggests that the 'v' symbols may not have been an important factor, or the break may naturally occur in a certain place which leads to the 'v' symbols always being separated. Sherd T35 does clearly display 'v' symbols, but this is the only one that can be determined to have had them, sherd T36 joins T35 but the 'v' symbols are not visible, so it was decided to omit this detail from the sort.

5.7.5.2 Level Two sites

The Level Two sherds also present some interesting data about the ‘v’ symbols. Figure 5.16 presents a clearly visible divide again, but this time between Component Category V9 and category V10, which are interpreted as sherds that have been cut off above the ‘v’ symbol and those which have no apparent ‘v’ symbol. The Component Code V9 presents what can be described as ‘invisible data’ - where it cannot be determined whether a specific vessel displays a characteristic which could possibly be accounted for in this research. None of the illustrations from Wheeler’s publications depict ‘v’ symbols; leading the author to wonder if this is artistic interpretation or whether they simply were not there? Finer details such as vegetation (see below) has been included, but without verification with the original sherds, is required (see future work section in Chapter Seven). The sherd from Pattanam is broken off above the point where the ‘v’ would appear, so there are no examples of the ‘v’ symbols from the Level Two sites.

5.7.5.3 Level Three sites

An increase in variety can be seen from the sherds of the Level Three sites in Figure 5.17, with three Component Codes being present. In addition to the V9 and V10 codes, there is a representation of the multiple asymmetrical ‘v’ symbols that have an uneven edge. This characteristic appears on two of the sherds from this level, being from opposite ends of the

East Indian coast, Alagankulam and Chandraketugarh. Again, there is a high percentage of V9 sherds – presenting further invisible data as discussed above. The ‘Future Work’ sections of Chapter Seven, sub-sections 7.74 and 7.75 discuss the issue of fragmentation and conducting further research to recover more sherds.

5.7.6 Vegetation

The final Component Category to be considered is the vegetation that appears at the side of the bird.


Vegetation		
Present	P1	
Not present / not visible	P2	
Possibly present, or possible damage	P3	

Table 5.10 Arikamedu Type 10. Components: vegetation

5.7.6.1 Level One site- Trench ASW2

Trench ASW2 does have vegetation on some of the sherds, and there are also some where it is clearly not visible, see Figure 5.15. It was decided that due to some of the vegetation being so fine, a third category would be introduced alongside the present or absence options to account for the possibility of vegetation being present, but perhaps due to the lighting on the photograph or the quality of the image it may be a little difficult to see. Scratches and general signs of erosion could also potentially obscure the view of some of the finer detail. Sherds from all three categories are represented at this site.

5.7.6.2 Level Two sites

The Arikamedu excavation report by Wheeler *et al.* does include representations of birds with vegetation (Wheeler *et al.* 1946: 57) – notably on Wheeler Type 10*d*, where in addition to the not very common feature of the vegetation the bird is also facing to the left, as opposed to the more usual right. This is the only sherd in the entire Level Two category that does have any vegetation; the sherd from Pattanam did not allow for any clear indication (see Figure 5.16).

5.7.6.3 Level Three sites

The dominant Component Code across the Level Three sites is the P2 code (Figure 5.17) – where the vegetation is not present or not visible. There

is only one example of vegetation, and that is on one of the rather unusual sherds from Chandraketugarh.

5.8 Initial overview of analysis

The section above and the table below demonstrate the diversity of Arikamedu Type 10 sherds that have been recovered. It is not possible to determine a set pattern from the sherds recovered at the Level One site of Trench ASW2, Anuradhapura, or from the Level Two site of Arikamedu which contributes significantly more sherds than Pattanam, the other Level Two site. The Level Three sites also present a diverse range of sherds and when referring back to the region codes discussed in the previous chapter, the sherds can be divided up as follows:




	Region	Border	Heads	Body	Feet	'v' Symbol	Vegetation
Level 3							
Anuradhapura (Not ASW2)	7	B5	H6	T	F3	V6	G2
India North of the Godavari River	4	B3	H1	IO	F2	V8	G2
		B4	H1	MO	F4	V9	G1
		B4	H3	IO	F2	V10	G2
India South of the Godavari River (excluding Arikamedu and Pattanam)	5	B4	H3	IO	F2	V9	G2
		B5	H2	FD/MD B B	F1	V8	G2
Indonesia	11	B4	H2	IO	F2	V9	G3
Sri Lanka (Not ASW2, not Anuradhapura)	8	B5	H6	T	F3	V10	G2
		B5	H5	N	F4	V4	G2
		B6	H5	I	F4	V9	G2
Thailand	9	B5	-	-	-	-	-
		B4	H6	T	F3	V10	G2
		B6	H3	IO	F3	V9	G2

Table 5.11 Arikamedu Type 10. Sherds from the Level Three sort

The table above emphasises the diverse range of sherds that are available for this study, the use of the Level One sherds as chronological markers will be discussed in the following chapter. But a reason for the possible variety is discussed below.

5.9 Chronological changes

Whereas some of the data for this study is not presented with a published chronology, the data from Trench ASW2 at Anuradhapura does allow for some investigation into the chronological changes. In her previous study Shoebridge investigated the chronological change of the bird stamps, resulting in a table that demonstrates the temporal changes across the periods from the excavation report (Shoebridge 2009: 63). The table made it possible to see changes in the vessels over time, from the earliest designs which appear in Period G2, through the last available illustration from Period D (*ibid.*: 63). Shoebridge's research showed that the designs change from a sherd depicting a basic design, in Period G2, with the evolution of more elaborate designs in Period G5. It was also noted that during the later Period of D, only unstamped designs are recorded. This chapter has shown how this current study has further dismantled the components that make up the decoration on Arikamedu Type 10, and although this was discussed in Shoebridge 2009, a more comprehensive and also flexible system is developed here.

Period	Example Sherd Number	Image
B	T78	 <p data-bbox="815 479 1252 517">after Coningham <i>et al.</i> .2006: 301</p>
D	T84	No image available
G5	T76 T35	 <p data-bbox="959 1173 1203 1249">Sherd T76 (photo: Coningham)</p>
		 <p data-bbox="916 1599 1182 1697">Sherd T35 (photo: Coningham)</p>
G4	T60 T81 T82	No available image



G3	T79 T80	No available image
G2	T38 T37	 <p data-bbox="911 645 1174 741">Sherd T38 (photo: Coningham)</p>
		 <p data-bbox="916 1021 1182 1117">Sherd T37 (Photo: Coningham)</p>

Table 5.12 Demonstrating temporal changes in the design of Arikamedu Type 10 at Trench ASW2 (after Shoebridge 2009: 63f).

Catalogue Number	Site	Period	Phase	Context	Border	Body type	Feet	'v' Symbol	Foliage
T37	ASW2	G2	LXXII	602NW	B1	IO	F3	V9	P1
T38	ASW2	G2	LXVIII	Unconfirmed	B5	IO	F3	V9	P2
T61	ASW2	G2	LXXXIII	638NW	B5	MO	F3	V9	P2
T36	ASW2	G3	LXXV	487NE	B1	IO	F3	V9	P2
T60	ASW2	G4	LXXXI	487NE	B6	MO	F3	V9	P2
T34	ASW2	G5	LXXXVII	477NW	B5	IO	F1	V9	P1
T35	ASW2	G5	XCI	15NW	B5	IO	F4	V2	P1
T76	ASW2	G5	XCI	385SE	B5	MO	F2	V9	P3

Table 5.13 Chronological changes in the components in Arikamedu Type 10 at Trench ASW2

From the data seen in Table 5.13 it is difficult to date any set patterns throughout the stamps that have been identified from Trench ASW2. This presents an interesting point as when interpreting many of the categories in this study, it is often the lack of clear data (due to poor images) that is noted as being the key reason for the inability to present specific results. However, this table from Trench ASW2 shows that even with results from a well recorded, well stratified site, there are still a variety of different results displayed.

When considering the other traits on the Trench ASW2 sherds, attention can be drawn to the research by Shoebridge (2009: Figure 7.4), who investigated chronological changes in rim sizes at Trench ASW2. Figure 5.18 presents the variances in the rim diameters that were available from these ceramics, presenting another example of the intra site variability. However, it is noted that there is a slight bias in the graph as eight of the sherds from Period G5 are from the same vessel (Coningham *et al.* 2006: 263). Shoebridge (2009: Figure 7.3) also compared the size of the rims with the Arikamedu Type 10 classification system developed by Coningham, again finding no common factors. The access to more sherds of Arikamedu Type 10 would allow for a more expansive study on the rim size to design ratio to be completed, although factors discussed in the next chapter such as fragmentation may have an impact on what data is available. The diversity of sherds will be discussed further in Chapter Six where similarities between chronological and geographical variances will be investigated, with the aim of building networks of communication using the two ceramics in this study as a vehicle by which to do this.

5.10 Summary of the distribution of Arikamedu Type 10 in this study

This next section will analyse Table 5.14, where the spread of the different Component Codes across this study is presented. In this table the invisible codes which cannot contribute to the study (the ones where the design cannot be determined) have been removed. Those that have been left can be analysed in two categories. Firstly, there are certain Component Codes which appear to be quite common at the various sites in this study, secondly, there are some which are more unusual and may have the potential to be used as chronological markers.

	H1	H2	H3	H4	H5	H6	B1	B2	B3	B4	B5	B6	B7	MO	M	D	O	T	B	FD	F1	F2	F3	F4	F5	V2	V8	V10	P1
ASW2 G2	x		x	x		x					x			x									x						x
ASW2 G3	x						x																x						
ASW2 G4				x							x	x		x									x			x			
ASW2 G5			x	x							x			x	x	x	x				x	x		x		x			x
Arikamedu x Pattanam	x	x		x	x					x	x	x	x								x	x	x	x	x			x	x
Region 4	x		x						x	x				x								x		x			x	x	x
Region 5		x	x							x	x									x	x	x					x		
Region 6																													
Region 7																													
Region 8						x					x							x					x					x	
Region 9			x			x				x	x	x						x	x					x				x	
Region 10																													
Region 11		x								x												x							

Table 5.14 Distribution of the Arikamedu Type 10 Component Codes across this study

What can be noticed about the spread of the sherds is that 15 out of the 26 designs on the table are recovered at Arikamedu, and eight are recovered at Region Five – locations south of the Godavari River. As discussed in the previous chapter, these are locations where it is most likely these vessels were produced. There is a bias in the data here as some images were available from Thailand, and studies such as that by Ford *et al.* (2005) emphasised that the vessels were the product of South India. A wide range of Component Codes can also be seen from Trench ASW2, but again this may be linked to the amount of data available.

The Component Codes which are most popular across the chronology at Trench ASW2 and the geographical locations in this study are B5. Representing sherds that do not have a border and as discussed earlier in Section 5.7.2.3 this may be due to the visibility of the designs on some of the sherds. However, there are a series of codes which appear in five different locations or chronological periods. These are mainly related to the feet on the birds, a quite tiny detail, but also the bird's heads, where H2 and H4 represent common Component Codes. Both these codes are recovered from Period G2 at Trench ASW2 and at Arikamedu. H2 also appears in Region Five, covering South India. Table 5.15 shows that these designs do stay relatively close to the proposed production point, with one exception from an H2 sherd being recovered in Indonesia. H4 is recovered at Arikamedu and Pattanam in addition to Trench ASW2, supporting the proposal that H2 and H4 were not distributed over a wider area and the variations of the design of H4 were very much a local choice that was popular through time. It can be suggested that the outlier here from Indonesia was transported as someone's personal property.

Unlike the heads of the birds, it is not possible to draw conclusions from the Component Codes representing the borders on the sherds as there is limited data, and as previously mentioned, it is questionable as to whether all the borders are included. The ladder border does appear in Period G2, which is radiocarbon dated, therefore providing a chronological marker, but its only other appearance in this study is at G3, implying that this style of border was produced over time, although perhaps it did not retain its popularity. Alternatively, the workshop producing the design may have halted the production for various reasons, such as a move to produce the more popular Rouletted Ware (if they were not producing it already), or increasing the amount that they did produce to keep up with the demand, exploiting its popularity to increase their income.

When considering the bird bodies, the majority of the birds appear to be male, and this is a common trait throughout the chronological periods at Trench ASW2. Overall there is such a diverse range in the bodies, again this is an area which would certainly benefit from an expanded dataset. As mentioned above, the feet on the birds are a very tiny detail, and the F3 category accounts for feet that are not present or visible, so are likely to be invisible data. There does seem to be a greater diversity of feet in Period G5 at Trench ASW2. It could be posed that this data should be more variable by this point as a more diverse range of skills have been adapted, as seen with the Rouletted Ware, but evidence does not support this.

A high proportion of the Component Codes have been recorded at Arikamedu, but not recorded at Trench ASW2. With the exception of the triangle beak (H3) which may have been produced to cater for a specific market in the northeast, all the bird head codes are recovered here. This distribution network demonstrates the internal systems that were operating in this area in the Early Historic period, rather than the area being dominated by Roman trade, as discussed by Coningham in the 2002 article “*Beyond and before the imperial frontiers: early historic Sri Lanka and the origins of Indian ocean trade*”. A variety of the borders around the sherds appear at Arikamedu and also Region Five, again, presenting a variety of designs close to the possible production point.

5.11 Peacocks

The peacock is a popular feature in Indian art. It makes appearances on Mesolithic cave art where it is a reasonably common feature, for example it can be seen at Lakhajuar and Bhimbetka in Madhya Pradesh, Khohahpbar in Uttar Pradesh, through to its appearance in later caves at Ajanta (Lal 2006: 50, 57, Mathpal 1984: Figure 65, Neumayer 2013: 151). Peacocks were also depicted in Indus Valley pottery, Wheeler (1966: 53) depicts an example of an Indus pot with a peacock, which he describes as “*various leaf motifs*” from Cemetery H at Harappa. Example of peacocks can also be seen at Navdatoli, and on a jar from Chanu-daro in the Museum of Fine Arts, Boston (Cat no: 176) (Clason 1975: 82, Kenoyer 1998: 14). The Indian Peacock (*Pavo cristatus*) was adopted as the National Bird of India in 1963, following the proposal that every country should have a national bird at the International Council for Preservation of Birds meeting in 1962 at Tokyo (Lal 2006: 11). *Pavo cristatus* is one

of three well known species of peacocks and is found in India and Sri Lanka (*ibid.*: 13).

There are examples of peacocks on silver punch marked coins from an almost comparative period to the Arikamedu Type 10, these depict a bird which is very rounded and perhaps comparable to sherd T75 in this study (Lal 2006: 30). Peacocks on coinage continued as a feature, for example throughout the fifth century at Malwa and seventh century at Thaneshwar. In addition to the punch marked coins and ceramics, peacocks have been designed onto other materials. Examples of peacocks on stone sculptures can be seen on the stupas at Bharat (Lal 2006: 39) and the North Gate at Sanchi (Mitra 2001: Plate III). Peacocks can be found featuring in the detail of a range of jewellery, veneer work and various accessories, and there are also examples of their appearance on textiles, with Gujarat and Rajasthan providing examples amongst others (Lal 2006: 105*f*). Peacocks can also be carved out of ivory (for example *ibid.*: 67), or can be decorative features on jewellery such as bracelets. They are also used for accessories such as umbrella handles, caskets, buttons and powder boxes, through to larger objects such as throne legs during the eighteenth century.

5.12 Conclusion

As Chapter Four provided a range of data and analysis in relation to Rouletted Ware, Chapter Five has provided data in relation to Arikamedu Type 10. There is less data provided in this chapter, but that is the result of fewer sherds available to this

study, and as the analysis has focussed on those with stamps, this has limited the data set further.

This chapter has demonstrated the variety of components that can be seen across the limited number of sherds in this study, therefore leading to questions about how many sherds of this vessel are still waiting to be discovered in either further excavations or reviews of existing museum collections. It has highlighted not only the range of complete designs, but also the variety of different components.

Therefore, this chapter has partially met Objective Six of this thesis, which was to analyse the distribution and chronological changes of Arikamedu Type 10. The next chapter, Chapter Six, will investigate further the data from this chapter along with the data from Chapter Four and discuss potential chronological and spatial markers for the two ceramics in this research, and consider routes along which they may have travelled.

Chapter Five

Figures

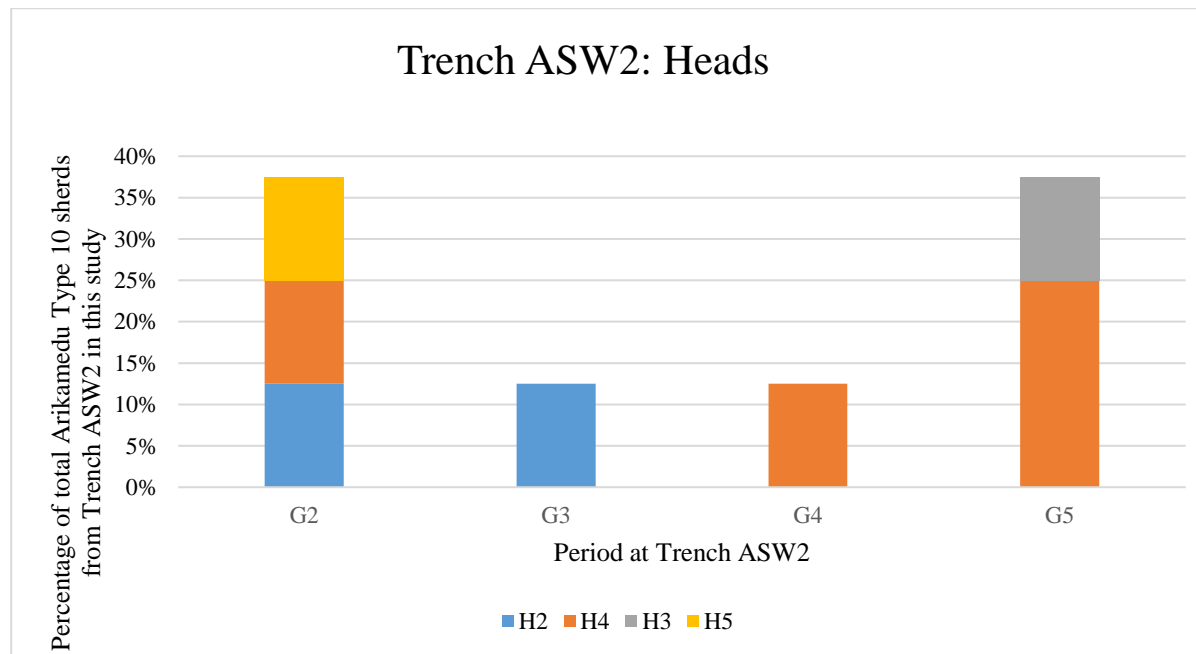


Figure 5.1 Birds heads at the Level One site: Trench ASW2

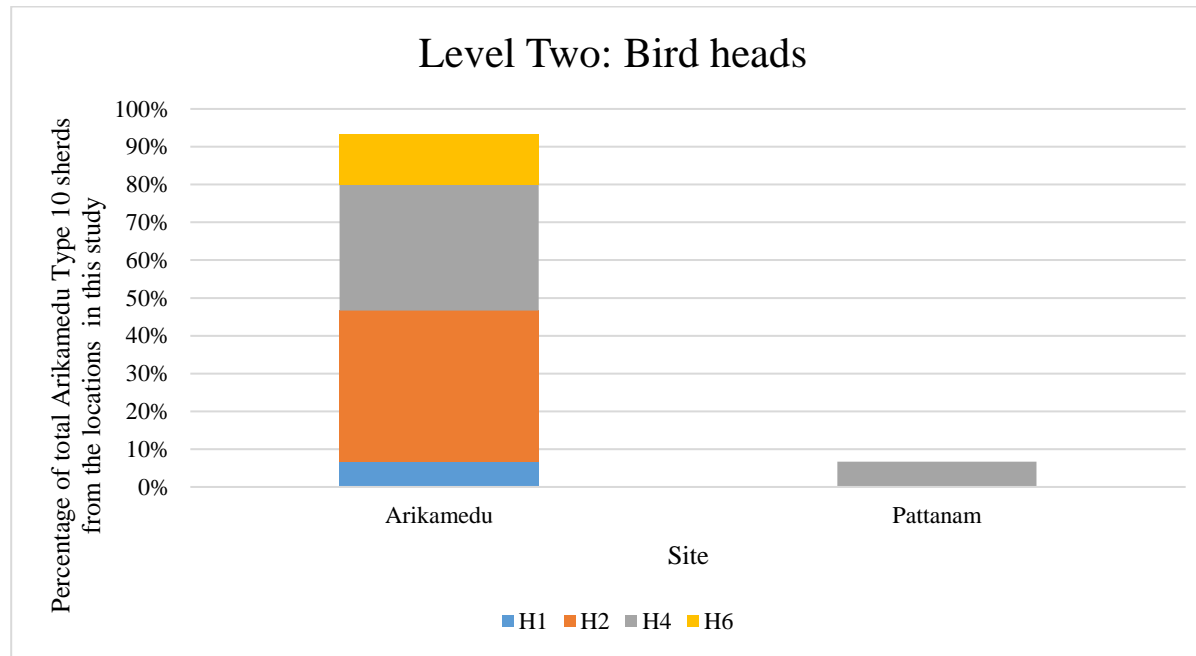


Figure 5.2 Birds heads at the Level Two sites

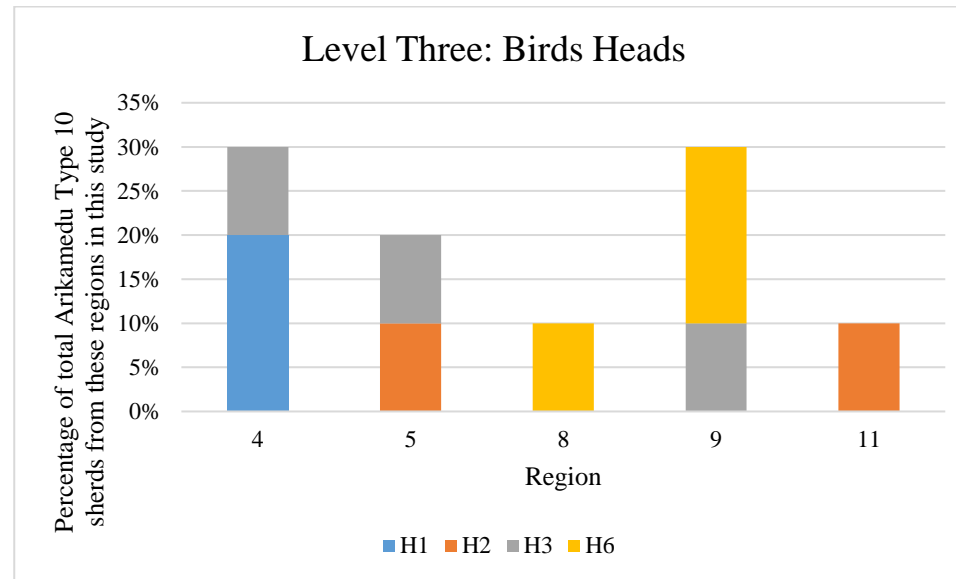


Figure 5.3 Birds heads at the Level Three sites (by Region Code)

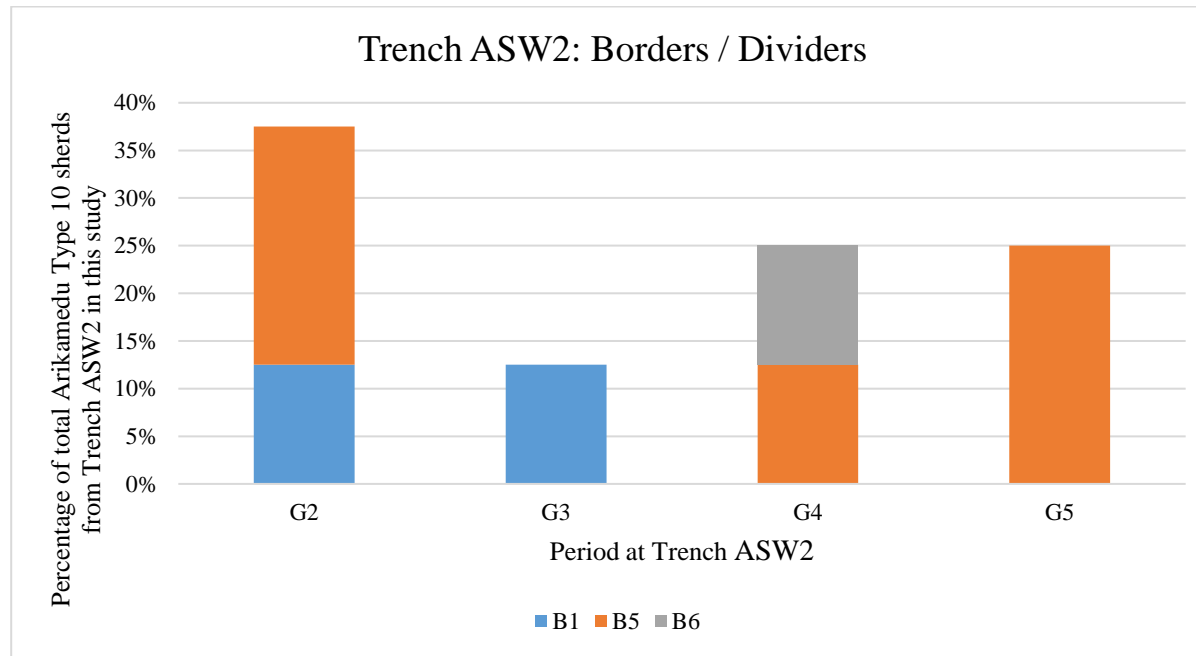


Figure 5.4 Borders and dividers at the Level One site: Trench ASW2

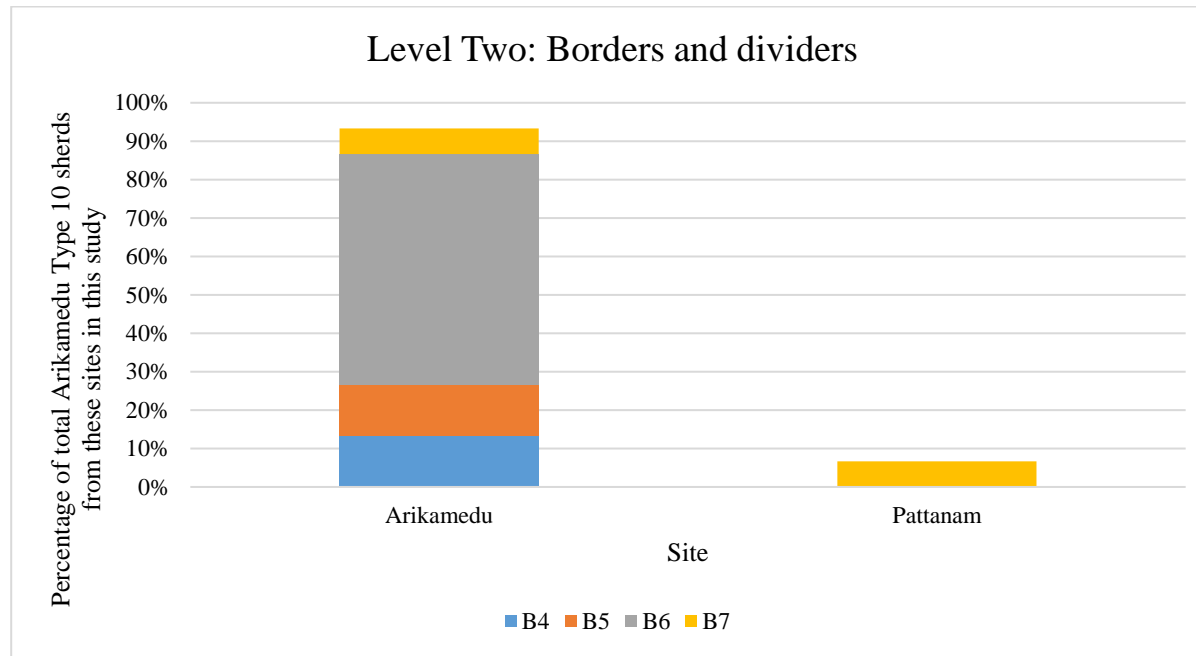


Figure 5.5 Borders and dividers at the Level Two sites

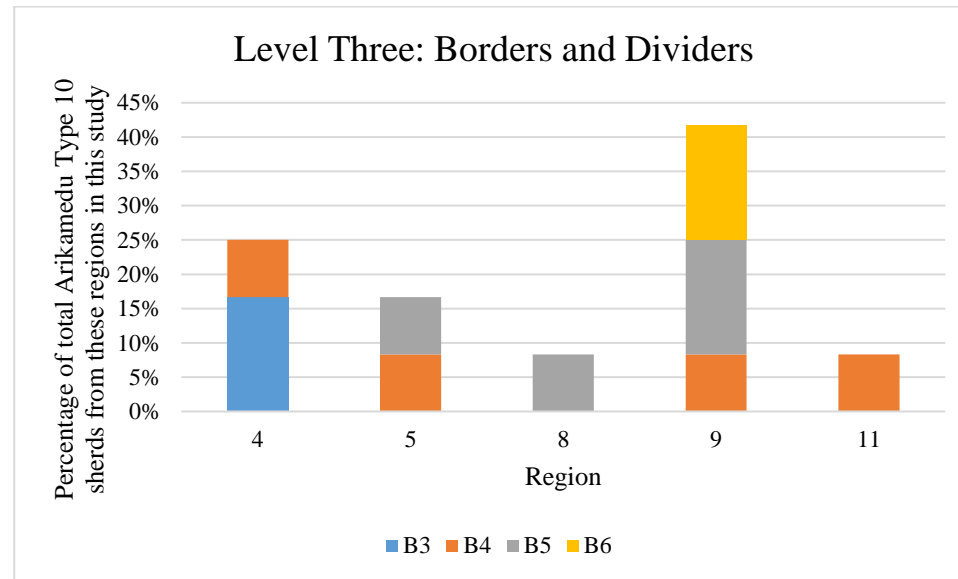


Figure 5.6 Borders and dividers at the Level Three sites



Figure 5.7 Peacock (Image courtesy of rhamm at FreeDigitalPhotos.net)



Figure 5.8 Peahen (photo: author)

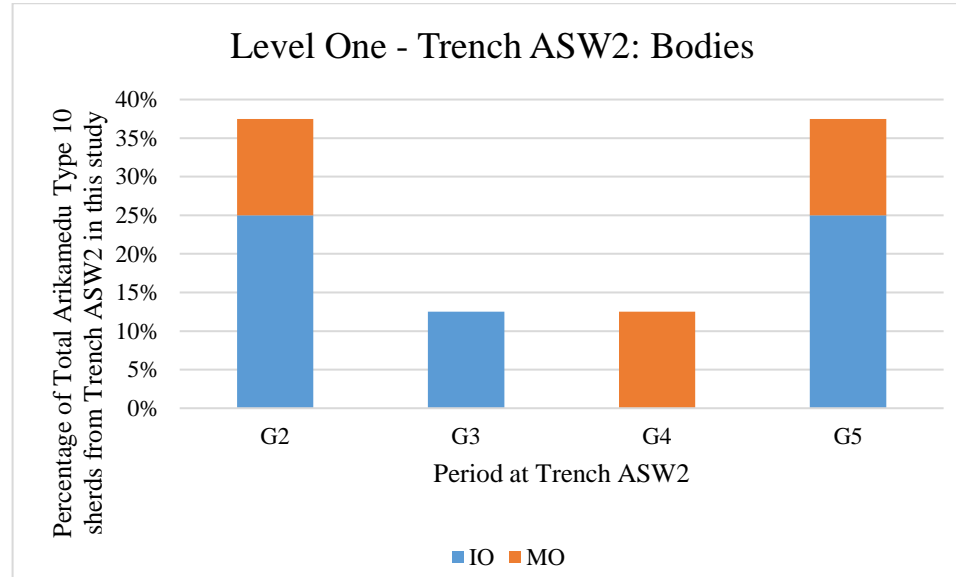


Figure 5.9 Bodies at the Level One site: Trench ASW2

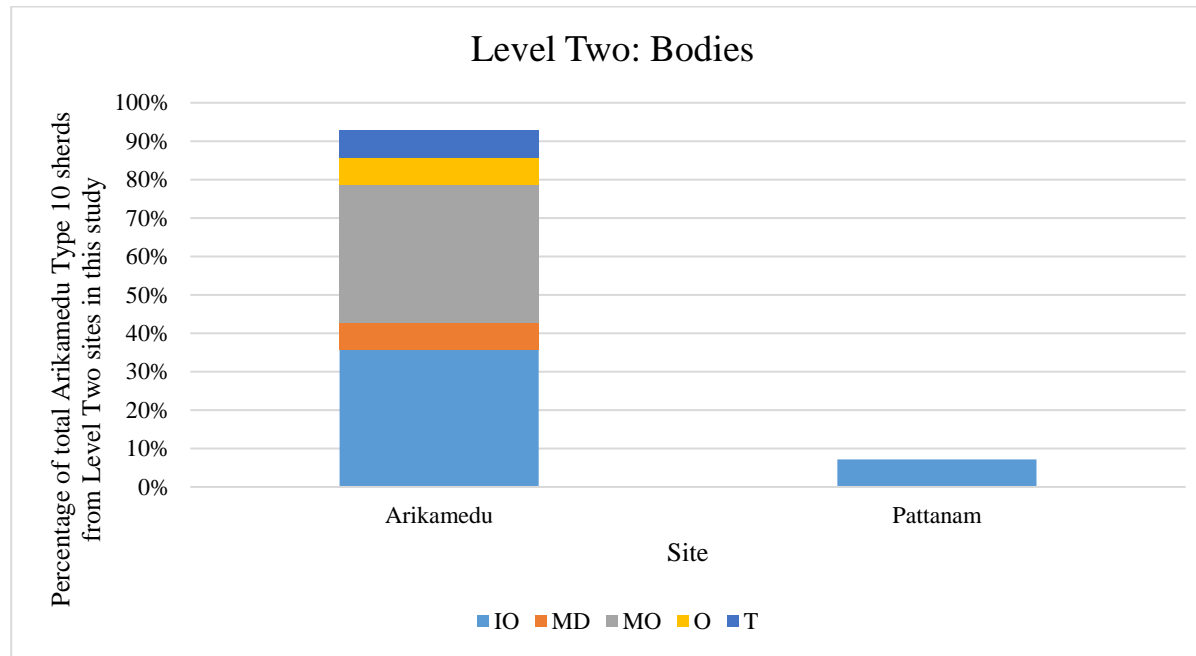


Figure 5.10 Bodies at the Level Two sites

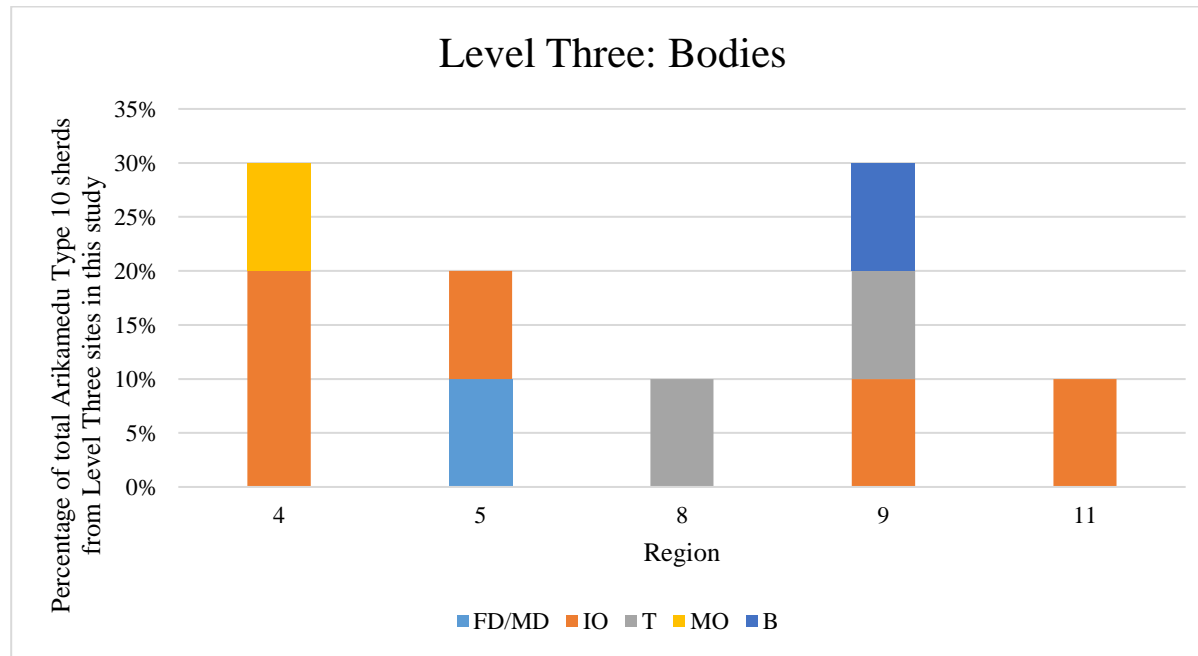


Figure 5.11 Bodies at the Level Three sites

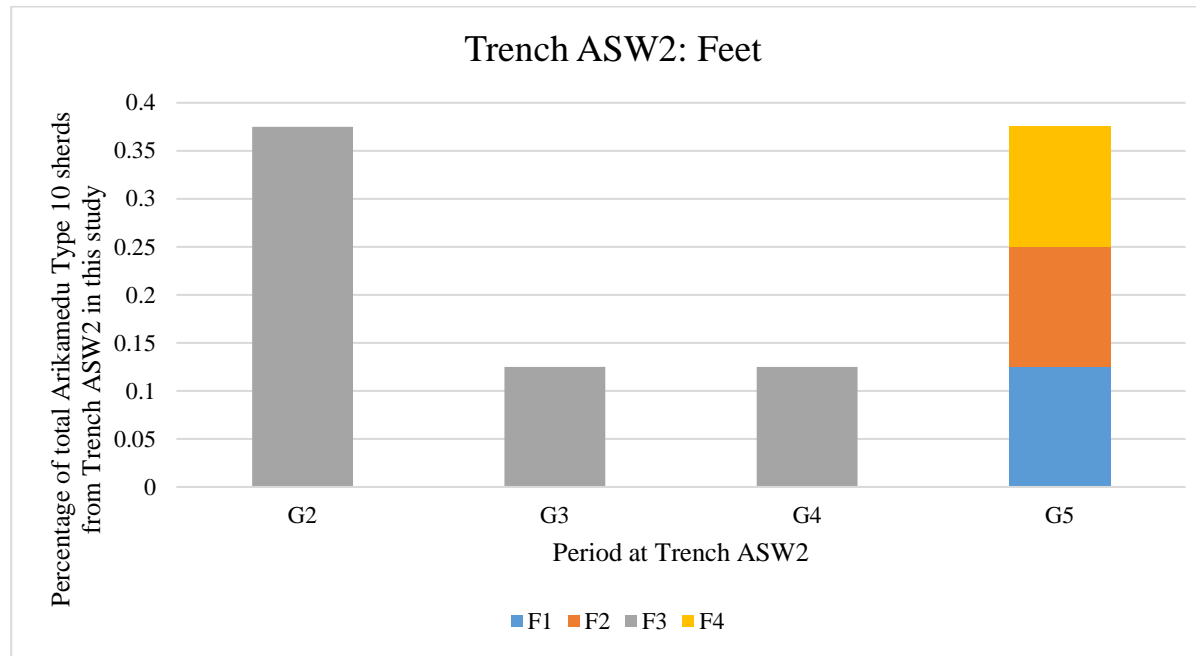


Figure 5.12 Feet at the Level One site: Trench ASW2

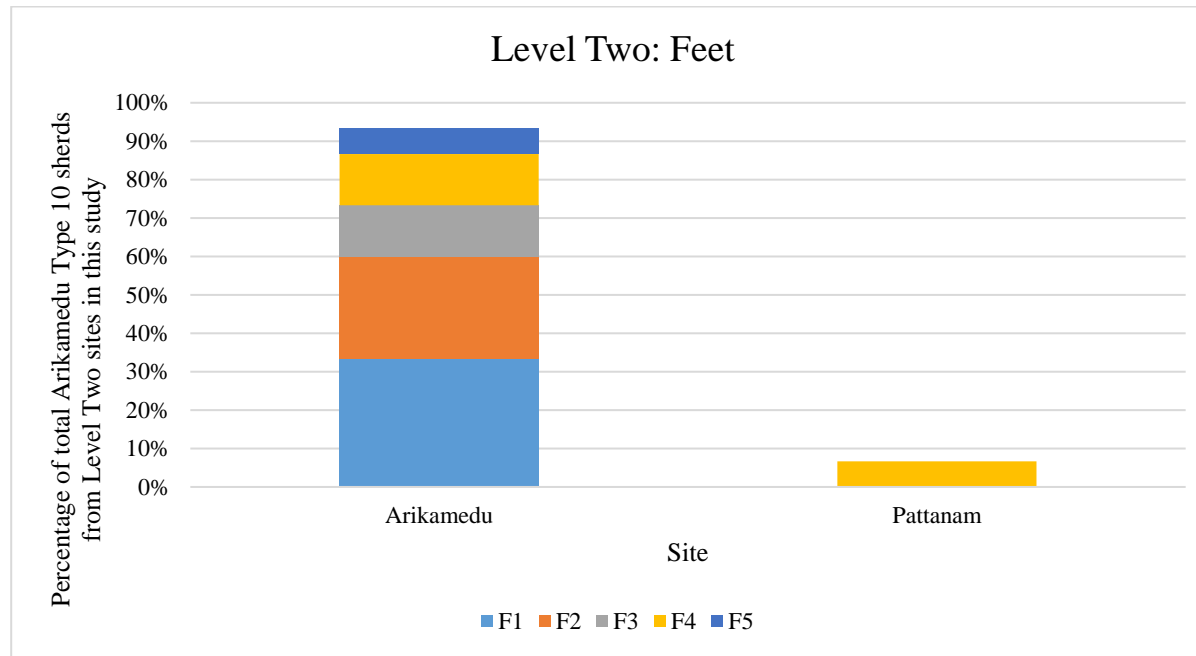


Figure 5.13 Feet at the Level Two sites

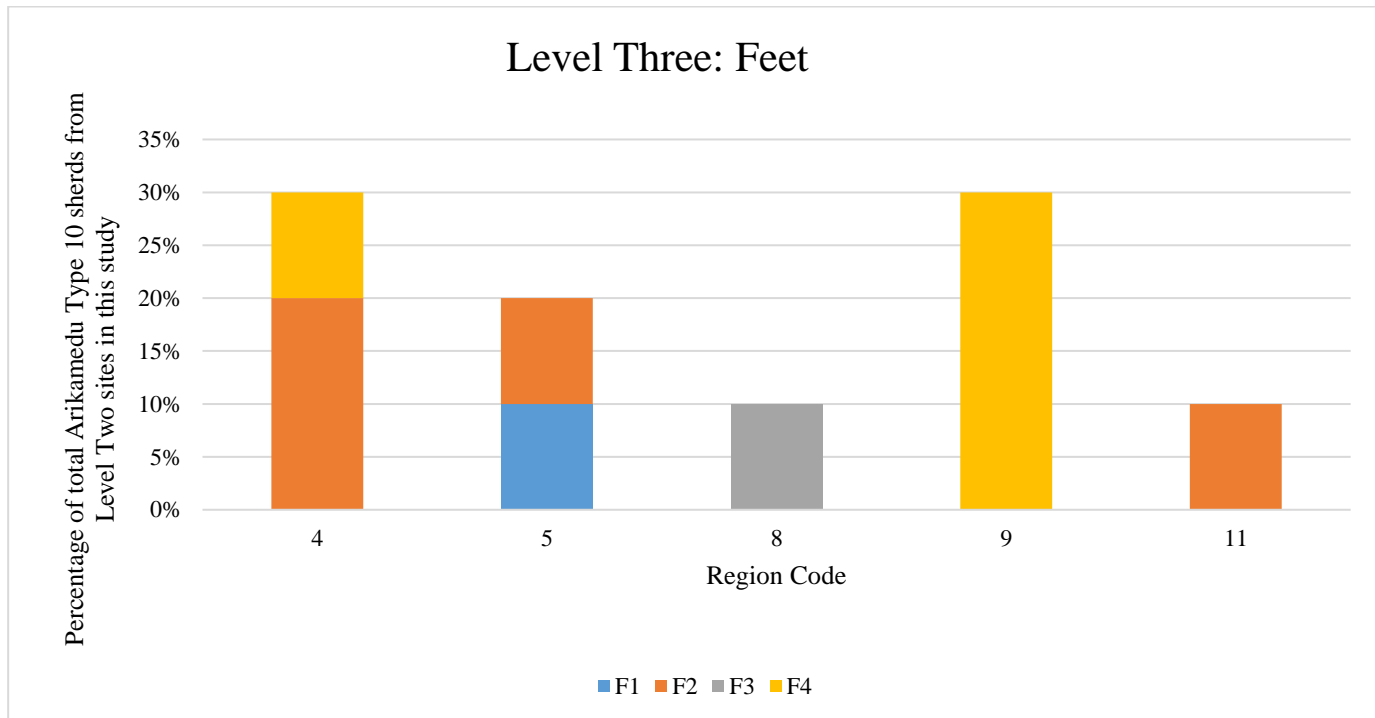


Figure 5.14 Feet at the Level Three sites

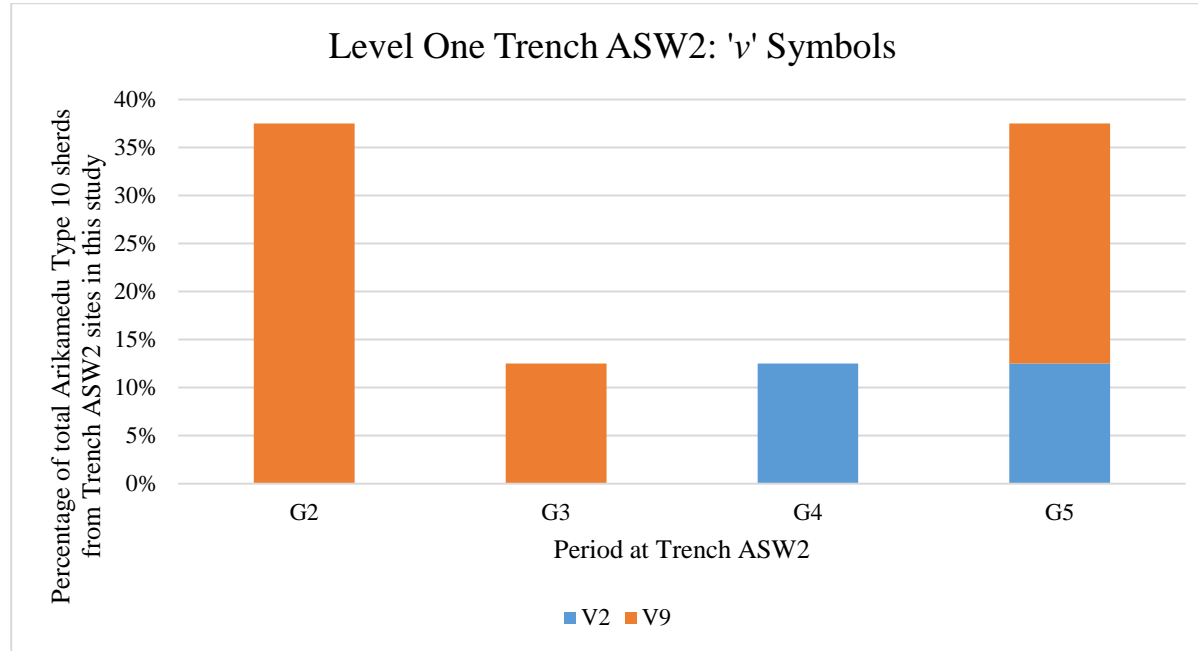


Figure 5.15 'v' Symbols at the Level One site: Trench ASW2

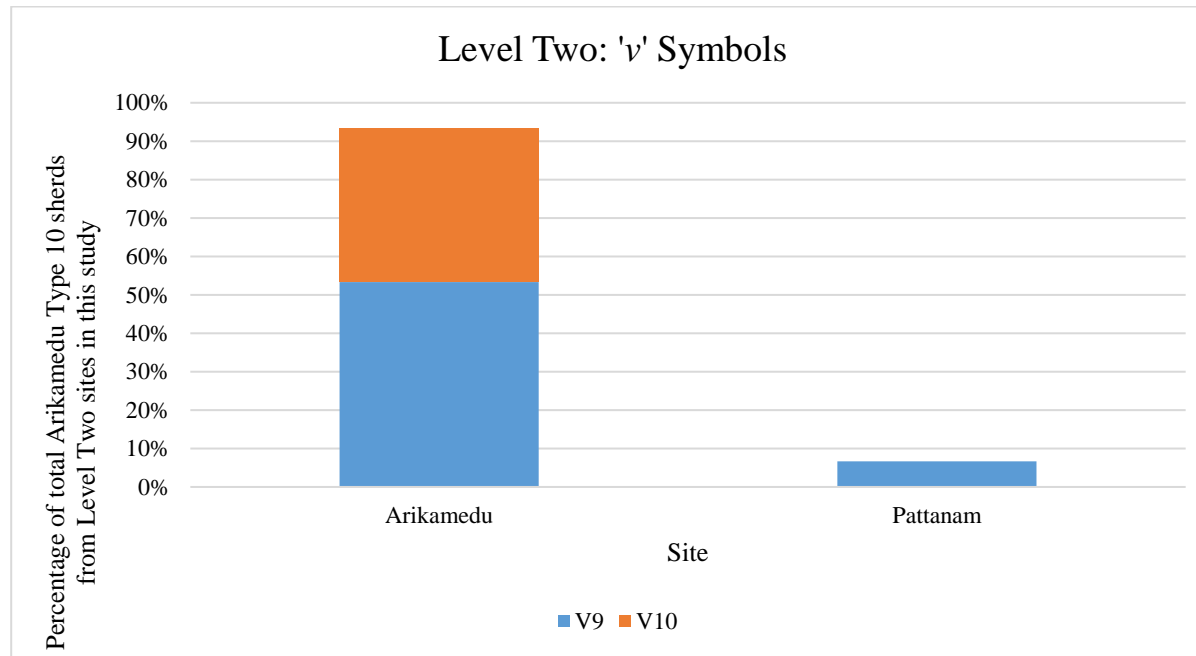


Figure 5.16 'v' Symbols at the Level Two sites

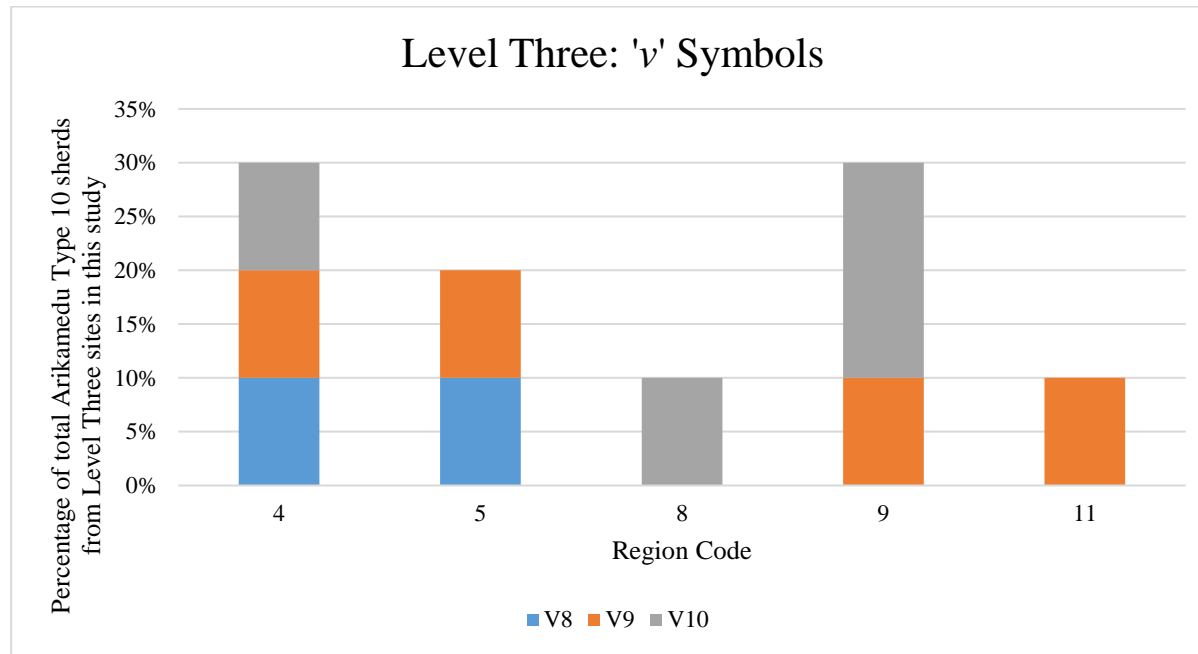


Figure 5.17 'v' Symbols at the Level Three sites

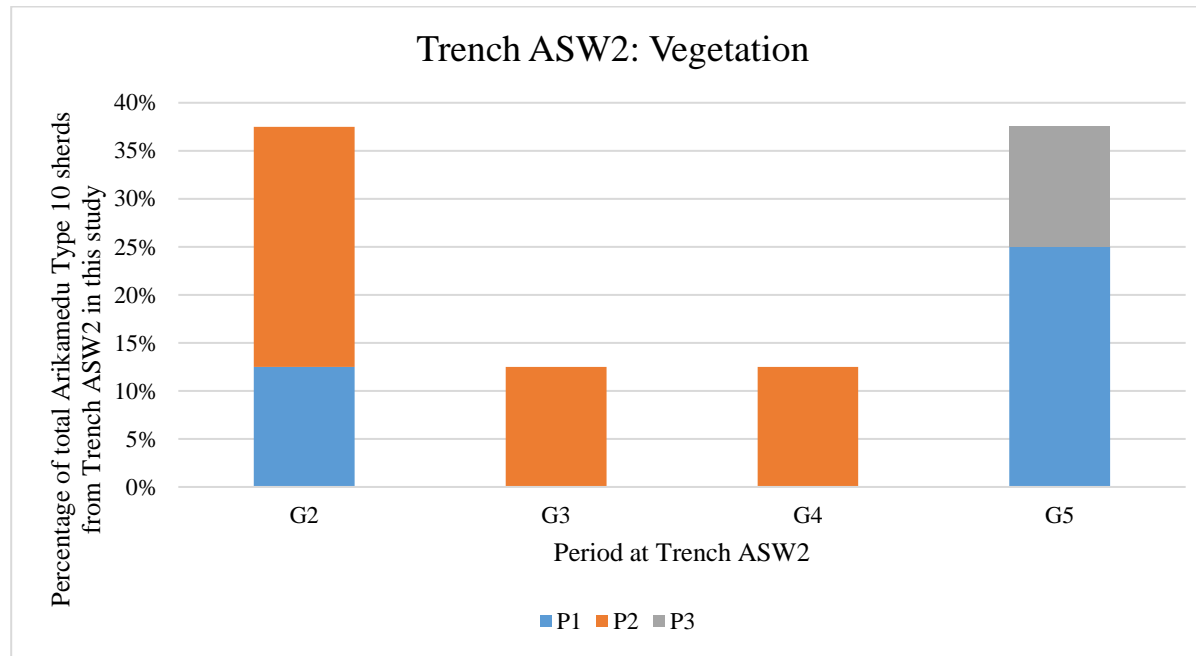


Figure 5.18 Vegetation at the Level One site: Trench ASW2

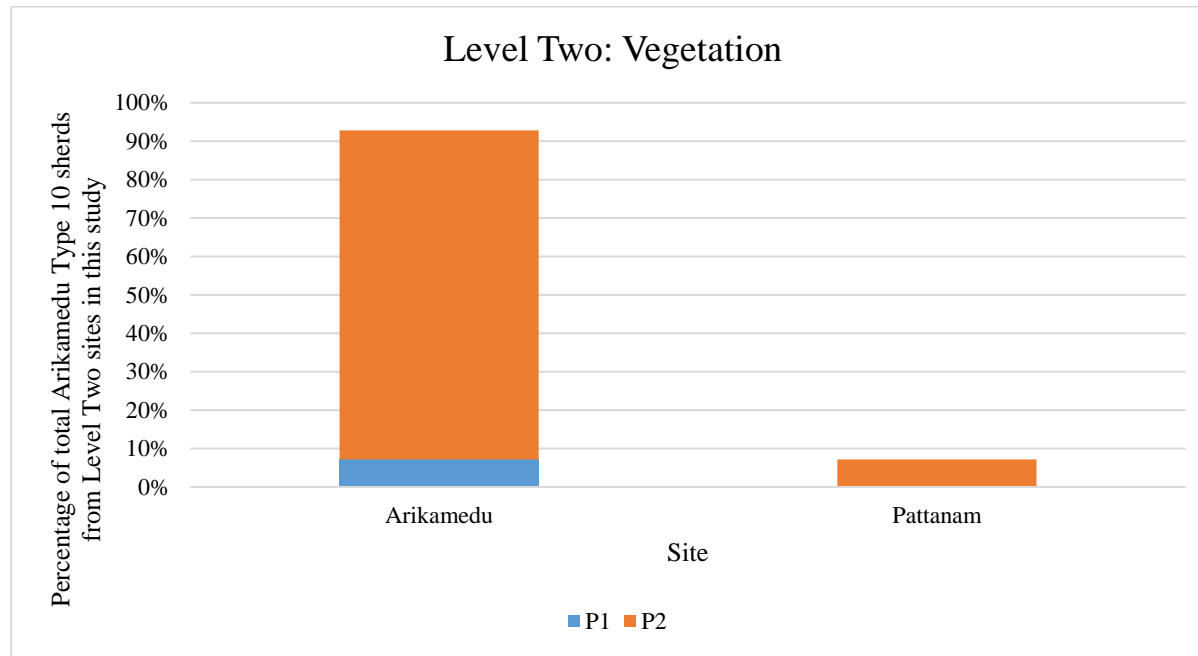


Figure 5.19 Vegetation at the Level Two sites

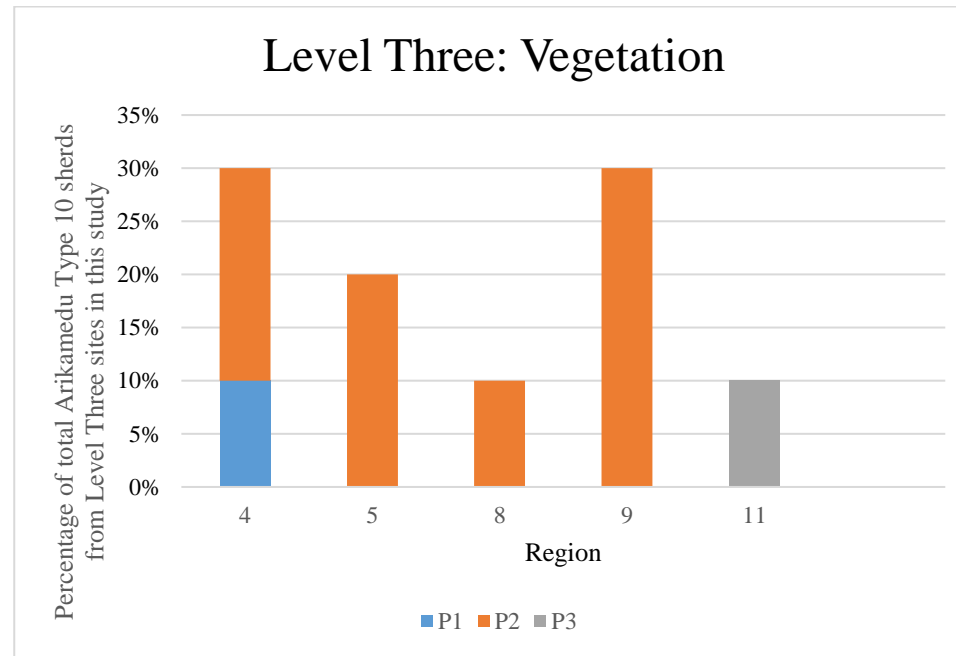


Figure 5.20 Vegetation at the Level Three sites

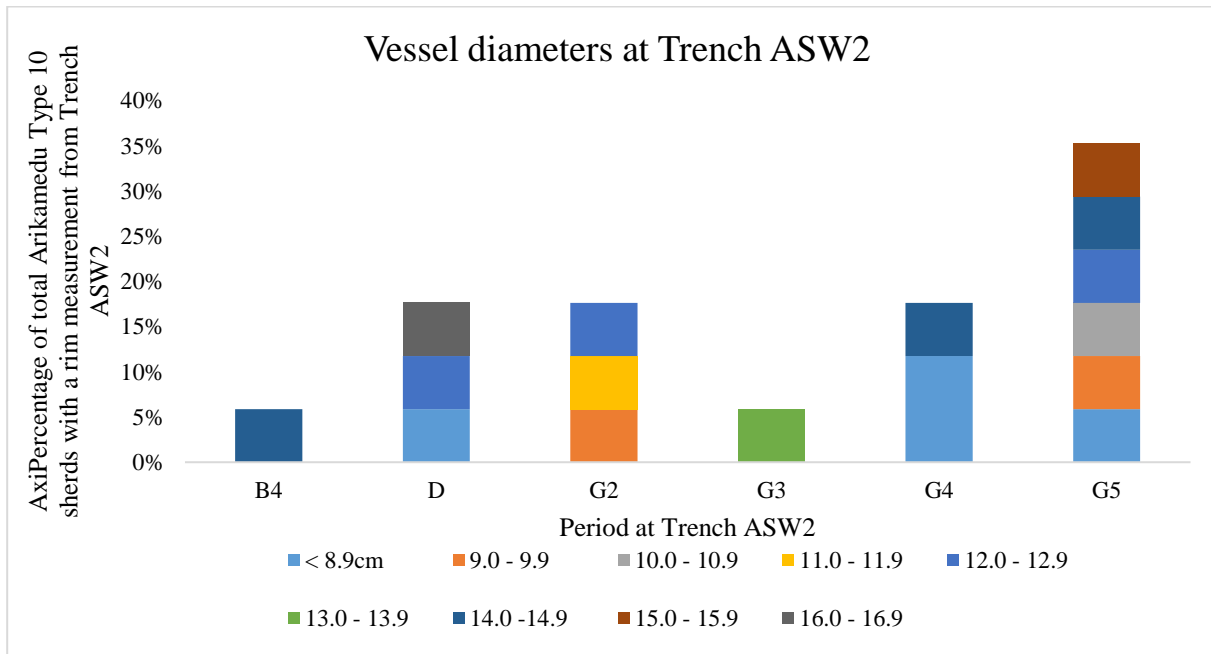


Figure 5.21 Arikamedu Type 10: Vessel diameters (CM) by Period at Trench ASW2 (after Shoebridge 2009)

Chapter Six

Discussion

“Because of its widespread distribution, pottery has always been a linchpin for archaeological analysis. Ceramics still are widely used for chronological determination and for providing indications of both the flow of material, goods and ideas”.

Beaudry (1988: 45)

6.1 Introduction

In the previous two chapters, the analysis of the two ceramics in this study was discussed. Evidence has been presented using the Design Codes system for the Rouletted Ware, and the Component Code system for the Arikamedu Type 10. This chapter will amalgamate the data which was presented, therefore completing Objectives Five and Six of this thesis. Objective Five is to analyse the distribution and chronological changes of Rouletted Ware, and Objective Six is to repeat this for the Arikamedu Type 10. Chapter Six will then proceed partly to complete Objective Seven by comparing the chronological and spatial data from the results of Objectives Five and Six, and it will propose dates for some of the ceramics analysed in this study. The second part of this objective, assessing the significance of the ceramics in relation to the development of networks of communication, will also be discussed in the following, final chapter.

Many of the periods from Trench ASW2 investigated in this research, have certain sherds that stand out as chronological markers – these sherds can be related to comparative sherds from other sites to build up chronological and spatial connections. As there are more Rouletted Ware sherds in this study, it is unsurprising that there are considerably more chronological markers for this ware. It was noted in Chapter Five that none of the Arikamedu Type 10 sherds in this study display the same set of components, therefore certain components that are unique to some of the sherds from periods at Trench ASW2 have been identified, and can be used as chronological markers. Not every period at Trench ASW2 produced sherds that were suitable to be used as chronological markers.

Throughout this chapter, Design Codes, Component Codes and chronological periods are discussed with a focus on whether the chronological markers allow the assignment of dates to sherds, or the proposal of the reassignment of dates, or the confirmation of dates that have been proposed. When using sherds from Trench ASW2 as a chronological marker, consideration needs to be given that there probably would have been a transit time between the production point and its deposition. It is impossible to stipulate how long a sherd would have been in circulation, but by using the data from Trench ASW2, it can be confirmed as to when a Design Code was deposited.

6.2 Period G2

With reference to Rouletted Ware from Trench ASW2, the initial sort which categorised the decoration on the sherds, demonstrated that sherds with the individual linear feature (IL) and the individual linear feature with border (ILB) accounted for most of the sherds (as seen in Figure 4.2). The second most common feature from the initial sort was the Design Code for an undeterminable sherd (ID) and a sherd that was deemed to be an exception (EX) to the established categories, as demonstrated in the graph in Figure 4.3.

Period G2 has been reliably dated to between 200 Cal BC and AD 130, therefore presenting an ideal starting point for attempting to formulate a chronology for the two ceramics in this study (Coningham 1999: Table 1). Begley records Rouletted Ware as being recovered in “*all trenches and associated with almost all loci*” in her excavations at Arikamedu (Begley 1996b: 227) and Wheeler *et al.* dates the first appearance of Rouletted Ware at Arikamedu to “*as early as the end of the first century BC, or the beginning of the first century AD*” and its “*terminal date attributable to c. A.D. 200*” (1946: 46).

When considering the second level of sorting of the Rouletted Ware from Period G2 at Trench ASW2, Table 6.1 along with Figures 4.5 and 4.6 demonstrate the diversity of the data extracted from the Rouletted Ware

across this period. Some of the Design Codes incorporated a question mark to allow for such discrepancies. An example of this is DC90, which is an individual linear feature with *possibly* a triangle roulette indentation, or DC110 which is the same questionable feature but where the linear design has a distinguishable border. However, as it was possible to take impressions of many of the decorated sherds from Trench ASW2, clearer images were available.

Period	Context	Phase	Design Code
G2	643NW	LXXII	DC85
G2	607	LXXI	DC84 DC84
G2	635NW	LXXIII	DC84 DC84
G2	635NW	LXXIII	DC84 DC84
G2	634NW	LXIX	DC84
G2	615NE	LXVIII	DC84
G2	601	LXXII	DC84
G2	601	LXXII	DC84
G2	602NE	LXXII	DC164
G2	635	LXXIII	DC123 DC123
G2	601SE/SW	LXXII	DC104
G2	615NW	LXVIII	DC103
G2	643NW	LXXII	DC103

Table 6.1 Rouletted Ware Data from Period G2

When the data is organised by Design Code, it is clear that the most popular Design Code for this period is DC84 (see also Figure 4.6), also appearing on sherds with two bands of rouletting. DC84 represents an individual linear feature with a spike and is noticeably the most common Design Code across the site in general chronologically. When looking for a comparable period from another site, in her excavation report Begley published a photograph (1996: 243, Figure 4.255) of a selection of ceramics that are from the Northern Sector, an area which she dated to being “*settled in the first century BC perhaps even earlier, and occupation was continuous through the first century AD (or early second)*” (1996: 21). This period is comparable with part of Period G2 from Trench ASW2, so therefore the parallels are worth investigating; the Design Codes can be seen in Table 6.2. Figure 4.9 can also be considered at this point; this graph compares the Design Codes across the Northern Sector at Arikamedu with all the Period G sherds from Trench ASW2.

Design Code
DC103
DC104
DC104
DC104
DC104
DC108
DC123
DC228
DC229
DC63
DC83
DC83
DC83

Table 6.2. Design Codes on Rouletted Ware sherds from Begley's Northern Sector

Initially there only appears to be a limited number of comparable Design Codes between these two sites which are geographically close to each other and, in general, share comparable material culture (Coningham 2002: 102). However, on closer examination there are some similarities. DC84 and DC104 both represent a rouletted design consisting of a linear feature with a spike, however DC104 represents the same feature but where a border on the rouletted band is present, see Map 6.7. There may be borders on the designs

of the sherds that are categorised as DC84, but as they are not visible this cannot be presumed. This difference may be due to larger sherds being recovered at Arikamedu, so more of the pattern may be visible, or it could simply be a coincidence as to how the vessel fragmented.

Using the data available for this study, DC83 appears to be another popular Design Code from Begley's Northern Sector at Arikamedu alongside DC104. DC83 represents an individual linear feature with a triangular roulette design, and the same design with a border can also be seen here – represented by DC103. Although DC83 does not appear in Period G2 at Trench ASW2, DC103 does. Therefore, as a starting point for forming a chronology of Rouletted Ware, through their representation in DC83 and DC84, and DC103 and DC104, spikes and triangles were the most popular features in this period, set in an individual linear design. As mentioned, Begley stated that the area was "*settled in the first century BC perhaps even earlier, and occupation was continuous through the first century AD (or early second)*" (1996: 21). Judging by the comparison of sites Begley was correct to propose that the Northern Sector could be even earlier than the first century BC. This date is more significant as it is likely that the ceramics did not need to travel as far to get to Arikamedu as they did to get to Trench ASW2 from their manufacturing point.

The codes considered above, DC83 and DC103, encompass some of the sherds from the Level One site of Trench ASW2, and also a selection from one of the two Level Two sites in this study, Arikamedu. The available data from Pattanam has slightly wider proposed chronological periods, and the 2007 data in Table 6.3 does come from contexts in trench PT 07 – I which are classed as “*Early Historic*” and interpreted as to between 1st century BC to 5th century AD (see Figure 4.13) (Cherian *et al.* 2007).

	Trench	Design Code
1st century BC to 5th century AD	PT 07 - I	DC102
	PT 07 - I	DC110
	PT 07 - I	DC164
	PT 07 - I	DC246
	PT 07 - I	DC83
	PT 07 - I	DC84
	PT 07 - I	DC84
	PT 07 - I	DC84

Table 6.3. Design Codes from the Rouletted Ware at Pattanam

In stratigraphic level PT-07-1 a range of Design Codes are presented. However, amongst that selection DC110, and DC246, represent undeterminable designs, this detail is also seen in Figure 6.5. The spike design of DC84 does also appear popular here, in common with the sherds recovered at Period G2, Trench ASW2 as discussed above, possibly suggesting a link around the Southeast coast. There is other evidence though

which does support the links between Pattanam and Trench ASW2, and these will be discussed later.

Within the rouletting classed as “spike” there does appear to be distinct division between a sherd with a long spike and a sherd with a short spike. In the Level One and Level Two sites, it is noticeable that only the shorter spikes are present, although later the wider distribution of both types of spike will be discussed. Although there is a slight variation in the design it is highly likely that they are the result of the same workshops or potters. With reference to the sherds classed as DC103, there are definite likenesses exhibited between the sherds from Trench ASW2 and Arikamedu (as discussed above). It can be proposed that these sherds are from the same workshop or the work of the same potter, and may possibly make them a little earlier than Begley’s dates.

Spreading the geographical frame wider, sherds from the Red Sea coastal site of Berenike are also recorded from levels which are chronologically comparable with Period G2. Sherd 4 recorded from BE95/96/97-5 is dated to c. 1st century BC and 1st century AD. From this period and this site sherd 4 was the only image of a Rouletted Ware sherd that was available and suitable for this study, (Begley & Tomber 1999: Table 6-1). This was categorised as DC135 – an exceptional linear feature with possibly a triangular roulette indentation. The sherd itself is quite unusual as the rouletting design displays

a raised effect which appears like a string of beads, however this could be where guidelines have been used. The possibility that this piece is the work of a novice is supported by the uneven lines that are visible on the inner rouletting.

The sherd from Berenike detailed above (sherd 4 in this study) is in some ways unique, from a well recorded site, with an exclusivity being emphasised by the manufacturing faults, therefore it does make a useful chronological marker should any similar sherds from undated contexts appear in this study. Sherd 2058 from Mantai has also been catalogued as DC135. As this Design Code covers a variety of exceptional sherds, it may encompass a range of different features. This sherd from Mantai does have different linear features which are demonstrated by the rouletting band on the sherd appearing to be almost split into three sets of grooves. There is some possibility that the beading effect seen on the sherd 4 may be replicated on the inner grooves, but this is unclear due to the eroded slip on the surface, so presenting a very tentative connection. Both sherds have a line in the design which is unlike some of the sherds discussed in the “groove” category, suggesting that this groove may be a feature of the design rather than a training aid. The linear feature on this sherd from Mantai is split into three sections, and the rouletting design is particularly unusual, there is the possibility that this sherd was a practice piece, or a piece where the potter wanted to demonstrate his skills. It could possibly be a demonstration (or practice) of skills that may be applied to different objects, not necessarily Rouletted Ware. Sherd 4 will have

travelled across the Indian Ocean to Berenike to reach the point where it was deposited in the archaeological record, whereas it is highly unlikely that the sherd from Mantai is as far from its place of manufacture.

There is a further sherd from Egypt that may be of a comparable date for Period G2 recorded at Myos Hormos. The sherd (14) is classed as “*late Augustan*” (Tomber 2002: 28). The Roman Emperor Augustus died in 14 AD, so a sherd which is described as late Augustan can fit into the same chronological parameter as the sherds from Period G2 at Trench ASW2 (Bunson 1991: 463). Sherd 14 is DC63, which is an individual scatter design. Although it is a little difficult to tell from the image available, the sherd may be one of the coarser fabric sherds. The coarser Rouletted Ware is discussed later in this chapter and Chapter Seven; however, it can be noted that if sherd 14 is of this fabric, then the quality of the material used to make the sherd, or the workmanship itself, did not prevent the movement of at least some of these vessels, it was not only the Fine Ware which was distributed.

6.3 Arikamedu Type 10 Period G2

When considering the Arikamedu Type 10 sherds from Period G2, there are two photographs (Figures 6.1 and 6.2) and a drawing (T61) available. All of the sherds from Period G2 are broken above the ‘v’ symbols (if there was one present at the time of manufacture) and shared characteristics are limited in that all the birds face to the right, and none of them have visible feet. The only distinguishing feature is that one of the sherds (T37) has a border of the

type B1 which is a ladder border and is only seen on one other sherd in this study, sherd T36 (Figure 6.3) from Period G3 at Trench ASW2. The border on sherd T37 does appear to be a divider rather than encompassing the entire sherd, however these two sherds do share some characteristics. Both T36 and T37 have round heads with a small beak (H2), are facing the same way, and on closer inspection of the body (which are both incomplete and outlines), a feature, possibly a wing can be seen to be raised. Considering the diversity amongst such a small selection of sherds, these two sherds may demonstrate features which lasted through various chronological periods. Sherd T37 also carries through the foliage detail from previous periods.

Figure 5.1 shows the distribution of bird heads at Trench ASW2 during Period G2 (200BC to 130AD). There are three Component Codes which are represented in the three sherds for this period. H5 (one of the bird head codes) was the only Component Code that was initially deemed suitable to be used as a chronological marker. When observing the locations where these other H5 components have been recovered, they are both from the same location, Tissamaharama. However, Component Code H5 represents unidentifiable bird's heads. The components were investigated to look for any similarities, but none were visible, the identification being hampered by unclear images.

6.4 Periods G3 and G4 – Arikamedu Type 10

On widening the chronological parameters to include the Arikamedu Type 10 from Period G3 and G4 in addition to G2, one image is available

from G3 (T36) as already discussed, and another image is available from G4 (T60). Sherd T60 is represented by a drawing, but although the border has been classed as B6 (lozenge imprint), there is also evidence of part of a ladder style divider present on this sherd. Sherd T36 also has a ladder feature as discussed above. With just the small piece of the border on T60 visible it is not possible to determine its full extent, although it can be stated that the trend for ladder style borders appears to have started in Period G3 and carried on. Sherds T60 and T36 both only provide a fragment of evidence to suggest what Arikamedu Type 10 may have been in circulation during Periods G3 and G5. There may be similarities in the bird's heads, but this is difficult to determine due to what appears to be damage or erosion on the right of the bird on T36.

At Trench ASW2, a sherd with Component Code B6 (sherd T60) was unique to Period G4 and it identifies sherds that have a lozenge surrounding the bird. This code was recorded on the pencil drawings of Arikamedu Type 10 from Wheeler's 1946 report, so this could be artistic interpretation. Sherd T75, which does have a lozenge (and as mentioned below may be the same sherd as T62) and is possibly represented in the drawing of the Type 10a appears to be quite correct (Wheeler *et al.*'s 1946: Figure 17), so that does support the accuracy of the drawings. The sherd from Phu Khao Thong (T57) with a B6 style border is also from an illustration. The two sherds that are represented by photographs are both from Arikamedu, one from Wheeler's excavations (T75) and one from Begley's (T32). The sherd from Begley's excavations is

from trench AV92-XI context 036. This context is described as “*pre-medieval / ancient*” (Sidebotham 2004: 38).

The Component Codes for the vegetation also provide a possible chronological marker for Period G4, but this code represents where there is possibly vegetation present, or the result of surface damage. The presence of vegetation on sherd T76 from Trench ASW2 and T39 from Sembiran (T39) is difficult to either deny or confirm, with the sherd from Sembiran probably presenting the more convincing case.

6.5 Period G3 and G4 – Rouletted Ware

Period G3 does not provide any sherds for this study so will not be investigated in depth at this stage, but G4 does provide some with Design Codes that can be discussed. These sherds are all discussed in other sections within the chapter so not discussed in detail here.

DC105
DC84
DC88
DC84
DC84
DC101
DC124

Table 6.4. Design Codes from Period G4, Trench ASW2

6.6 Period G5

Figure 4.6 demonstrates the diversity of the data across Trench ASW2, and when considering the data from the varying contexts within a period. Some of these contexts are the same, with several representing a fill. Although initially this appears a very random selection; it does highlight the range of Design Codes that were in circulation during the Period G5, and it does include codes where the features cannot always be determined, for example DC90, which is an individual linear feature with possibly a triangle, or DC110 which is the same questionable feature but where the linear design has a border. When the questionable sherds are removed, and the list is sorted, two categories, DC84 and DC164 are the more prominent. The Level One code that is most suitable to be deemed as a chronological marker in Period G5 is the individual Groove code. Although the individual Groove (IG) and the Continuous Groove code do overlap, it is only the IG code that appears in

Trench ASW2. The grooves are discussed later and can be seen summarised in Map 6.14

Period	Context	Design Code
G5		DC133
G5		DC104
G5	385NW	DC164
G5	386NW	DC159
G5	390NE	DC84
G5	395SW	DC103
G5	399SE	DC168
G5	409NE	DC84
G5	409NE	DC89
G5	409NW	DC84
G5	409NW	DC164
G5	416NE	DC110
G5	416NE	DC84 DC84
G5	416NE	DC133
G5	416NE	DC164
G5	417NW	DC84 DC84
G5	417NW	DC91

G5	419	DC164
G5	422	DC96
G5	427	DC84
G5	432SE	DC84
G5	437NE	DC84 DC84
G5	437NE/SE	DC164
G5	437NE/SE	DC84
G5	441NE	DC117
G5	448SW	DC164
G5	490SW	DC104
G5	5626	DC103

Table 6.5. The range of Design Codes from Period G5 at Trench ASW2

On investigating the sherds where the Design Codes included questionable features, DC91 was highlighted as this code does appear at some other sites and was therefore considered further. This Design Code has a definite linear feature (individual linear) but in the second level sort, the design of the rouletting was on occasion inconclusive. Although not an ideal choice as a

chronological marker, there may be some common factors highlighted in the second sort. However, although sherds from five other locations in this thesis were classed as DC91, problems arose in interpreting the designs on some sherds. Having said that, DC91 has raised some interesting similarities; unfortunately, these are not linked to the DC91 sherd from Trench ASW2, so it is not possible to consider these sherds against the chronology of the trench; but they should be investigated. Despite issues with the quality of images, sherd 2090 from Arikamedu and sherd 734 from Brahmagiri potentially display some similarities. This analysis of DC91, revealed that sherd 2077 from Abhayagiri, Sri Lanka, on closer inspection, may also display a pattern that is comparable to some of the sherds that have been referred to as having the wave pattern.

6.7 Arikamedu Type 10 in Period G5

In relation to Arikamedu Type 10, two of the sherds recovered in Period G5 at Trench ASW2 are from the context XCI, (T35 and T76, see Figures 6.4, 6.4a, 6.5) and there is also a further sherd from another context, LXXXVII (T34 – Figure 6.6). A few similarities can be seen from this period in relation to the Arikamedu Type 10 sherds, however, it is not the two sherds from the same context which share some of the same features, but sherds T34 and T35. All the birds on these three sherds face to the right, but that is the only common feature. The heads on the birds on T34 and T35 were classed as having the Component Code H4 (rounded heads with the pronounced eye). There is a modern repair on sherd T34 where the beak would be if the birds

head was facing forward, and a small protrusion can be seen on the other side of the head, which may imply that the bird is looking behind, or this may be the peacock comb. There is no such feature as a comb on T35, but there is a very pronounced beak. Sherd T34 is the only sherd out of the three to display 'v' symbols, and these have been categorised as V2, an asymmetrical 'v' with perfect edges. The other sherds have the break above where the 'v' would be situated should there have been one. One theory that can be proposed on this sherd is that this larger image of the peacock is accompanied by its young – represented by the 'v' symbols, and is about to feed on the berries being carried in its beak. However, this is a theory that probably cannot be extended to all sherds with a 'v' symbol and will be discussed later. Both T34 and T35 appear to have some sort of foliage present in front of the bird, and there may be some foliage on T76, but this is hard to confirm from the image available, probably due to the damage to the sherd. Despite the query over the direction of the head, sherds T34 and T35 are from the same vessel, a claim that was made by Coningham *et al.* (2006: 160); the two contexts they were recovered from were 477NW (T34) an old land surface and 416NE (T35) which is possibly collapse.

Period G5 does produce a range of Component Codes which, on initial inspection, can be proposed as chronological markers, these take in Component Codes from the bird heads, the 'v' symbols and feet. The H3 category which represents a bird's head with triangular beak (as shown in Table 5.3), is seen on sherds from Adam (T72), Alagankulam (T22) and Phu Khao Thong (T57). When these sherds are compared with a sherd from

Trench ASW2 (T76), there is going to be an immediate difference with all the other sherds, as the head on sherd T76 appears to be facing to the left, although the body is facing to the right. Interpreted as a “*dolphin*” by Coningham *et al.* (2006: 161), the sherd is then compared to Wheeler’s Type 10a, and an outline of a bird can clearly be seen on both of these sherds (see Figures 6.7 and 6.8), although misinterpretation can be understood when considering sherd T75. The fluidity of the design for the birds make them difficult to interpret, and this was not a characteristic that was unique to the ceramics as will be discussed later. There are vague similarities between sherds T75 and T76, but nothing prominent enough to draw any conclusions, the necks on the birds are also significantly different. When taking into consideration the drawings of the sherds from Phu Khao Thong and Adam, little can be gained from investigating the sherd from Phu Khao Thong, and it is difficult to commit to any similarities between any of these sherds.

Moving onto the feet from Period G5, Figure 5.12 in Chapter Five, displays the distribution of the bird’s feet components. Here, Component Categories F1, F2, and F4 are present, with everything else that appears in the other periods is classed as F3 (feet not present or feet not visible). When considering the F1 categories overall, there are eight sherds that fit into this category, however, five of the eight sherds are from sherds in Figure 17 in Wheeler *et al.*’s excavation report (1946: Figure 17), where the smaller details such as the feet are rather difficult to interpret. The feet on sherd T34 from Period G5 appear to be sitting on the top of the groove, as discussed previously, perhaps to imply that the bird is perched on something. This may

also be a feature on a sherd from Alagankulam (T23) as on close inspection there does appear to be a slightly raised or a thicker groove, which may be designed as a perch. However, although the feet are possibly comparable, so many of the other features are diverse, it is almost impossible to propose any connections between these two sherds. The type of foot seen in Wheeler *et al.*'s Type 10g (T68), and 10j (T71) from Figure 17 (Wheeler *et al.* 1946) does compare with that component on sherd T34, although this is a very small detail and it will be considered throughout this section.

Period G5 does present other feet components that appear to be chronological markers, however the validity must be considered with this being such a tiny feature, much of the available data being taken from images or photographs that appear pixelated when enlarged. Both Component Codes F2 and F4 also appear to be good chronological markers, and despite the issues mentioned, they were investigated in case of any comparisons. When considering the feet there does appear to be two avenues to explore within the F2 Component Code. One design appears to have the feet flowing out from behind the bird, as if it is in flight, and this applies to all the sherds with this Component Code except for T24 from Chandraketugarh. Sherd T24 shows the bird's legs in a vertical position below the bird and the bird is perched on the grooves or border. This has raised the possibility that sherds T75 and T62 from Arikamedu may be the same sherd, and the investigation into this component has also highlighted the similarities in the sherds from Adam (T73), and Sembiran (T39).

6.8 Period G4

The only Design Code that was deemed suitable for a chronological marker in this category was DC88 (Sherd 576 at Trench ASW2, Figure 6.9), DC88 represents an individual linear feature with the teardrop shaped rouletting. This Design Code was also recovered at Arikamedu and Sisupalgarh. One of the sherds from Arikamedu which was categorised as this Design Code is sherd 15 which is in the collection of University College London, where the catalogue does not propose a date. The other sherd from Arikamedu which also has this Design Code is sherd 67. Both sherds 15 and 67 have two bands of rouletting, with DC88 being the outer rows on sherd 15, and both bands of rouletting on sherd 67. The other sherd which had this Design Code is sherd 743 from Sisupalgarh. Information is limited about this sherd, with Lal's (1949: 86) proposal of the date of AD 50 possibly being influenced by the almost contemporary excavations carried out by Wheeler at Arikamedu and the initial recording of the ceramic. Sherd 15 has considerably more rows of rouletting than sherd 67 on the outer band, sherd 743 has an indeterminable amount due to the break on the sherd. However, there is an unevenness in the rouletting which is common across the three sherds, suggesting at the least, that these sherds played a part in a network of cultural interaction. The sherds from Arikamedu are both from Wheeler's excavations and Begley, following her re-evaluation of Wheeler's date, dated the trench which sherd 67 was recovered from to before 100 BC (Begley 1983: 466). This date proposed by Begley is comparable or slightly earlier than what was proposed for Period G4 from Trench ASW2 (Coningham &

Batt 1999: 128f), however it can be considered that this sherd, with its graffiti, may have adopted a secondary function due to the decoration on it.

When extending the investigation of the “teardrop” rouletting feature, there is a sherd from Arikamedu which is classed as DC108, the Design Code which represents the same as DC88 but with a border. This sherd bears some similarities to the codes designated DC88, but not enough to really postulate any connections with confidence, unlike between sherds 15, 67 and 743 as discussed above.

6.9 Period F AD 200 – 600

Period F is situated in the more recent chronology of Trench ASW2, dated to between AD 200 and 600 (Coningham 1999: xix). Coins recorded at the end of the previous period, Period G, imply a construction date for the pillared hall that is a key feature of Period F to be during the earlier centuries of the first millennium AD (*ibid.*: 129). Radio carbon dating of a sample from the foundations of another pillared hall “*adjacent to the Citadel’s APG sondages*” (*ibid.*) calibrates to between AD cal. 340 to 540 (with a 68% confidence level). Other dateable evidence includes two Late Roman Imperial Third Brasses, one of which can be identified as being manufactured in Antioch during the third and fourth century AD.

When considering the Rouletted Ware that was recovered during this period, Figure 4.3 shows the range of sherds recorded in the Level One Sort. When compared to the other periods, there are more sherds with exceptional linear

features (EX), and interestingly also in this period there are more sherds with interlocking linear features (IN) and sherds that are classed as INB (IN with border). The combination of the EX and the IN suggests that possibly, by the later periods of production, a more diverse range of rouletting was being demanded as opposed to the IL and ILB features that had been more common up to this point. This extension in diversity could be due to the impact of external influences on the designs. However, by this late stage it is also possible that these designs have been in circulation for a while, yet not recorded elsewhere.

When considering the distribution of Design Codes for Period F at Trench ASW2 as shown on Figure 4.5, there is a noticeable increase in the diversity of codes, compared to the different sub-periods that were recorded in Period G, and this is a trend which continues into Period D as well. Period F introduced a range of Design Codes which were not seen previously, and saw the return of some from earlier periods. Period F has a range of Design Codes which are unique to this period, but it is the variety that is noticeable. It can be debated as to whether this was generated through potters gaining extra decorative skills to create more variety on the pottery, and they may be able to demand a higher fee or reward. Alternatively, the demand for a change in the established trends could have been consumer led, possibly being generated from the market at (or closest to) the place of manufacture, and therefore other markets have had the change imposed on them. Craftsmen from other locations may have joined a manufacturing base and either stayed there or passed on their skills to the local population and moved on. The

change in design may also be linked to a variation in manufacturing tools, possibly influenced by fluctuation in the availability of resources. It is discussed in the following chapter as to whether there was negotiation for style as well as quantity.

The variation in styles may also be due to changes in the locations of manufacture. This would possibly be verifiable if some of the production points for Rouletted Ware were found and the date of the vessels manufactured could be proposed. By the time the vessels are appearing in Period F, Rouletted Ware has been in circulation for several centuries and the locations that were producing the early Rouletted Ware may no longer be in existence, possibly due to diversifying into other trades, change in available resources (such as natural resources) or movement of manpower.

Within Period F, although it is not possible to see where any particular Design Code is setting the trend, (as demonstrated in Figure 4.5), the variety of sherds provides a series of Design Codes which are unique to this period from the excavations at Trench ASW2 and therefore can be used as chronological markers.

The codes that are unique to Period F at Trench ASW2 are:

DC84*	DC1	DC107	DC111	DC112	DC122	DC124
DC95						
DC131	DC163	DC23	DC3	DC74	DC93	

Table 6.6 Design Codes that are unique to Period F at Trench ASW2

*it is acknowledged that DC84 is a common Design Code. It has been included here as it appears with DC95 which only appears in Period F.

From this point it can be considered as to where else, within this study, do these Design Codes appear? The appearance could be from either one of the sites that has a published chronology, or from one where there are limited details. Table 6.7 shows the locations where these design codes also appear. However, there are some Design Codes from Period F which do not appear anywhere else in this study, they are listed in Table 6.8.

Design Code	Also seen at:	Seen with any other Design Code
DC111	Level Two site: <ul style="list-style-type: none"> • Arikamedu, Level Three Sites <ul style="list-style-type: none"> • Alagankulam • Phu Khao Thong • Tissamaharama 	At Alagankulam with DC245
DC112	Level Two sites: <ul style="list-style-type: none"> • Arikamedu Level Three sites <ul style="list-style-type: none"> • Abhayagiri 	At Arikamedu with DC103 and DC221. At Abhayagiri with DC103.
DC131	Level Two sites: <ul style="list-style-type: none"> • Arikamedu Level Three site <ul style="list-style-type: none"> • Kantarodai 	
DC163	Level Two sites:	At Arikamedu with DC171

	<ul style="list-style-type: none"> • Arikamedu • Pattanam <p>Level Three site</p> <p>Mantai</p>	
DC3	<p>Level Two site:</p> <ul style="list-style-type: none"> • Pattanam 	
DC95	<p>Level Two site:</p> <ul style="list-style-type: none"> • Arikamedu 	

Table 6.7 Appearance of the Design Codes recorded in Period F

DC1
DC107
DC122
DC23
DC74
DC93
DC95

Table 6.8 Design Codes that appear at Period F that are not found elsewhere in this study.

Sherd 526 from Trench ASW2 is categorised as DC111, and sherds from Phu Khao Thong (Chaisuwan 2011: 94), Alagankulam (Begley 2004: 269), Arikamedu (Wheeler *et al.* 1946: Plate xxvib (3)), and Tissamaharama (Schenk 2006: 124) are also classified the same. This Design Code however, is representative of sherds which have a border, but the rouletting itself is difficult to identify. The sherd from Trench ASW2 does have some concretions which cannot be removed with a gentle clean (using the method detailed in Chapter Three), so further cleaning was not carried out to prevent any possible damage. The need for less precise categories such as this is primarily the result of the quality of some of the images that are available for this study.

The image for Phu Khao Thong was extracted from a small image in the publication and has not enlarged well enough to produce an interpretable representation. It is possible to see that the linear features are in a form of wave. This wave feature is reflected in the DC111 sherd from Tissamaharama, but again the actual rouletting is difficult to interpret; however, it could be considered that the wave linear feature is a characteristic trait of a particular potter or group. The border that appears is on the inner rouletting on the sherd from Tissamaharama, and on the outer edge on the sherd from Phu Khao Thong.

In her 2006 article, Schenk proposes that from the study of Rouletted Ware at Tissamaharama, the production of Rouletted Ware ceases in the first century BC. However, the ceramic is given the role of an heirloom, therefore appearing throughout sites which have an extended, or “*residual chronology*” (2006: 123). The re-use of the vessel will be discussed later, but the question can be raised that if the production of the pottery ceased in the first century BC, then the increase in designs, and possibly unique designs recovered at Period F at Trench ASW2 could only be explained by sherds that were stored elsewhere before being recovered, or had faced a period of extensive reuse, and this does not appear to be the case.

Design Code DC112 was recorded at Arikamedu and Abhayagiri, and interestingly, as seen on Table 6.7, the code is accompanied by another style of rouletting, being either DC103 and DC221 (sherds 17 and 2071 at Arikamedu and sherd 2079 at Abhayagiri). At Arikamedu DC112 is also recovered with DC221 (sherd 48). DC112 is a band of rouletting which contains dots, and has a border, and DC103, is an individual linear feature with a triangular rouletted decoration and a border. DC221 is again an individual linear feature with border, but where the rouletting design consists of diamonds and triangles. Begley (2004: 268) dates the contexts where sherds 48 and 53 (sherd 53 is DC112 only) were recovered to between the middle of the first century AD, through to possibly the second half of the second century AD, therefore chronologically overlapping with the parameters of Period F at Trench ASW2, and proposing a stylistic connection.

The combination of DC103 and DC221 occurs several times at Arikamedu, and raises the question as to how many of the sherds had two bands of the same rouletting, or was it the norm to see two different types of rouletting together? At present this is difficult to deduce, as the majority of the sherds recovered have just a single fragmented piece of rouletting on. It would only be possible to propose an answer should larger sherds with more of the rouletting pattern on be recovered. The sherd with the DC112 design from Abhayagiri (sherd 2079) is the geographically closest sherd with this code to Trench ASW2. This sherd also has rouletting classed as DC103, but the image available was very small and was quite difficult to interpret, and incidentally, is referred to the authors of the publication as an import (Bouzek & Deraniyagala 1985: 591).

On viewing the sherds with the DC112 Design Code, although there are the issues with the clarity of the images, there are shared characteristics which are visible across some of the sherds. Connections can be postulated between sherds 17 and 48 from Arikamedu, and sherd 535 from Trench ASW2. These sherds appear to have inconsistencies in the pressure of the rouletting, and there are areas of the rouletted design which appear to have a shallower rouletting design than seen elsewhere. This is emphasised on sherd 535 in Figure 6.11 / 11a, where the different degrees of depth appear to be highlighted, the shallower rouletting is central, highlighted in the box, but some of the outer rouletting appears to have the gouged appearance, and this

is reflected in the cast of the sherd (Figure 6.11a), particularly in the outer border. There is also a relatively wide gap between the inner row of rouletting and the second row in on sherd 535, a trait also seen on sherd 17 from Arikamedu.

6.10 DC131

DC131 appears at Arikamedu and Kantarodai in addition to Trench ASW2 during Period F. This Design Code represents sherds with an exceptional linear pattern and an indistinguishable rouletting feature; although not initially appearing to be a potentially useful code, the sherds were investigated to check for any shared characteristics. With the exception of sherd 527 from Trench ASW2 (Figure 6.12 / 12a), the sherds in this category are difficult to interpret. Sherd 527 does present a rather gouged appearance, but closer observation of the cast (Figure 6.19a) shows that there are triangle indentations in the rouletting design.

Regarding the two other sherds recorded as DC131, sherds 2065 from Kantarodai and 2083 from Arikamedu, unfortunately the designs are virtually indecipherable. On sherd 2083, the linear feature appears to be two sets of lines with a border at the edge and a haphazard design running horizontally through the middle of the sherd. The sherd from Kantarodai (2065) is from a very small image and difficult to enlarge. On this sherd it is challenging to decipher as to whether rows of dots or an interlocking design are being viewed. This may be clarified by inspection of the sherd itself. In her 1967 article on Kantarodai, Begley classed Rouletted Ware as the “*Type A*” ceramic

for the site, and stated that “*It is identical with the Rouletted Ware and its variants from Arikamedu*” (1967: 25). Although the images supplied by Begley in this article are generally too small to be analysed, later in the article she did discuss how the Rouletted Ware at the site could provide a useful dating tool (*ibid.*: 26) and based that on the dating information supplied by Wheeler. These excavations at Kantarodai are prior to Begley’s at Arikamedu (Begley 1996). Begley acknowledged the need for further “*substantial*” (1967: 27) excavations to propose a more specific date and highlights how similar sherds which have been recovered from Kantarodai and the Gedige site at Anuradhapura, may be used to infer contact between the two locations. This proposal referred to Rouletted Ware, and the ceramic that she labels as Type B, which is comparable to the Megalithic Black and Red Ware recovered at sites across Southern India.

In the Arikamedu excavation report, Wheeler *et al.* describe sherd 2083 as Coarse Ware (1946: xxvib). On comparison, it is difficult to clarify if sherd 2065 from Kantarodai is of a similar fabric and finish. If the actual sherd was inspected it would be possible to confirm or deny as to whether the sherd from Kantarodai is of coarse fabric or not, as this could support earlier proposals that coarse fabric was considered to be worth exporting, whether as a saleable product or something which travelled as someone’s personal possessions. Sherd 547 from Trench ASW2 as mentioned above does present a rather gouged appearance, and proposes that there may be some connection between Wheeler’s sherds recorded in the coarser fabrics and the gouged designs. Sherd 547 is from a later Period for Rouletted Ware, and Wheeler *et al.*

comment that Coarse Ware at the site is recovered through all phases of the Southern Sector, but only in the later phases of the Northern sector (1946: 48). It can be proposed that due to the extended life of the Coarse Ware at Arikamedu that some of it did get circulated and will be recovered elsewhere. This will be discussed below and further in the following chapter, highlighting the need for proper recognition and recording. Although no identifiable manufacturing tools have been recovered for any of the ceramics in this study, it would be interesting to see if the quality of the rouletting wheels differed for the coarser sherds.

6.11 DC163

The Design Code DC163 is found at Arikamedu, Mantai and Pattanam, and in common with majority of the sherds in Period F, this Design Code does not seem to have a particularly wide distribution network. All the sites are reasonably close to each other, and close to the most likely location of the manufacturing point (South India). DC163 represents a sherd where the linear feature is unidentifiable, but the actual rouletting consists of triangles. As with DC131 above, there is potentially no useable data to be recovered from sherds such as these, but they will be investigated.

The sherds from Pattanam that are classified as DC163 have a small part of the design on the sherds visible, there is a little erosion and some concretions which can present difficulties when trying to glean any data from these sherds.

What is noticeable about one of these sherds (1043) is that it has a particularly rounded side. Evidence of Rouletted Ware discs are recorded at Trench ASW2 (Coningham *et al.* 2006: 150f), and throughout South India worked ceramic discs are recorded, often classified in South Indian Museum collections as gaming counters or “*Hip hop*” as shown in Figure 6.13. This will be discussed further in Chapter Seven, although Sherd 1043 may be a partially worked disc (Figure 6.14).

The impression taken from the small amount of rouletting on sherd 497 (Figure 6.15 / 15a) from Trench ASW2, which is also DC163, shows triangular rouletting features which appear to be doubled up, followed by a gap, and possibly a raised line at the back of the design which may have acted as a guideline (see Figure 6.15a), as first discussed in Chapter Four. It is difficult to deduce further information about this Design Code from the sherds available. Sherd 1043 from Pattanam may also have a design where the triangles are paired up, but this is difficult to verify.

Sherd 2057 from Mantai which has been categorised as DC163 presents a clearer image and an interesting design. As seen with sherd 2083 above from Arikamedu, the actual linear feature is a significant change from what is expected. Sherd 2083 does not have a gap between the two sets of the rouletting, but a pronounced change in the linear feature, sherd 2056 from

Mantai does have a small gap between the rows of rouletting, but not of the size that would be seen between the actual bands of rouletting.

6.12 DC3

The Design Code DC3 is the final code which is recovered in Period F but is not unique to this Period. This Design Code represents a code which has an interlocking linear feature with triangles. DC3 has only been recorded by this research in Period F at Trench ASW2 and from the 2008 excavations at Pattanam. The sherd from Period F (sherd 533), is shown in Figure 6.16 / 16a. It appears to be a triangle design with a base line along the triangles that is providing the wave effect. The other sherd classified as DC3 is sherd 1079 from Pattanam (as seen in Figure 6.17), which displays a visible wave which is highly comparable to sherd 533 from Trench ASW2. The edge of the rouletting on sherd 1079 has some concretions so it is difficult to ascertain as to whether this sherd has a concentration of rows at the edge of the rouletting like sherd 533 does, but the two sherds represented here display such strong similarities, it can be proposed that they are manufactured by the same potter (or group of potters). It could be argued that this design is simply a triangle – which is appreciated when observing the impression of sherd 533, however by having the interlocking feature in the initial sort, alternative features are noted, confirming that the wave design was in circulation during Period F. The sherd from Trench ASW2 is from context 369 which represents one of the pillar supports that was excavated from Period F, suggesting that this may be one of the later designs of Rouletted Ware, where after mastering a simpler design, diversity and complexity were introduced.

6.12.1 Period F, other Design Codes

Table 6.8, shows a selection of sherds from Period F that have Design Codes which are unique to that period. These seven sherds are primarily formed from the less common or more difficult to clarify Level One sherds, although the Level Two sort characteristics are the more common types. Design codes such as DC123, one of the exceptional (EX) Design Codes was investigated, but there were no similarities with other sherds which warranted the investigation being progressed. The Design Code results which are seen here that are a little more unusual are IN and INB, these represent an interlocking design (or interlocking with border) at Level One. DC1 represents an interlocking design with diamond rouletting, and DC23 is an interlocking with border and triangle rouletting, and also present is DC74 which indicates individual scatters and borders, and possibly a spike and triangle design. These more unusual configurations of rouletting would increase the traceability of the sherds as opposed to the spikes, triangles and diamond rouletting that appears on them as well. However, due to the regular design on the vessels of Rouletted Ware, it is highly likely that there are more of the sherds of the Design Codes featured in Table 6.8 still in the archaeological record, these could either complete the vessels for which there are sherds in this study, or may be from other vessels made using the same (or similar) rouletting wheel.

6.13 Period D

Following on from Period F, sherds of Rouletted Ware and Arikamedu Type 10 are recorded in Period D. Period D however, is represented by a series of robber pits that are cut through from above into the structures below, and are all directly located next to a stone feature which demonstrates that the robbing was “*of an epidemic nature*” (Coningham 1999: 80). Therefore, the disturbance in this period makes it impossible to confirm where the sherds in this context were originally deposited. Because of this, the Design Codes of these sherds will be investigated to see if, and if so when, they appeared at the other parts of the site. The circulation of the sherds found in this Period will also be discussed outside Trench ASW2.

	Unique to D?	Distribution at Trench ASW2	Also recovered at:	
DC101 DC103	Both N	DC101: F, G4 DC103: F, G2, G5	DC101: Arikamedu DC103: Alagankulam, Arikamedu, Berenike Mantai, Nasik. Pattanam	
DC103	N	F, G2, G4	As above	
DC105	N	G4	Arikamedu	
DC106	Y		No other appearance in this study	
DC177	Y		No other appearance in this study	
DC41	Y		No other appearance in this study	
DC43	Y		Amaravati	
DC84	N	F, G2, G5	Arikamedu Brahmagiri Chandraketugarh, Chandravalli Malhar	Tamluk Uraiyur, Phu Khao Thong, Wari Bateshwar

			Sisupalgarh	

Table 6.9. The location of the Design Codes recorded in Period D

6.14 DC84

The Design Code DC84 recovered during Period D and mentioned above, is by far one of the most commonly occurring Design Codes in this study. This Design Code, is interpreted as an individual linear feature with a spike, and in addition to its recovery from Periods F, G2, G5 and D at Trench ASW2, Pattanam and Arikamedu, this spike design is very common throughout the sherds from South India recorded in this study. There is a noticeable variety in the length of the spikes on the sherds with some being longer (such as sherd 774 from Tamluk) and some being quite tiny, a common feature at Pattanam (as seen in sherds 1114 and 1133, Figure 6.18). Although the geographical spread of this code is reasonably clear in Map 6.7, what is more difficult to interpret is any chronology for this particular Design Code. On investigating the distribution of the longer and shorter spikes, it may be possible to propose chronological or spatial distribution networks.

Site	Long spike	Short spike	Dated?	Any visible manufacturing faults?	Additional notes
Level One Site					
<input type="checkbox"/> Trench ASW2		Yes	G2- 200 BC – 130	Yes	Sherds 513 and 588 double indentations. 579 possibly a double design or a manufacturing fault.
Level Two Sites					
<input type="checkbox"/> Arikamedu		Yes		Yes	Overlapping
<input type="checkbox"/> Pattanam		Yes	Early Historic -1st century BC to 5th Century AD	Possibly.	
Level Three Sites					
<input type="checkbox"/> Brahmagiri		Yes		Yes	736 – Fainter towards the centre
<input type="checkbox"/> Sisupalgarh	Yes			Yes	742 - Overlap

<input type="checkbox"/> Chandravalli		Yes			The spikes are very close together
<input type="checkbox"/> Uraiyur	Yes			Yes	Overrun
<input type="checkbox"/> Malhar		Yes		Yes	Overlapping
<input type="checkbox"/> Tamluk	Yes	Yes	Circa first second t A. D o centuries		Double spike pattern row of single short spikes
<input type="checkbox"/> Tissamaharama*	Yes			Possibly	Interlocking Spike pattern where the rows of spikes appear to make almost one long spike.
<input type="checkbox"/> Wari-Bateshwar		Yes		No	
<input type="checkbox"/> Phu Khao Tong	Yes	Yes		Possibly	

Table 6.10 Location of DC84 Sherds, * and DC4 sherds, see below

The sherds categorised as DC84 demonstrate a wide diversity within this single Design Code. The long spikes are recorded at five locations, Sisupalgarh, Tamluk (which has both long and short spikes) and Uraiyr, which are all positioned on the eastern edge of India, Tissamaharama in Sri Lanka, and also Phu Kho Thong in Thailand. It is clear in Map 6.1, how two of the sherds are geographically located close together. The Rouletted Ware from Tamluk is from Period III at the site, and this has been interpreted as circa first to second centuries A.D. (IAR 1954 – 55: 20), and according to the Indian Archaeological Review of 1954 – 55 (20) a “*profuse occurrence*” of Rouletted Ware was recovered at the site. The IAR of 1954 – 55 does state that the Rouletted Ware was “*believed to be ultimately originating in Rome*” (IAR 1954 – 55: 20), which is not surprising as this publication was contemporary to Sir Mortimer Wheeler’s publication “*Rome beyond the imperial frontiers*” as discussed earlier in this research. The two sherds from the site of Tamluk are particularly interesting; with only published images of small sherds there is not a great deal of data available to extract, but sherd 777 from Tamluk exhibits a double (long) spike design, rather than single spikes, (IAR 1954 – 1955 Plate xxxvii). It is difficult to decipher through the available image, but the other DC84 sherd in this study from Tamluk (sherd 774) also seems to display a unique characteristic in that there is just a single row of small spike rouletting accompanied by some grooves (IAR 1954 – 1955 Plate xxxvii). Other sherds from this site will be discussed later, but it may be considered that this port site possibly attracted a variety of different demands in the terms of style. Sherds of a Design Code not found at Trench ASW2 have been added to the table above, as it also features the long spikes, but this sherd, 2050 from Tissamaharama, is classed as DC4 due to its interlocking nature.

The earliest Rouletted Ware sherds from Sisupalgarh are those which Lal (1949: 86) in his excavation report describes as being from AD 50, Period IIB at the site. The data from the Rouletted Ware at Uraiyur was extracted from a cast, and unfortunately there is little information available. Sherd 754 has evenly spaced rows of rouletting, and interestingly the inner design only appears to consist of two rows, this, along with the sherd mentioned above from Tamruk (sherd 774) above demonstrated further examples of variety. Therefore, it can be tentatively proposed that there is chronological and geographical links between these three locations.

Map 6.1 demonstrates how the DC84 sherds which have the shorter spikes are concentrated around the south of India, and with a bias towards the west, apart from those recovered from the Level One site of Arikamedu. The sherds recovered at different periods at Trench ASW2 help to support the chronology of this design, and the DC84 sherds that were recovered at Trench ASW2 were recorded in Period D, G5, G4 and G2 in addition to Period F. The sherds seem to have been at their most popular in Period G5, but by the time of their appearance in Period G2 (200 BC – 130AD) it certainly was not an unusual design, apparently keeping its popularity through Period F as well. It is not possible to provide any dating evidence for the sherds from Arikamedu, whereas two of the DC84 sherds from the 2007 excavations at Pattanam are from a context that was dated to between 1st century BC to AD 5th century.

The sherds classed as DC84 but with shorter spikes from the Level Three sites, have a varying amount of data available. However, the sherds display the characteristic of having all the spikes relatively close together. Many of the sherds have a characteristic which could possibly deem them to be imperfect – for example the sherd from Malhar has varied spacing in the rouletting (which may be an error on the actual wheel itself), and the rouletting on sherd 736 from Brahmagiri gets narrower towards the middle, which may possibly be the result of some difficulty in holding the rouletting wheel at such an angle. As discussed in Chapter Four, there appears to be questions as to what is an acceptable design – in both rouletting style and the quality of the finished product. Map6.2 summarises the distribution of the manufacturing faults.

Three sherds of DC104 (individual linear feature with spike and border) were recovered from Trench ASW2 and these are spread across Periods G5, G2 and F. What is noticeable is that sherds 573 (Figures 6.19/19a) and 595 (Figure 6.20/20a) do have the longer spikes as detailed above extending the chronological distribution of this feature. This emphasises that this characteristic was in circulation prior to AD 130, therefore possibly pushing back the date of the sherds at Tamluk a little earlier than published. However, it must be considered that as these sherds are probably removed from the source of production, there is uncertainty about the network travelled and the time taken for them to reach such a location.

DC104 also appears at the Level Two site of Arikamedu, Figure 4.255 in Begley's first volume of her Arikamedu excavation reports (Begley 1996) shows examples but

it appears that two of the sherds (74 and 82) are from the same vessel and the rouletting is formed into a slanting design. At present these characteristics do not seem to match up with others seen. Sherd 1651 from Pattanam may also have a double spike pattern (with the shorter spikes) but this is difficult to determine due to the concretions on the sherd.

The Level Three sites also provide some examples of DC104. Sherd 774 from Sisupalgarh provides a very different design – with what appears to be tiny spikes in an interesting wave pattern. Wave patterns are mentioned above but this feature is different, and appears to be quite unique. Interestingly, when the search for DC104 is expanded further to take in the sites at the geographical edge of this research, examples are provided that expand the distribution of the DC84 / DC104 sherds. DC104 is recovered from Mahastangarh (690) and from Phu Khao Thong (705). The condition of the sherd from Mahastangarh does raise questions as the spikes may be eroded features of a different shape, but there does appear to be areas on the surface of this sherd which are still slipped, and the spike is visible. Having said that, this sherd is difficult to compare with others. The sherd from Phu Khao Thong only has a very small piece of design on a tiny sherd which does not enlarge very well. However, what can be gleaned from this small piece of evidence is that the rouletting on the sherd is the smaller spike design, and may be comparable with sherd 1092 from Pattanam, 771 from Malhar or the inner circle on 21 from Arikamedu.

When considering the distribution of the Design Codes DC84 and DC104, it can be noticed that very few sherds from Sri Lanka are being discussed. With the exception of those from Trench ASW2, there is an extremely limited selection of sherds with the linear design, spike rouletting, and appearing with a border (DC104). In Begley's paper on Kantarodai (1967: 25), there is a sherd with smaller spikes, again, this may be comparable to the sherds listed above, but this cannot be confirmed.

However, the addition of the DC104 sherds to this study does allow for some interesting similarities. The two sherds from Trench ASW2 that have this code both have the longer spikes as discussed above and shown in Figures 6.29 – 6.30, these can be added to the similar grouping of sherds from Uraiyur (754), Tamluk (774) and Sisupalgarh (741) which almost certainly implies that this group of sherds have come from the same workshop, possibly being the work of the same person. The sherd from the dated context of 200 BC to AD 130 demonstrates how this Design Code must have been in circulation by this time.

6.15 Other Design Codes in Period D

There are no other Design Codes found in Period D which are as prominent in this period as DC84. Sherd 503 (Figure 6.32/32a) from Period D displays two Design Codes, DC101 and DC103. DC103 is significantly more widely distributed as demonstrated in Table 6.9 above, whereas the DC101 code only appears on two other sherds from Trench ASW2, and has a single representation from Arikamedu. Both

these Design Codes represent individual linear sherds with borders, DC101 being a diamond rouletting design and DC103 being a triangle.

The DC101 data is obtained from a cast of a sherd (2108) at Arikamedu. The sherd shows a diamond design which gets increasingly smaller towards one end of the sherd; it is difficult to determine from the impression as to whether this is the inner or outer edge of the rouletting. This sherd is from trench AV92 XII, context 068, Sidebotham (2004: 53) describes this context as being “*ca. first century B.C.*”. The two examples of DC101 from Trench ASW2 are varied, the diamond rouletting is very different between the two sherds with a heavily indented border on the edge of the sherd from Period F, and the sherd from Period G4 having a more gradual wave design. The rouletting design that accompanies DC103 on sherd 503 from Period F also has a heavily indented border, but the design of the diamond appears to be slightly different and impacted by concretions.

DC103 is a more widely distributed Design Code, making several appearances in India, and it is also recorded at Berenike. Representing a linear feature with a triangle and a border design, and although briefly discussed in the other periods, it will be further investigated here. DC103 will be reviewed here along with DC83, the Design Code with the same features, but without a border. The issue of manufacturing faults on the sherds was discussed briefly in Chapter Four, and noticeable throughout the DC83 and DC103 Design Codes to the extent that it may aid the proposal of networks of communication. The possibility of sherds having guidelines for the craftsman was

also discussed in Chapter Four, and there appears to be a reoccurrence of guidelines on several of the sherds in this code. It was also briefly discussed in Chapter Four as to what makes a vessel an ‘acceptable’ vessel – are there any decorative characteristics that could deem a pot ‘defective’, and not suitable for trading.

Sherds 18 and 72 from Arikamedu present a very similar characteristic where the triangle rouletting appears to have been dragged across the sherd with a guideline that was either on the design of the rouletting wheel, or applied onto the vessel before the wheel was used. The design on sherds 18 and 72 differs from those such as 2054 from Mantai where the triangle appears to have a little tail, which seems to be more of a drag from the rouletting wheel than a guideline. It is possible that the design on sherd 18 was made with a very worn-down wheel, but there is an unevenness to the width of the rows of the rouletting that implies that this sherd (or the rouletting wheel) is the work of a novice. Sherd 72 displays a very similar rouletting pattern to that shown on sherd 18, this sherd was discussed in Chapter Four, where reasons for its haphazard rouletting were considered. Sherd 18 is from Wheeler’s excavations at Arikamedu, whereas sherd 72 is from Begley’s excavations. Begley recorded the sherd in trench AV90-1 016, and although the location of Wheeler’s trench could not be identified, Begley identifies the location of her Trench AV90-I as the same place where Wheeler recorded his ‘warehouse’, Wheeler’s AK V (Begley 1996: 50-51), and a sherd with rouletting was recovered in this large context (Begley 1996: 51). Context 016 sits just below what is described as “*certainly disturbed and of modern date*” (Sidebotham 1996: 71), being partially disturbed by the effects of a cyclone and coconut planting, which due to the pottery present, Sidebotham (in Begley 1996: 71) dates to “*generally*

first half first century AD”, and it can be postulated that sherd 18 from Wheelers excavation is of a comparable date to this.

In addition to the common factors discussed above, there are other features across another group of sherds within the DC83 / DC103 coding which should be addressed. This group has a clear triangle design, but again has the background line (or guideline) line sitting across the triangle. The triangle feature here is a little more definite than sherds 18 and 72 as mentioned above, and there are more sherds with this feature available to this study with a noticeably greater distribution network. Amongst the Level One sites, sherds of DC103 are noticed, for example sherd 611, 604, and the excellent example of sherd 522 from Period G5 (Figures 6.28 and 6.29) which Coningham *et al.* highlighted as “*dia/tri/con*” (2006: 146) presumably interpreting the rouletting as a continuous multi-rouletted triangular and diamond shaped design. This feature is very apparent also at Arikamedu where an example can be seen in sherd 52, which from the image in Wheeler’s excavation report, appears to be almost identical to sherd 604 from Trench ASW2 with the exception that sherd 604 has a border, and is also extremely similar to sherds 522 and 611. The sherd 604 is from Period G2, which as discussed previously is from the context with the calibrated date of 200 BC – AD 130, whereas the sherd from Arikamedu is from Trench AV92XIII 068 from Begley’s excavation, and this context was dated to the second century or earlier (Sidebotham 2004: 69). With this Design Code appearing throughout several contexts, this may have been one that did retain its popularity over time, however, if it was a method used for training potters it may have been the result of a standard procedure that was followed.

In Begley's excavation report, the image of the sherd from Alagankulam (sherd 732 in this study) also has the triangle with a background line (Begley (2004: 271, Figure 3.287), there is no information relating to the excavation of this sherd, however Sridhar *et al.* (2005: 11) described the first appearance of Rouletted Ware and stamped ware (but no confirmation as to whether this is Arikamedu Type 10) in Period II at Alagankulam, which they date to 300 BCE to 100 CE, continuing into Period III (100 CE to 500 CE). Period II at Alagankulam matches reasonably closely with Period G2 at Trench ASW2, and it is stated that a "*considerable number*" of Rouletted Ware sherds were recovered (Sridhar *et al.* 2005: 24). Sridhar *et al.* refer to how they divided the Rouletted Ware into eight different pattern types (2005: 245f), although the author of this current research was unable to determine what these were.

The sherd described by Coningham *et al.* (2006: 146) as "*tri/cont*" may have a wider distribution. Sherds 709 (in Taim 2006: 338) and 691 (Manguin & Indradjaja 2011: 127) from Unur Lempeng display relatively similar characteristics. Unur Lempeng is one of three Unurs (the local name for a Tel), on which the temples of Batujaya, Karawang, Western Java are situated (Manguin & Indradjaja 2011: 113). In his 2006 paper, Taim states that what he describes as "*Fine Rouletted Ware*" (Taim 2006: 338) made up ten percent of the total pottery finds at Batujaya (*ibid.*: 338f), and he also provides examples of a coarser Rouletted Ware from the site.

Taim describes Arikamedu as an “*ancient, 2nd century A.D. port site on the south east coast of India*” (2006: 338) and “*from the early centuries A.D.*” and compares the corpus of imported pottery to that from Arikamedu. This is a considerably later date than what would be expected in an article published in 2006. Manguin & Indradjaja (2011: 118, 127) describe the Rouletted Ware as appearing in “*Segaran IIA*” which is a low-lying area of Unur Lempeng in 2005 – 2006 and has been dated to “*last century BCE or the first century CE*” (*ibid.*). This chronological bracket corresponds well with Period G2 at Trench ASW2. Manguin & Indradjaja also comment on some sherds of Indian stamped wares that are contemporary to the Rouletted Ware, but on observation of the available images, these are not Arikamedu Type 10 (*ibid.* 127, Figure 5.15)

The continuous designs described above may have also been recorded at Khao Sam Kaeo, Thailand. Sherd 727 displays the continuous line, and an indentation that is possibly a triangular feature (Bouvet 2012: Fig 11.20a). Dating information is not available for this study for this sherd, but judging from other evidence it can be suggested that it is comparable with Period G2 at Trench ASW2. It is noticeable however that the sherds are either based around South India and Sri Lanka, or at the easterly extreme of this study in Indonesia.

Design Codes 83 and 103, on analysis, do represent a range of triangular features, for example, impressions of sherd 693 from Sembiran on the island of Bali have a design which at a distance looks almost comparable with the sherds discussed above. However, on closer analysis, the detail between each triangle is not a line, but another small indentation. Whether this is an intentional feature or not cannot be verified, but

this characteristic at the time of writing does seem to be unique to Sembiran. No dating information is available for this sherd, so without comparable sherds it is difficult to make further conclusions.

Some of the sherds categorised as Design Codes 83 and 103 show triangles which present a more densely concentrated design, although due to this density and the quality of some of the images, it is sometimes a little difficult to identify what form the actual indentation takes. This density is demonstrated by sherds from Karaikadu (750), Mantai (2097), Pattanam (995) PKT (716) and also the Buni complex (692, 2098). The sherds from the Buni complex display a dense vertical line with a wave in it, but horizontally are not densely displayed. A similar design to one of the Buni complex sherds can be seen on sherd 1669 from Pattanam. Although eroded, sherd 1669 does exhibit the border feature and the same vertical features as 2908 from the Buni complex, but it is difficult to identify as to whether this is a common pattern across the sherd. Sherd 1669 may also display very similar features to sherd 781 from Nasik, or 695 from Tuam Thay but this is not possible to confirm. However, between these sherds there does seem to be a design where there is a border that consists of a few triangles in a definite slant pattern, then a linear row of triangles in a different composition.

Assessing a context at Trench ASW2 which is difficult to date has allowed for the proposal of dates and networks from across the chronological and spatial divide of this research. DC83/103 and DC84/104 have provided a considerable amount of data.

Period F does also contain some less common sherds. DC105 is recorded at Period G4 at Trench ASW2, and at Arikamedu in addition to Period F, at Arikamedu the context the sherd is from is dated to the second century AD or earlier (Begley 2004: 69). DC105 represents a sherd that has an individual linear feature and a hoof design – which is a similar profile to a spike but a little broader. The two sherds from the different periods at ASW2 (sherd 499 from Period D, 557 from Period G4) do display some similarities and if the rouletting was complete on sherd 557, it may be possible to see the border which could highlight even more similarities. These similarities suggest that the rouletted feature itself has not changed but the linear design has changed a little. The sherd from Arikamedu (sherd 50) does display a similar linear distribution to the design on 557, again, if the whole design was complete, more information may be gleaned, but with the available data one can tentatively propose that these three sherds are connected by some means of workmanship, if not by the same potters, then by cultural communications, and the hoof design is a little unusual.

6.16 Design Codes outside Trench ASW2

The investigation in this chapter up to this point has focused on the sherds from Trench ASW2 as a base, from which to build up geographical and chronological networks. However, it cannot be presumed, despite the extensive chronology, that every Design Code in this study will have a representative sherd deposited in Trench ASW2; there are other Design Codes which have occurred in this research which were not recorded in the images available from this site. There is very little supporting information to accompany some of these sherds, however, they will be discussed to try and enhance the chronological and geographical distribution networks. Quite a

few of these Design Codes only represent a single sherd, this usually stems from damaged sherds or poor images where it is difficult to see the rouletting and the best judgment possible has been made. Appendix Three details the distribution of this further selection of sherds, and on investigation, there are some points which require further analysis. Many of the sherds in Appendix Three can be seen to belong to DC171, which represents a sherd that cannot be allocated any Design Code due to unidentifiable features.

Rather than look at these sherds individually, certain ones with some shared features have been grouped together. Initially sherds classed as exceptional that had triangle features were investigated, and this included Design Codes DC123, DC135 (as discussed above) and DC250. Sherds 242 (Figure 6.33) and 1849 (Figure 6.34) from Pattanam (2007 and 2008 excavations respectively) display the triangular feature with a background line. This feature is also seen on sherd 4 from the 1997 excavations at Berenike. However, there is possibly a raised effect to this sherd (or the impact of the lighting makes the decoration on the sherd stand out a little more.) A similar feature is seen on sherd 10 (Begley & Tomber: 2000, Plate 3-3), also from Berenike and recorded a year later in the 1998 excavations where rows of lines have a triangle rouletting design with them. The design is incomplete, but the rouletting gets narrower as it gets towards the centre of the sherd, which is from a context dated to be “*early Roman*” (*ibid.*: 152). Sherd 242 from Pattanam is from a modern context (Cherian *et al.* 2007) and 1849 is from quite a mixed context – the locus the sherd is from is close to a structure which is described as “*highly disturbed*” (Cherian *et al.* 2008).

When considering sherds that are linked by the individual linear feature (and with a border), and may possibly have a triangle rouletting design, although some of the sherds have been allocated certain Design Codes which take into consideration the quality of the available image, or the level of erosion, there are some sherds with interesting features that should be explored. Sherd 1492 (from the 2008 excavations at Pattanam, Figure 6.35) presents features comparable to those discussed above (DC83 and DC103) where there is a possible guideline. This sherd has been classed as Design Code DC228, which is a sherd where the rouletting is a triangle with a line, so it is possible to connect this sherd with others at the site of Pattanam that have a guideline. A comparable sherd with the Design Code DC226 (which is individual linear sherd with a border and possibility a triangle), is sherd 2094 from Wheeler's excavations at Arikamedu. This sherd presents a design which is a midway step between the sherds with a guideline and those with a wave as discussed below.

Design Code 224 is recorded at Vanagiri (Kaveripattinam) and Arikamedu. Again, a rather vague Design Code representing an individual linear feature with a border and where the rouletting is, possibly dots. This Design Code can be applied to sherds 56, 57, 68 and 757. Sherds 56 from Arikamedu and 757 from Vanagiri (Kaveripattinam) both display some characteristics seen in other Design Codes – this is particularly noticeable in 757 with the deeply indented border, and the same feature (to an extent) may be seen on sherd 56. Sherds 56 and 68 have rouletted indentations, but appear faint. These sherds were classed as “*Thick gritless grey ware with poor rouletting*” (Wheeler 1946: 48) and probably of the type of Rouletted Ware that Wheeler would presume to be manufactured locally. The quality is a little difficult to tell from the images that are available – there is no slip visible to support the possibility that they

may have been highly fired, but sherd 57 does display a decorative border at each side of the rouletting, and two different rouletting types in between. Therefore, the question is raised that possibly the lower quality pottery was for people to practise on. It could be that the work classed as “*poor rouletting*” by Wheeler is the output from the potter’s apprentices who were developing their skills on poorer quality ceramics, rather than the highly fired fine ceramic used in Rouletted Ware. The rouletting on sherd 57 demonstrates some intricacy and skill – it is possible the different designs demonstrate how the sherd was used for experimentation with new designs, and this was done on an inferior material. The rouletting may appear to be of poorer quality as the sherd is not as highly fired, and may have degraded at a different rate and in varying conditions.

Wheeler *et al.* found the “*thick gritless grey ware*” (1946: 48) to be “*fairly common in the southern sector (AK IV) through all phases of its more prolonged occupation*” (*ibid.*). In her revised chronological sequence of Arikamedu, Begley dates the AKIV phase from 0AD through to AD 200 (Begley 1983). As Rouletted Ware was on the site before that, it is unlikely that the coarser Rouletted Ware was a precursor, or an experimental design phase, however it may imply that production was carried out somewhere else, and moved closer here. There may be more of the Coarse Ware sherds at other locations, or at location yet to be discovered where the corpus contains more practice pieces.

6.17 North East India sherds (Rouletted Ware)

The Design Code 243 represents an individual linear border on a sherd what appears to have a spike and a groove. DC244 is primarily the same, but with the possible addition of a triangle. DC241 represents an exceptional linear feature with a groove and possibly a spike. On observation, these Design Codes represent sherds of similar appearance, however they stand out as being very different to many of the other sherds across this study, and this was also noticed by Blair (2009: 178). These differences raise questions as to whether these sherds can be classed as Rouletted Ware in the same way that those recorded by Wheeler at Arikamedu can. It can be postulated that they may provide examples of where a specific local demand has been catered to, possibly due to a more disposable income to demand something different, as the sherds detailed here are all from West Bengal or the vicinity. Each of the sites of Chandraketugarh (sherd 768), Tamluk (776) and Pakhanna (772) contribute a single sherd to the DC243 Design Code. Sherd 768 from Chandraketurgh appears to have a zigzag design around the outer edge, which is limited by the break of the sherd, this is not seen on any other sherd in this study. Sherd 772 from Pakhanna has a combination of spike design with continuous grooves, Wheeler *et al.* identified numerous concentric grooves on Wheeler Type 6a, possibly these sherds form a fusion of two different types (Wheeler *et al.* 1946: 55, Fig. 15). Sherd 776 from Tamluk displays features in common with the sherd discovered above from the same site (Sherd 772) in that it has a row of spikes and grooves. Sherd 775 from Tamluk is classed as Design Code 244, although the inner border of the rouletting pattern is unclear, there are similar characteristics between this and the other two sherds in this study from

Tamluk, an also sherd 766 from Chandraketugarh. Sherd 766 has been classed by this study as DC241.

Three sherds with Design Code 84 as discussed above can also be added to the discussion at this point. Sherds 765, 774 and 771 are both categorised as DC84, and they are geographically close to the sherds discussed above, or from the same site. 765 is from Chandraketugarh, 774 is from Tamluk, West Bengal and sherd 771 is from Sisupalgarh, in nearby Orrisa. These sherds have a spike design, but these are longer spikes, and there may have possibly been borders on sherds such as those discussed from Design Codes D243 and D244. The paragraphs above demonstrate a collective of sherds with similar, distinctive features which stand out in the Northeast of India. There is also a sherd from Chandraketugarh (767), which along with 768 possibly sits at the very perimeters of this research in relation to style. Sherd 767 has a series of densely packed spikes in three sections separated by grooves, much of the vessel is missing, and possibly only access to the complete vessel (should it be recovered) would ensure that all the design features can be seen. The shared features discussed here raise questions as to whether they can be compared in the same way as the Rouletted Ware that is more typical of that seen at Trench ASW2. This will be discussed in the review of the method in the next chapter.

The section started by considering sherds that did not make an appearance in the chronology at Trench ASW2, and has discussed Design Codes DC241, DC243 D244 in relation to the significance of their presence in Northeast India, yet these Design

Codes make a very limited appearance throughout the rest of the geographical locations in this study. DC241 has been recorded at Ayodhya, the most northerly Indian site in this study, and the image, although poor quality does not correspond with the configuration of the rouletting on the other DC241 sherds. DC244 also appears at Nasik and the 2008 excavations at Pattanam. Sankalia & Deo (1955: 70) compared the rouletting on sherd 782 from Nasik to plate XXVB (8) from Arikamedu, which is a sherd that does display several types of rouletting, but this is hard to verify as the image from Nasik is difficult to enhance.

6.18 North East India sherds (Arikamedu Type 10)

Evidence above shows how sherds of Rouletted Ware from North East India display different designs, consideration will now be given to the Arikamedu Type 10 that also appears in this region, to investigate if the same can be deduced about this ceramic. As highlighted in Chapter Five, the two sherds of Arikamedu Type 10 from Chandraketugarh do present alternative features to what was seen on the other sherds in this study, whereas instead of common decorative features, they have unique regional differences. These two sherds are the only ones in this study that are seen to have the hook head (H1) feature, supporting the proposals made in relation to the Rouletted Ware. These sherds provide further confirmation that there was a definite stylistic demand in this region, or possibly there was a separate group of potters with different or varied styles producing for this area.

6.19 Unusable sherds

As much data as possible has been extracted from the table above, however, there is a selection of sherds which cannot provide any valuable data to this research, and these are listed in Appendix Three. This is primarily due to the quality of the images. All this data will be retained, as advances in technology may allow for the less pixelated enlargement, or an image to see underneath the concretions. Alternatively, arrangements could be made for visits to collections to take new images, or if possible, more impressions.

6.21 Manufacturing errors

The issue of manufacturing faults has been raised at several times throughout this thesis with reference to both ceramics, leading to the question is there such a thing as a 'perfect' sherd? Throughout the ceramics that have been studied, it can be considered if there was the requirement for a sherd to meet certain criteria to be deemed as an acceptable sherd, and can standards expected today be applied to these sherds when the manufacturing conditions, processes and use of the vessels can only (at present) be proposed.

The quantities of the ceramics in this study lead to the postulation that Rouletted Ware was a much more commonly produced, everyday ceramic, and therefore it may have been acceptable that it was not always perfectly formed - consumers were happy to accept a mass-produced product which was not always perfect. Comparatively today, it may be acceptable that a product of a lower price point may have certain flaws,

provide that the product is fit for the intended purpose. Decorative flaws may have been acceptable on the mass produced Rouletted Ware, as the design was not a cause for concern and did not hinder the use of the product. However, this can only be speculation.

Manufacturing flaws can be the result of several different factors. The phrase “*more haste less speed*” may be applicable to manufacturers across many spatial and chronological boundaries, if the production rate slowed down, therefore more care would be taken and fewer mistakes could occur, possibly leading to greater productivity (and greater profit due to less wastage) over an extended period. With the data available for this study it is impossible to determine the daily production rate, however, this is something that could be further explored through experimental and ethnographic research. As the complete manufacturing process cannot be determined either, it is not possible to determine as to whether the bowls that were produced were perfect as they were made by an experienced potter and they were required to serve a purpose, whereas the decoration was considered a secondary feature and therefore could be the work of a less experienced or less capable individual.

Earlier chapters detail the geographical distribution of the Rouletted Ware in this study, supplemented by a selection of chronological data. As discussed earlier in Chapter Two, one of the questions that has been debated with reference to Rouletted Ware since its initial recording by Sir Mortimer Wheeler *et al.* (1946) has been the location of the point (or points) of production (for example, see Gogte (1997), Ford *et al.* (2005)). Earlier analysis of some of the data presented in this study determines

how the ceramics with the continuous groove as opposed to a series of rouletting impressions are found at Arikamedu and Kantarodai and other locations, possibly being training aids for potters. Kantarodai is situated on the Jaffna peninsula in Sri Lanka and is one of the few areas in South Asia which has incompatible geology for the clay used to make these ceramics, so the ceramic must have been transported there. It can be proposed that if Arikamedu (or a location in its hinterland) was a production centre for the ceramics in this study, it would be possible that the actual site or the vicinity could be the source of a range of ceramics that could be the work of apprentices.

From Arikamedu, at least fourteen of the seventy-nine sherds of Rouletted Ware display a noticeable imperfection which has occurred at some point during the manufacturing process. The imperfection may be the result of several factors, possibly not having enough time to complete the job to a better standard, not having the right tools, experience or ability to complete the work properly. Alternatively, some of the irregularities may not necessarily be down to ability, the manufacturer may not care about perfecting the finer details of the finished product which, if deemed to be acceptable by the end user of the vessel, may suggest that perfection was not necessarily important, certain flaws were an acceptable or tolerable choice.

Where there are possible design errors on the sherds, the skill of the person who made the equipment that was required for production - principally the rouletting wheel and the stamp that produced the impression on the Arikamedu Type 10 should also be

considered. The objects used in the decoration process may not necessarily have been produced for this purpose, they could be reused from another process, as no recognisable manufacturing tools have been identified. Because of this lack of evidence this study is unable to answer questions such as the frequency of repair or replacement. These are two factors which would almost certainly have an impact on the how the rouletting appeared in the ceramic. Sherd 72 from Begley's excavations at Arikamedu provides an example of a possible manufacturing flaw where the potter was new to using a rouletting wheel, was hurried or simply got distracted.

On further investigation, it can be demonstrated that among the sherds from Arikamedu, a high proportion of evidence can be seen to support uneven rouletting, and this does seem to be the most common irregularity. The impressions of the sherds taken by Professor Ian Glover do clearly exhibit irregularities (sherds 2099, 2100 and 2101). The errors are close to the edge of the design where an unevenness can be noted, this may imply that more skill is required in the edge of the rouletting, perhaps when finishing the design rather than completing the middle of the design.

Following on from the errors noted in the Rouletted Ware at Arikamedu, the question can be raised as to the degree at which errors can be seen at other sites. There are twenty-four sherds out of the seventy-six from Trench ASW2 in this study which may have a manufacturing flaw on them, however, as continuously stressed, some sherds which contain what may appear to be manufacturing faults could possibly be a planned design of choice. An example of this is three sherds from Trench ASW2 491, 621 and

587 which all display rouletting that gets fainter as the design gets closer to the centre of the vessel (see Figures 6.21 – 6.23a). This feature could be the manufacturers choice or consumer demand, or possibly it is easier for the craftsman to produce the design in this way, alternatively, it could be down to use-wear or the condition of the roulette wheel. However, the faint rouletting at the centre of the sherd can also be seen on sherds 498 (SFN 1803) and 535 (Figure 6.11/11a) where this is accompanied by other supposed errors on the sherd as well.

Although they are not Level Two sites, following the consideration of the Trench ASW2 sherds the other sites from Sri Lanka will be investigated at this point. While there was a relatively high proportion of possible manufacturing errors from the sherds at Trench ASW2, out of the twenty-six sherds from other locations in Sri Lanka, only one can possibly be seen to have a manufacturing error. Many of the sherds in this category are published images, but whilst taking that into consideration, there is certainly a noticeable drop in errors. The sherd that appears to have a fault is from Kantarodai (Begley: 1967) and although two sets of grooves can be seen, it appears that the inner grooves, of which there are approximately ten, are very close together. This may have caused the craftsperson a problem because at some stage the lines do almost appear to be interlocking, yet there also seems to be some variety in the width of the grooves.

Manufacturing variances can be seen on both the Level Two sites in this research. From Pattanam, two sherds from the 2007 excavations and six from the 2008

excavations were deemed to possibly have visible manufacturing errors. Sherds 1142 and 1436 from the 2007 excavations display definite evidence of irregularities, similar to that proposed above where the rouletting is not of a uniform design. From the 2008 excavations there is also further evidence of irregularities for example in sherds 995 (Figure 6.24) and sherd 1849 (Figure 6.25). Sherds of Rouletted Ware from Arikamedu with proposed manufacturing faults have been recovered in both North and South sectors, suggesting that if the vessels were manufactured in the region it was not directly where the site of Arikamedu is. This would possibly be more viable if the manufacturing errors were concentrated on in sector.

When considering the remainder of the sherds from India (namely regions 4 and 5), of the fifty-four sherds in this study there are at least eight irregularities. Those that are from the southern region (therefore closest to the proposed manufacturing location by Ford *et al.* 2005: 917) have the slightly higher number of relevant sherds (five from south of the Godavari river and three from the north of the river). Imperfect goods may have been traded closer to their point of production, or used by those who made them. The movement of the sherds with errors may possibly have some links to the movement of vessels with blank designs. They may represent areas where the ceramics were moved as personal possessions, not specifically moved for trade?

The investigation of manufacturing irregularities can be expanded to the extreme geographical boundaries of this study. When considering the eastern boundaries, anomalies are recovered at sites in both Indonesia and Thailand, and these are

predominantly in the form of overlapping designs. Linking back to the point proposed earlier, if these sherds were transported from South India and further distributed, was it considered acceptable that these were not deemed to be perfect? The western boundaries of this study provide the example of a sherd of Rouletted Ware recovered at Berenike (sherd 4) which does display a manufacturing fault. Other evidence from this site does possibly support the existence of an Indian trading community at this Red Sea coastal location (Tomber 2000) as discussed with reference the blank sherds. The imperfect Rouletted Ware may have been part of the cooking ensemble transported as discussed in Section 7.2.

6.22 Arikamedu Type 10: manufacturing variances, review

Sherd T24 from Chandraketugarh (Figure 6.26) displays features which may be erroneous, or possibly part of the vessel's decorative features. The top of the border that surrounds the birds overlaps onto the grooves, on initial observation this could be interpreted as a manufacturing fault, but when closer inspection is carried out, the top of the frame (on the right-hand bird) trails off to the left and is imprinted onto the grooves, with the same appearing to have happened on the bird to the right. The bottom of the frame also appears to overlap onto the set of grooves below, just beneath the bird's feet, and this is a characteristic which appears on both birds.

Features like these may have been a planned part of the design, but it is not possible to confirm. The birds head also slightly overlaps onto the grooves as well on sherd T24, but again, this is a feature that appears on both birds. The other point that needs

to be considered is that there is a possible misjudgement, when the grooves were placed on to the vessel they should have been a little further apart to allow the entire stamp to fit in. The bird's feet appear to be 'perching' on the bottom row of the frame, implying that the frame could represent something that the bird may stand on, such as a branch, a bird stand or the outer edges of a bird house. However, as with the proposal for there being guidelines on the Rouletted Ware, it can be suggested that the grooves on the inside of the Arikamedu Type 10 vessels were used as a guideline for the stamps. The placement of the 'v' symbols on sherd T24 display a degree of uniformity, with the top of the 'v' just overlapping the bottom groove, but with a significant (relatively equidistant) gap between the bottom of the 'v' and the lower set of grooves.

On sherd T35 from Trench ASW2 at Anuradhapura (Figure 6.27), the bird appears to be standing on the top level of the grooves, again as if perching on something. There is an indentation on the grooves where the feet from the impression of the bird have been planted, the bottom of the stamp appears to have flayed out and widened rather than follow the profile of the bird. A feature in common with sherd T24 above, this does show that the grooves were on the vessel before the stamp, possibly to be used as a guide line. The 'v' symbols on this sherd are also interesting shapes, and maybe placed in a pattern. They present an asymmetrical 'v' and the middle sherd 'v' is higher than the other two, implying a pattern that may have gone around the whole vessel, or they may have just been placed randomly - it is impossible to tell without any more of the sherd being present. Sherd T36, also from Trench ASW2, does have a border but there does not appear to be any indentation in the border where the feet are, making it appear as if there are no feet on this bird, if a standard can be set by the sherds above. There is possibly a little damage to the right of where the feet would

have been expected to be, but this is not considered to be the same kind of indentation as discussed.

6.23 Other chronological markers: Blank sherds of Arikamedu Type

10

Some of the sherds of Arikamedu Type 10 in this study do not appear to have the characteristic stamp. However, when considering some of the descriptions in the available literature it is difficult to determine whether sherds that are recorded as not having a stamp are from the wrong part of the vessel to have the impression (for example a rim sherd with just the edge of the grooves), or where both of sets grooves are present and there is clearly a blank space where a stamp could be positioned.

A side issue that has been highlighted here is the importance of the clarity of recording in archaeology; whereas it is valid to say that a rim sherd of Arikamedu Type 10 with the edge of an upper set of grooves does not have a stamp, it presents a different interpretation to a sherd of this type with the blank space between the two grooves which does not have a stamp. This emphasises the value of the person cataloguing the sherds having experience of the chronological and regional ceramic types; this will be discussed in the next chapter. An example of this issue can be seen in the excavation reports for Trench ASW2, where the Arikamedu Type 10A category is deemed to be comparable to the type recorded in Wheeler's excavation report as Type 10k (Coningham *et al.* 2006: 159). Some examples are clearly missing a stamp, for

example sherd 659, which has two rows of grooves mentioned and is supported by a figure (*ibid.*: Figure 6.5). However, it must be questioned as to whether sherd 688, which is a sherd weighing less than one gram, and having “*one band, 7mm wide, with four grooves*” (*ibid.*: 162) can be deemed to be missing a stamp in the same way as Sherd 659 mentioned above.

Having considered the possibility of sherds with no stamp being interpreted differently, an analysis of the sherds recorded as Type 10A from Trench ASW2 has split the sherds into two categories as seen on the graph in Figure 6.28. Firstly, the “*blank area*” category on the graph represents those sherds where the descriptions in the Trench ASW2 report allow it to be determined that these sherds have a blank space where the stamp should be. These sherds are separated from the second category, which represents those sherds that do not have a stamp (“*not stamped area*” category on the graph - for example sherd 688 as discussed above). It can be seen from the graph that the sherds classed as Type 10A (*blank area*) cover a wide chronological parameter at Trench ASW2, appearing in Periods G2, G4, G5, and D.

Blank sherds were recorded at Begley’s excavations at Arikamedu, for example a stamp classed as “*faint, unclear*” was recorded at AV92- XV 015 where the sherds from that context are classed as “*recognizably ancient*” (Sidebotham 2004: 89). A sherd with a faint or indistinct stamp was found in the balk of AV92 XI, a trench where there was activity from the first century BC onwards (*ibid.*: 38). In relation to the discussion above, it can also be debated as to how a sherd classed as “*faint, unclear*”

should be interpreted. It could be a sherd that is faint due to abrasion during its lifetime, alternatively, it may be the consequence of depositional conditions. The tool that was used to apply the stamp may have been of poor quality or worn, and the clay it was going to impact on may have not been in a suitable state for the application of a stamp. Wheeler *et al.* (1946: 59) inferred that the Type 10k in their excavations was unsuitable to take the pressure of a stamp as the vessel walls were too thin to withstand the impact (it is unknown whether there is only one vessel with this characteristic). Finally, the stamp may be faint due to the level of experience or the quality of workmanship executed at the point of manufacture. Tomber, in her 2000 article does mention two such unstamped vessels at Berenike (Tomber 2000: 625), these are noted in the 1997 Berenike excavation reports, where Begley and Tomber do distinguish between the “*slight impression*” on some sherds and the “*missing*” stamp on another (Begley & Tomber 1999: 165). Catalogue number 7 from the 1997 excavations at Berenike (sherd T2 in this study) is associated with a date of ca 50 BC to AD 50, therefore a comparative time with Period G2 at Trench ASW2. There may also be blank sherds at Alagankulam (Bouvet 2012: 266) and at Pattanam but these are a little difficult to decipher. Although having considered the various reasons for a blank sherd, if the grooves on a sherd (which are probably the deepest incisions) are eroded to such a level that they are barely visible, it is possible that any other impressed features may have been erased.

In consideration of another area, no blank sherds, or sherds with faint, lightly impressed details were recovered by this study in the North East of India, where the Arikamedu Type 10 sherds with distinctively different features were reported (as discussed above). Sherds with the fainter details, are more likely to be produced closer

to the point of the manufacture - why would an imperfect vessel travel so far north to a region that seems to have quite specific demands as demonstrated elsewhere in this chapter? Having considered that, sherds which are both blank and with faint impressions are recovered at Berenike which is also out of the presumed production area for these vessels, but as mentioned earlier, these sherds were probably transported for personal use (Tomber 2000: 630).

While it would be useful for this research to see more images of the blank vessels appear in publications (or have access to the actual sherds) it is likely more aesthetically pleasing sherds with the stamps on will be published. It is vital that these blank sherds are recognised, catalogued and described accordingly, supported by images so a more comprehensive distribution record can be presented. It would be useful to see more images, and possibly further comparisons could be made initially to strengthen the argument of the chronological and spatial connections between Berenike and South India, and then expanded to include new locations where the sherds were recovered.

6.24 Manufacturing faults – a summary

On attempting to match up sherds that have manufacturing faults from both the vessels in this study at the same location, certain difficulties have arisen. This is primarily the result of factors that have been problematic throughout this study, namely lack of supporting data and poor quality images. Also, the difference in quantities between the two types in this study - so the tendency in this section has been to compare the location of the Arikamedu Type 10 sherd with the locations of Rouletted

Ware to see if any of the locations both exhibit sherds with manufacturing faults. Sherd T24 from Chandraketurgarh is a sherd of Arikamedu Type 10, with what can be described as manufacturing variances, yet there are no sherds of Rouletted Ware from this location that display any feature that can be defined in this way. This supports the theme throughout this thesis that it is unlikely that the ceramics in this study were manufactured in the North East of India, obviously this is the result of comparing a single sherd, whereas an expanded data set could potentially prove otherwise.

The Arikamedu Type 10 sherd T35 from Trench ASW2 is from Period G5 at the site, which is the Period with the most sherds of Rouletted Ware, and the most Rouletted Ware with “errors”. However, it is not possible to make comparisons between the errors on the two vessels, and the limited amount of Arikamedu Type 10 and the diversity of the designs prevents the use of the sherds as a chronological marker. It appears at this stage that the benefit of considering the manufacturing variances is more likely to provide theories in relation to the production site of the vessels, rather than any chronological or spatial parameters.

6.25 Continuous Grooves

Some of the sherds which were classed as Rouletted Ware do not always clearly portray individual indentations, but appear to present a continuous line. There is a single sherd with this characteristic at Trench ASW2 in Period G5 (sherd 586, Figure 6.30), which displays these features and is almost identical to some of the other sherds in this study. The grooves on these sherds raise questions as to whether they

were a guideline as discussed above, or whether the groove itself forms a design. Wheeler *et al.* noted that some of the sherds from his 1945 excavations did have groove features, but from the illustration provided in Wheeler *et al.* 1946, Figure 15 shows the base of the vessel of Type 6a which appears to be covered right across in grooves, unlike the sherds in this study which have a set of five or six rows.

Sherd 586 from Period G5 at Trench ASW2 is the only sherd of its kind recorded on the site that is available for this study, therefore making a potential chronological marker. It has been posed that Period G lasted from “*around the first quarter of the third century cal. BC to the latter half of the first century cal. AD*” (Coningham *et al.* 1999: 129). This is based on carbon samples from Period G2, G3 and G5, with G5 being the chronologically later end of the period.

When considering the dates of the other sherds with grooves, many of these have only limited supporting evidence. The sherd 780 from Tamluk was classed as DC199, and in common with the sherd from Tamluk discussed above, the sherd is from the phase dated Period III, which is dated to the first to the second centuries AD (IAR 1954 – 55: 20). Judging from the evidence from Trench ASW2 it may be the end of the first, or early second, however as mentioned above, it depends on where the manufacturing point is that the sherd has travelled from. The sherd from Tamluk does have considerably more grooves than the one referred to from Trench ASW2, so could possibly be more like Wheeler *et al.*'s Type 6a rather than the Rouletted Ware.

Sherd 2060 appears in Begley's article "*Archaeological exploration in Northern Ceylon*" (1967: 25). As this article is published several years prior to Begley's own excavations at Arikamedu, she may have considered the information published by Wheeler *et al.* in 1946 to attempt to provide a general date for the site. At the time of writing she describes the dates for Arikamedu as "*fairly securely established covering the first few centuries of the Christian era*" (*ibid.*: 26). In the article Begley considered that it may be possible, following what she describes as "*substantial excavations*" (*ibid.*: 27) to correlate the dates between Arikamedu and Kantarodai, and hinted at the prospect of extending this to Anuradhapura. However, on considering the similarities in sherds, there may be some possible connections between this sherd and the one discussed above, perhaps they were produced by the same person and the similar tools, then there is an impact of cultural communication demonstrated within these sherds.

There is a slight variation in the sherds with the grooves, but sherds 749 from Karaikadu and 2091 from Arikamedu do both display grooves with a slightly uneven aspect to them. As sherd 749 is a cast, and 2091 is from Wheelers 1946 publication, there is quite a difference in the material being assessed. However, what does come out through both images is a slight unevenness. It is not possible to propose dates for these sherds at present, however, as with the sherd above, they are almost certainly influenced by the same decorative process as sherd 586 from Trench ASW2.

Having considered sherds that appear to follow a design theme, further sherds can demonstrate similarities, these are namely sherd 1385 from the 2008 excavations at

Pattanam (Figure 6.29), and sherd 586 from Anuradhapura (Figure 6.30). The outer grooves from the Trench ASW2 sherd are not quite the same but the inner ones do appear very similar. Single lines are seen on the sherd from Tamluk (sherd 780), but the sherd from Tamluk has a more concentrated design. Similarities between sherds from Pattanam and Anuradhapura have already been hinted at in this research and will be discussed in more detail later, however it is possible that these two sherds are linked by chronology, and manufacturing point.

Sherd 93 from Arikamedu was discussed above in relation to it depicting rouletting along with some guidelines. However, this sherd will be mentioned here as well as some of the grooves are similar to what is being discussed, especially the ones towards the centre of the vessel. The innermost circle of rouletting appears to be quite deep, possibly this is where the same rouletting wheel has gone round the vessel several times.

With the exception of sherd 93, all the sherds discussed above have a set of grooves only. Sherd 712 from Sumhuram (Pavan & Schenk 2012: Figure 3.3), although a tiny image, does appear to have a few rows of an indented rouletted design and a groove feature also. Pavan & Schenk (2012: 197) described this sherd as “A *bottom sherd with somewhat carelessly executed decoration and an almost completely worn layer of slip has been found in a later stratum*”. They dated the majority of the Rouletted Ware to their c2 Period at the earliest, which is the first century BC, and commented on how it is comparable with Tissamaharama, a site on which Schenk has published extensively (for examples see Schenk 2000 and Schenk 2001). However, there is no

comment in the article on a possible date for the later stratum for sherd 712, which, due to the uniqueness of the design, could potentially provide a chronological marker should similar sherds be found. As this sherd displays many designs, grooves and possibly two different types of rouletting, can it be postulated that to call the design on the sherd “*carelessly executed*” (Pavan & Schenk 2012: 97), could be erroneous. The “*execution*” of the design could be due to several reasons, it could be because the manufacturer did not care, however it could also be an apprentice practising what they had learnt, or someone who did not have time to apply to the decoration properly.

Having considered the continuous groove designs that appear on the Rouletted Ware, the possibility of a relationship between the grooves on the Rouletted Ware and the grooves on the Arikamedu Type 10 should also be discussed. There are a limited number of impressions of Arikamedu Type 10 in this study, and while it is acknowledged that impressions of sherds of Rouletted Ware are available from other sources, they were not made by the author of this research and the shrinkage rate of these casts is not known, so accurate results could not be guaranteed.

There are a limited number of sites where Arikamedu Type 10 and also Rouletted Ware with grooves rather individual rouletting have been recorded. These sites are focussed on the south of India and northern Sri Lanka in addition to Trench ASW2 (see Map 6.3). It has been discussed at various points in this research that the ceramics are certainly of South Indian origin, therefore it can be considered that close by to one

of these locations was a workshop manufacturing both ceramics. Due to the geological features, Kantoradai on the tip of north Sri Lanka can be excluded from this proposal.

6.26 Chronological distribution: a summary

Throughout this chapter various networks have been highlighted in relation to factors shared by different sherds. This final section summarises these connections which are demonstrated in Appendix Four. This data will then be investigated in Chapter Seven, the following and final chapter, however, this penultimate section in this current chapter will amalgamate the chronological and spatial distribution discussed, which can then be used with the other graphs already produced in this chapter to portray the chronological and spatial distribution of Rouletted Ware and Arikamedu Type 10 in Chapter Seven.

In Appendix Four the key connections that have been highlighted throughout this chapter can be seen. Due to the limited data available for this study, the data in Appendix Four starts at Period G2. Some of the Design Codes in this study have demonstrated that they are in a distribution network for a considerable period of time, such as DC83 / DC103, whereas some appear to have tighter chronological parameters. By considering a code such as DC83 / DC103 and its appearance in Period G2 and G5 at Trench ASW2, it can be compared with the dates proposed from sites published elsewhere, and propose dates where this has not been possible, as seen in Box Two of Appendix Four.

Box Two in Appendix Four contains sherd 774 from Tamluk which demonstrates the long spike from a site which has been dated to between the first and second century AD (IAR 1955), judging from the style of the sherd, and the similar styles that have been recovered in the archaeological record it is highly likely that this sherd is at the earliest date of this proposal, if not even before. This box builds up a chronological picture of the sherds that 774 may potentially relate to. The green arrows show links which do imply some stylistic connections, and the yellow arrows suggest possible connections where a little more caution should be exercised. The box shows that the sherd from Uraiyr (which was from one of the casts made available for the study) may tentatively also be dated to the first century and possibly second, in common with the sherds from Period G2 at Trench ASW2 or the Tamluk sherd. The sherd (572) from Period G5 at Trench ASW2 recovered in context 490 (old land surface) may have been in circulation for a while.

The shorter spikes also appear initially in Period G2 in this study, with some recorded from the Northern Sector of Arikamedu. However, DC104 is not recorded with smaller spikes at Trench ASW2 but can be found at the sites shown in Box Three on Appendix Four. There is little dating evidence for these sherds, the sherd from Pattanam was from a context dated to 1st century BC to 5th century AD (Cherian *et al.* 2007), whereas there is no dating evidence for the sherd 21 from Arikamedu, which Begley notes is “*weathered*” (Begley 1988: 438). The sherd from Phu Khao Tong is pictured with sherds of different designs and in the article dated to “*about the third to the first centuries BCE*” (Chaisuwan 2011: 93). Although the sherds with the shorter spike and a border are not present at Trench ASW2, it is not unreasonable to propose

that DC84 and DC104 are reasonably similar chronologically. This would bring the sherd from Pattanam to the start of its proposed chronological period, and the sherd from Phu Khao Tong to the end of what Chaisuwan suggested, and proposes chronological periods for those which have no supporting information, namely sherd 21 mentioned above from Arikamedu, and the sherd from Malhar (sherd 771).

Box Four demonstrates how the sherds with the Design Code DC103 are recorded in Period G2 and G5 (and also Periods D and F). One of the sherds from the most easterly point of this study is included in Box Four. Manguin & Indradjaja report a date of “*last century BCE or the first century CE*” (2011: 127) for the context where the Rouletted Ware was recovered at the site of Segaran IIA. This date is comparable with the calibrated date of Period G2 at Trench ASW2. Sidebotham (2004: 69) proposes that the context which sherd 52 from Arikamedu, (another DC103 sherd) comes from is “*Second century or earlier*” (Sidebotham 2004: 69), the sherds relationship to Period G2 proposes that Sidebotham is correct to add that the sherd may be earlier than the second century. The sherds in this box are from recorded excavations with relatively small chronological brackets, the exception is sherd 1492 from Pattanam which has been grouped in this box due to its similarities with the other sherds as discussed above, and it can be confidently proposed that it is from a comparable period to G2 from Trench ASW2.

The sherds which displayed the individual or continuous grooves came with a very limited amount of data, they were all very similar to sherd 586 (DC159) from Period

G5 at Trench ASW2, and are grouped within Box Five. DC159 only appeared at Trench ASW2 in Period G5 in this study, so it can be proposed that the continuous / individual groove feature may be a later design. However, it can be noted that from the evidence provided this feature does not travel particularly far, but does reach into Jaffna.

In addition to using sherds from Trench ASW2 as chronological markers, there are also some sherds which can be connected although they have not passed through Trench ASW2. An example of this is provided by sherds with the Design Code DC91, which appear at Brahmagiri and Arikamedu, which although dating evidence is not available, connections are noted in the design, and these sites are reasonably close to each other. Design Code 135 appears at Berenike and Mantai, but again was not recorded by this study at Trench ASW2, however unlike DC91, DC135 does come from a well dated site and a date can be proposed (and is comparable with many of the sherds in this study). The sherd DC135 from Berenike is dated in the excavation reports to between 1st century BC and the 1st century AD (Sidebotham & Weindrich 1999: 166). It is unfortunate, that despite the disc included in the 2013 report on Mantai, there is little further information on the sherds and this will be discussed further in Chapter Seven.

Box Six in Appendix Four shows a selection of sherds that do share some common features, and includes sherd 1079 from the excavations at Pattanam, which as noted above bears a striking similarity to sherd 533 from Period F at Trench ASW2. The

final box in Appendix Four represents DC88 and the relationships between the sherds that may be proposed. Again, there is limited data but there is the added feature of the sherd from Arikamedu having the graffiti on it as discussed above. The dates from the sherd from Arikamedu and Trench ASW2 allow a sense of “transit time” for the code to be circulated, which is not always clear on some of the other sherds, so from Begley’s re-evaluation of the location where Wheeler excavated sherd 67 from being prior to 100 BC, the design is recorded at Sisupalgarh with the slightly later date, possibly allowing for this design to circulate.

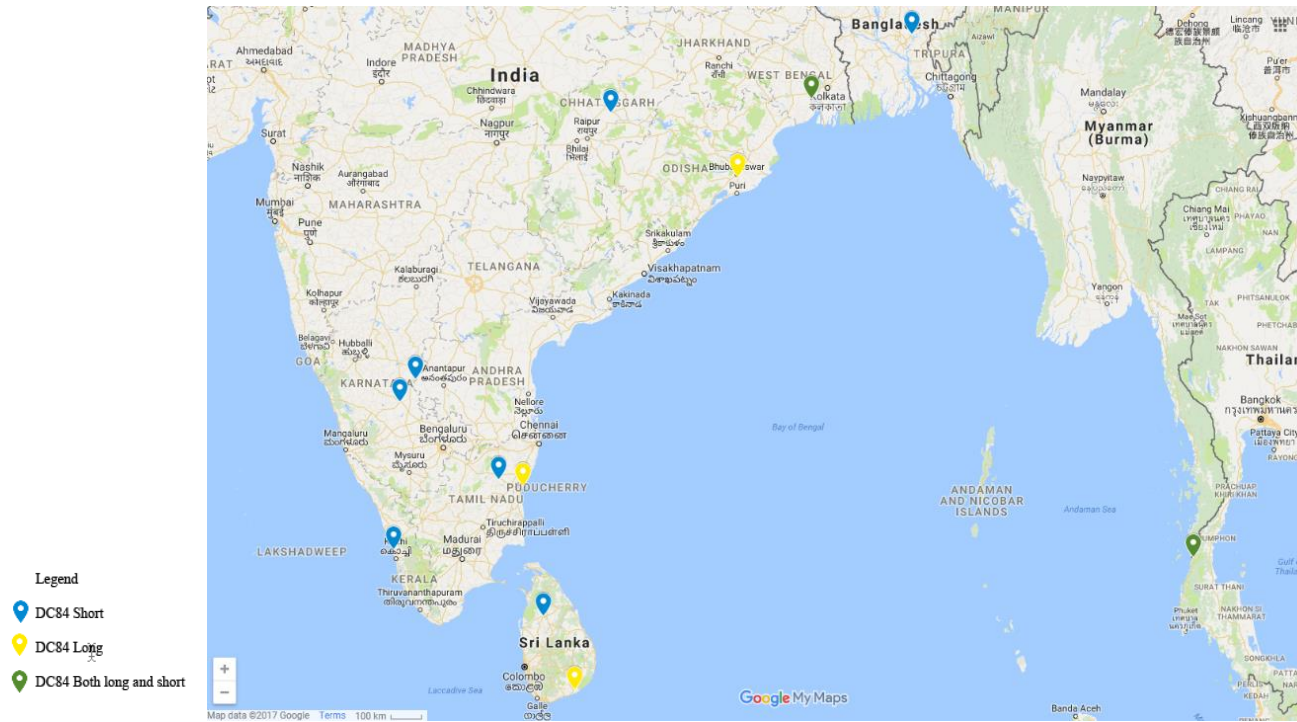
Although there is considerably less data from the Arikamedu Type 10 sherds there are still chronological consistencies that are noted. For example, the features such as H2 are recorded throughout Periods G2 and G3, and H4 in Periods G4 and G5, the analysis of the Arikamedu Type 10 is hampered by the wide variety of combinations of Component Codes.

6.27 Conclusion

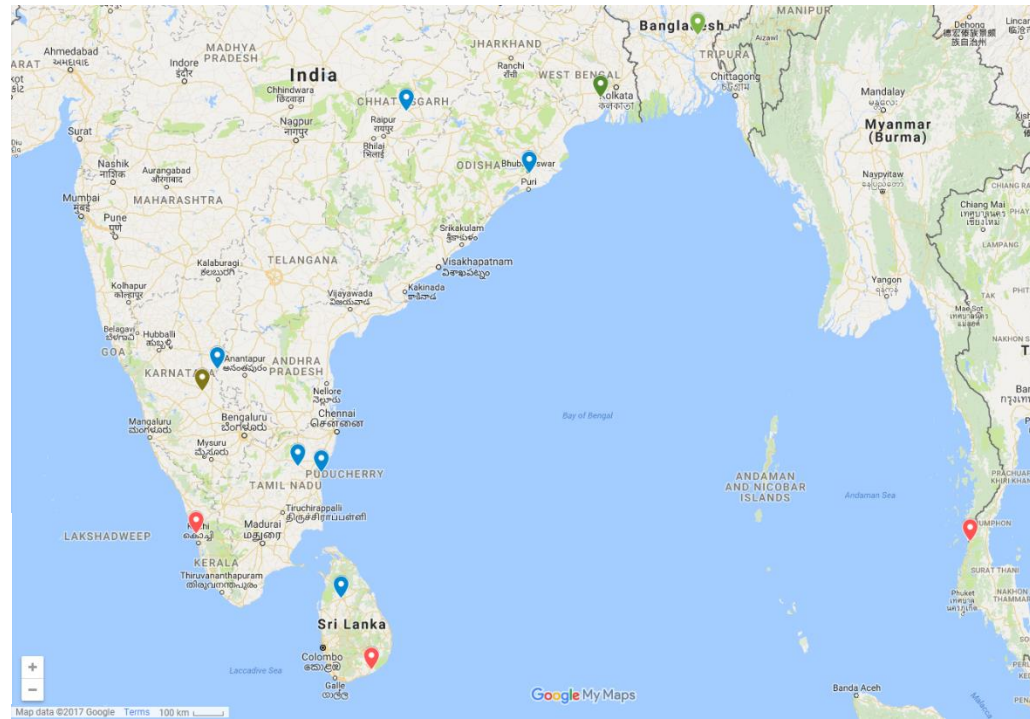
This chapter has compiled the data from the previous two chapters therefore meeting Objectives Five and Six of this thesis. The data has been highly biased towards the Rouletted Ware, due to the amount of Rouletted Ware recovered from the archaeological record in comparison to Arikamedu Type 10, and as mentioned throughout this study, there has been instances when barriers such as lack of supporting information or quality of image have prevented sherds being investigated as deeply as they could have been.

The final section of this chapter has used Appendix Four to complete part of Objective Seven. It has proposed dates for some of the ceramics, but has also agreed with some of the dates from the literature that accompany others. Chapter Seven will see the completion of Objective Seven, and will also consider some of the more functional aspects of the ceramics in this study in order to meet Objective Eight, where it will discuss the original purpose for the ceramics. Chapter Seven will also review the data from this thesis and make proposals as to where the vessels were manufactured in order to meet Objective Nine of this study, and finally the method used in this thesis will be reviewed. This review, along with a discussion regarding the transferability of the method will be followed by proposals for future projects, these points will complete the final objective in this thesis, Objective Ten.

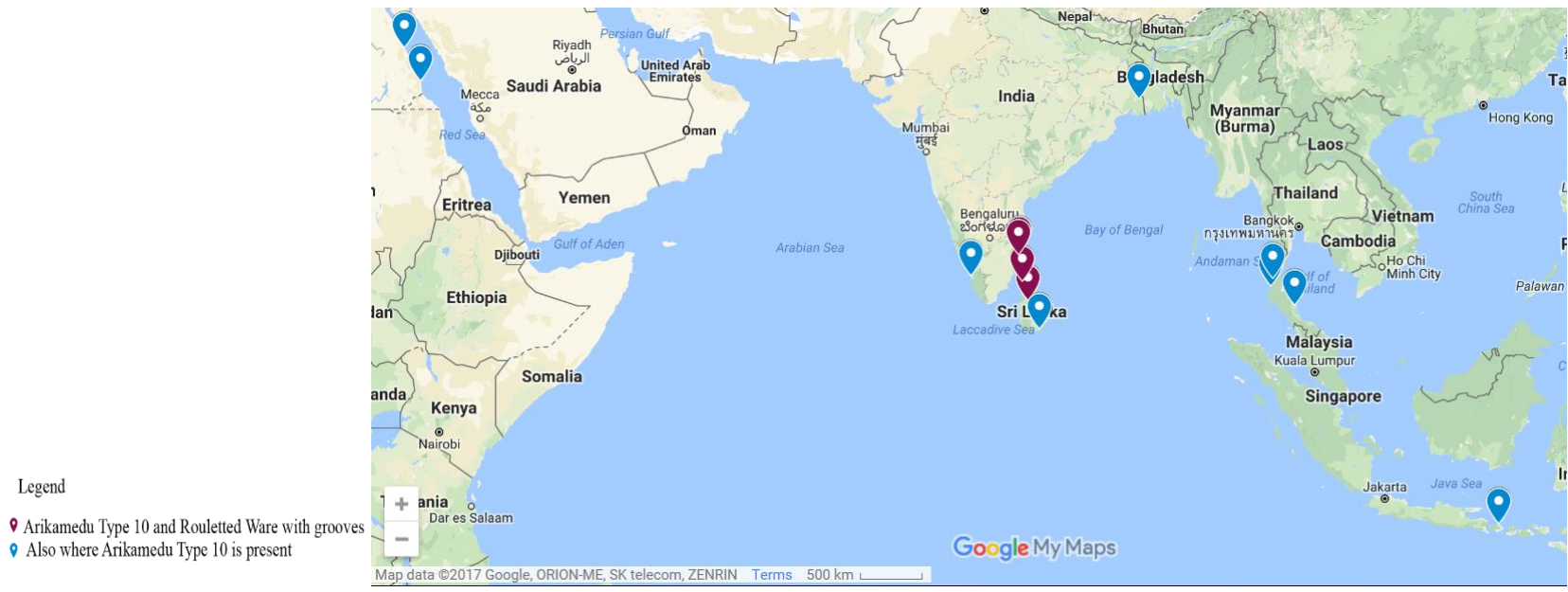
Chapter 6: Maps



Map 6.1 DC84: the distribution of the long and short spikes (NB included here is the a sherd from Tissamaharama which was DC4 – see text)



Map 6.2 Summary of manufacturing faults on Rouletted Ware (DC84 & DC 104)



Map 6.3 Distribution of sherds of Rouletted Ware with grooves and Arikamedu Type 10

Chapter 6

Figures



Figure 6.1 Sherd T37. Arikamedu Type 10 excavated at Trench ASW2 (photo: Coningham)

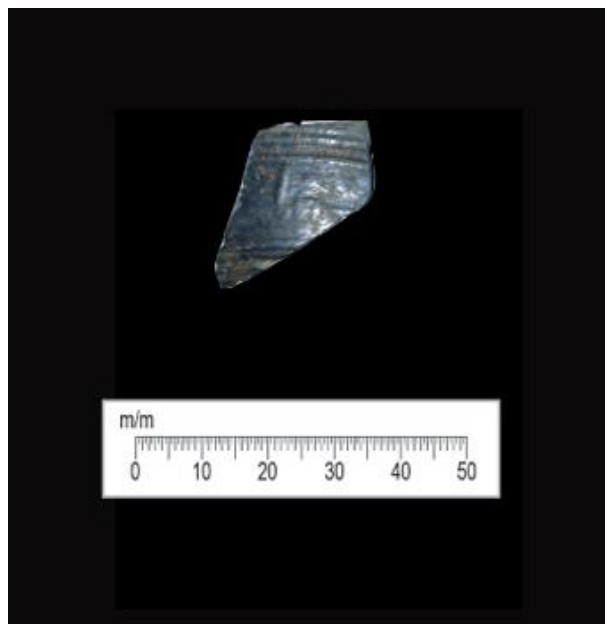


Figure 6.2 Sherd T38. Arikamedu Type 10 excavated at Trench ASW2
(photo: Coningham)



Figure 6.3 Sherd T36. Arikamedu Type 10 excavated at Trench ASW2
(photo: Coningham)



Figure 6.4 Sherd T35. Arikamedu Type 10 excavated at Trench ASW2
(photo: Coningham)



Figure 6.4a Drawing of sherd T35, excavated from Trench ASW2



Figure 6.5 Sherd T76. Arikamedu Type 10, excavated from Trench ASW2
(Photo: Coningham)

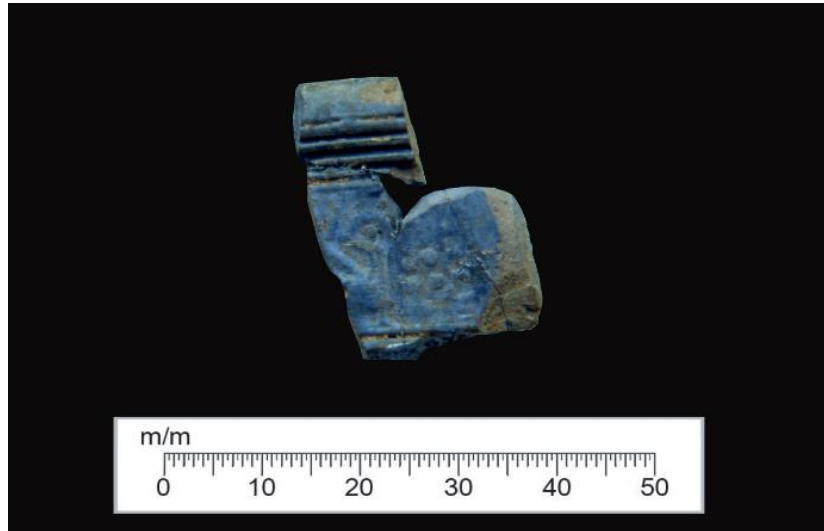


Figure 6.6 Sherd T34. Arikamedu Type 10, excavated from Trench ASW2
(photo: Coningham)

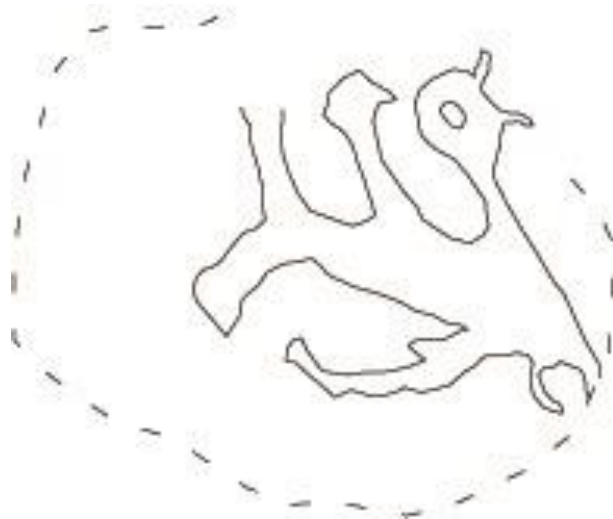


Figure 6.7 Drawing of the bird stamp from Arikamedu Type 10, sherd T75



Figure 6.8 Drawing of the bird stamp from Arikamedu Type 10, sherd T76



Figure 6.9 Sherd 576 from Trench ASW2 (photo: author)

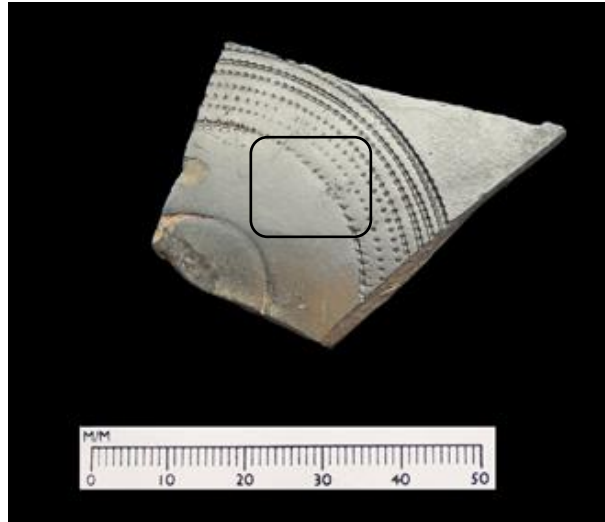


Figure 6.11 Sherd 535. Rouletted Ware with shallower indentations highlighted (photo: author)

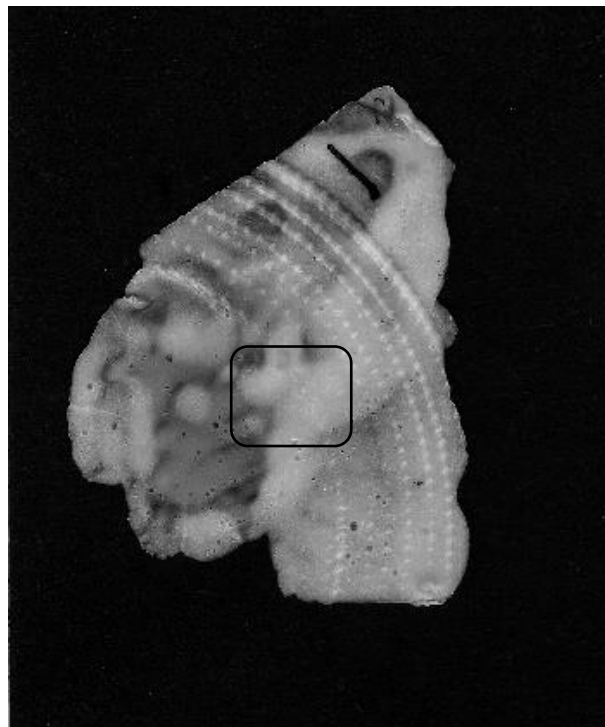


Figure 6.11a Impression of the Rouletted Ware sherd 535 (photo: author)



Figure 6.12 Sherd 527. Rouletted Ware from Trench ASW2 (photo: author)

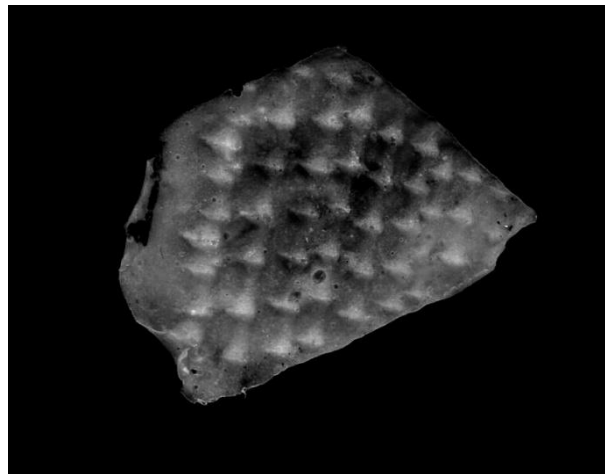


Figure 6.12a Impression of the Rouletted Ware sherd 527 (photo: author)



Figure 6.13 Ceramic discs on display in the Karur Museum (photo: author)



Figure 6.14 Rouletted Ware disc(?) from Pattanam (sherd 1043) (photo: author)



Figure 6.15 Sherd 497. Rouletted Ware excavated from Trench ASW2
(photo: author)

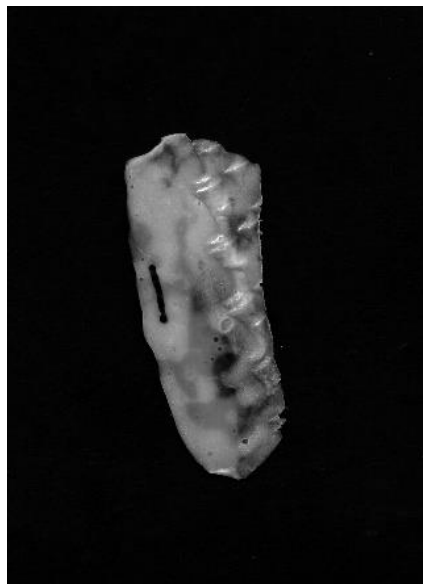


Figure 6.15a Impression of the Rouletted Ware Sherd 497 from Trench
ASW2 (photo: author)



Figure 6.16 Sherd 533. Rouletted Ware excavated from Trench ASW2
(photo: author)

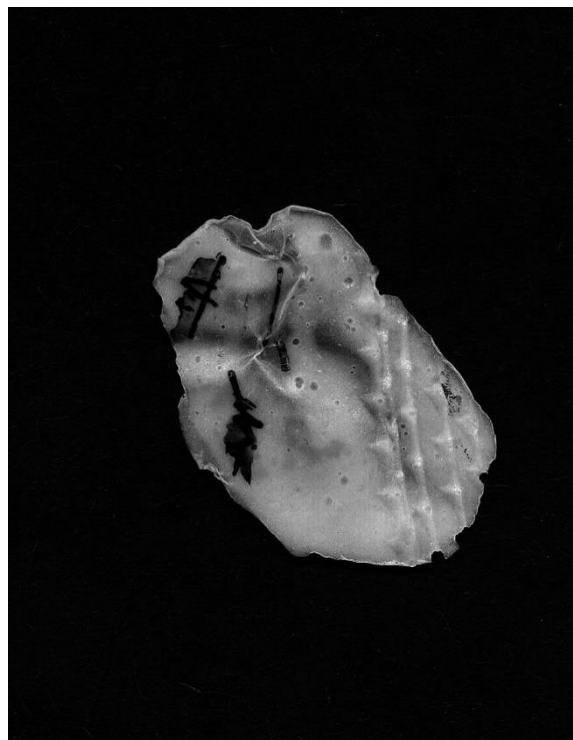


Figure 6.16a Impression of the Rouletted Ware Sherd 533 from Trench
ASW2 (photo: author)



Figure 6.17 Sherd 1079 from the excavations at Pattanam (photo: author)



Figure 6.18 An example of short spiked rouletting on sherd 1133 from Pattanam (photo: author)



Figure 6.19 Sherd 573. Rouletted Ware from Trench ASW2 (photo: author)



Figure 6.19a Impression of the Rouletted Ware sherd 573 (photo: author)

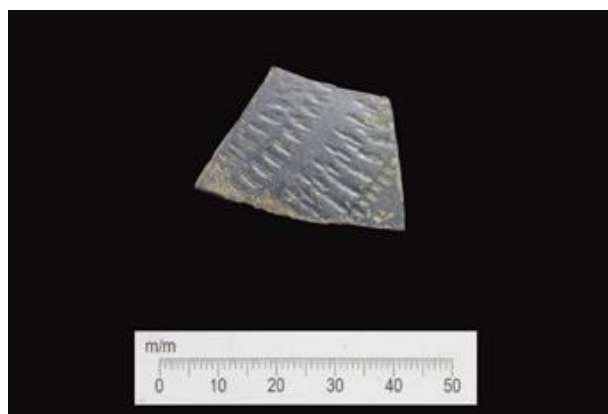


Figure 6.20 Sherd 595. Rouletted Ware sherd excavated from Trench ASW2 (photo: author)



Figure 6.20a Impression of Rouletted Ware sherd 595 (photo: author)



Figure 6.21 Sherd 491. Rouletted Ware sherd excavated from Trench ASW2 (photo: author)



Figure 6.22 Sherd 621. Rouletted Ware excavated from Trench ASW2 (photo: author)

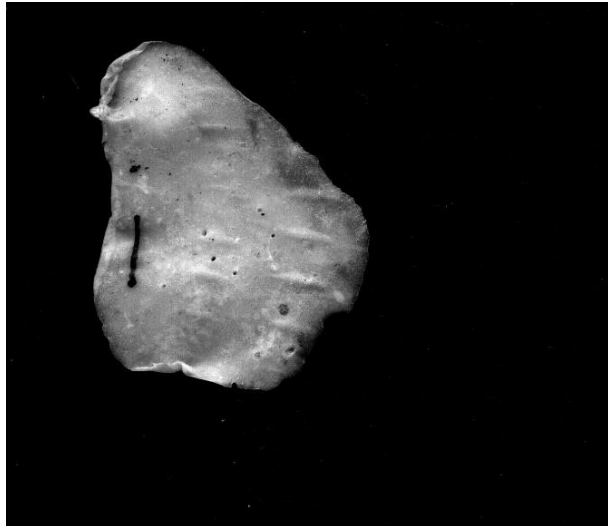


Figure 6.22a Impression of Rouletted Ware sherd 621 from Trench ASW2

(photo: author)

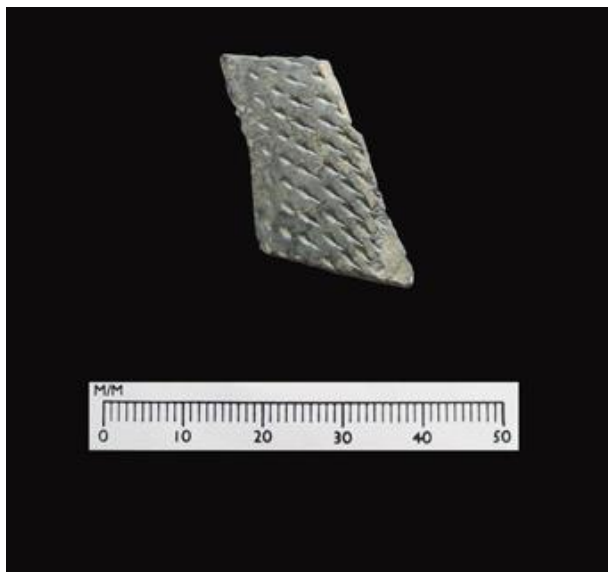


Figure 6.23 Sherd 587. Rouletted Ware sherd from Trench ASW2 (photo: author)

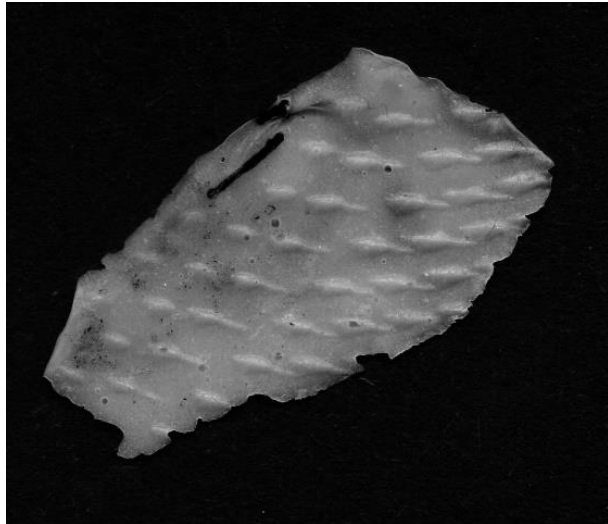


Figure 6.23a Impression of Rouletted Ware sherd 587 (photo: author)

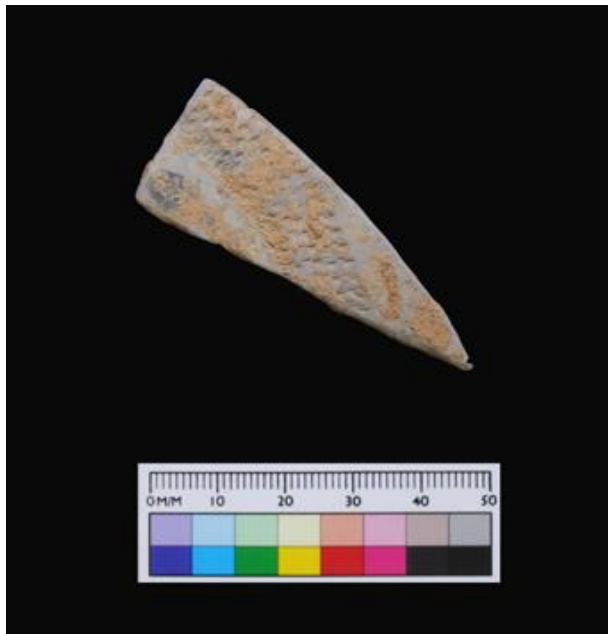


Figure 6.24 Sherd 995 excavated from Pattanam (photo: author)

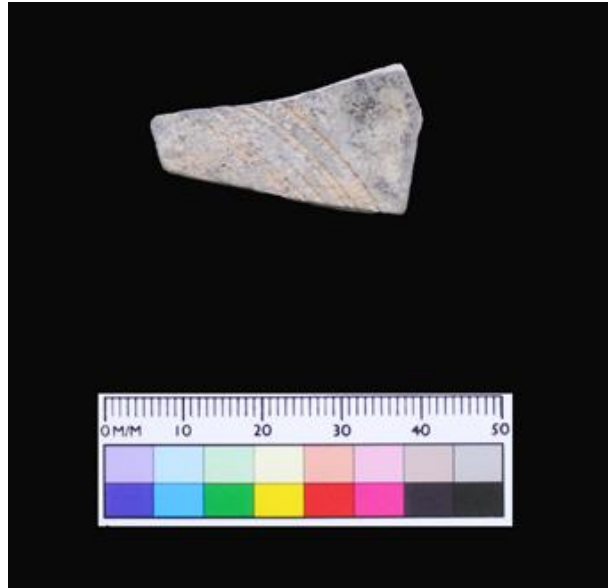


Figure 6.25 Sherd 1849 excavated from Pattanam (photo: author)



Figure 6.26 Drawing of Arikamedu Type 10 sherd T24 from Chandraketugarh



Figure 6.27 Drawing of Arikamedu Type 10 sherd T35 from Trench ASW2

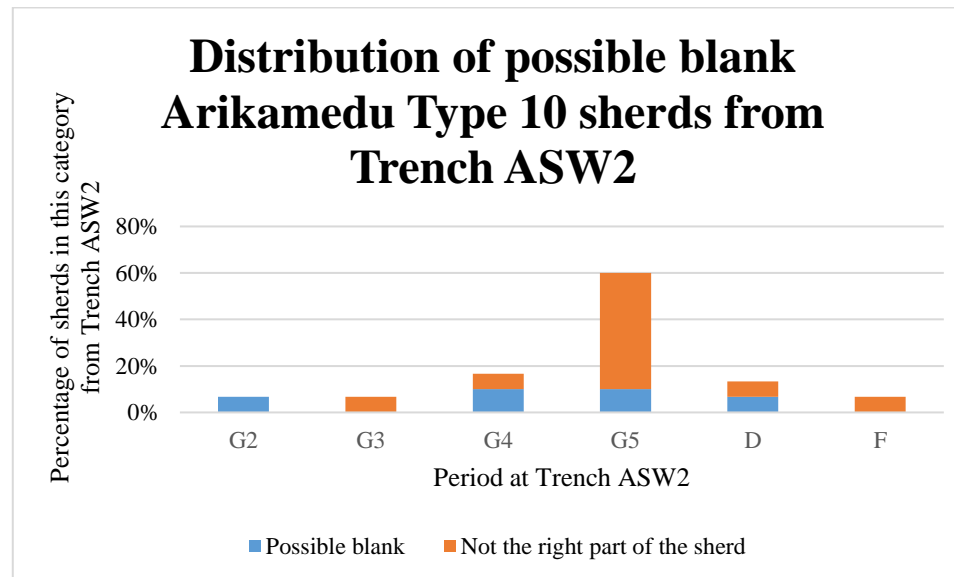


Figure 6.28 Arikamedu Type 10 sherds with no stamps at Trench ASW2



6.29. Sherd 1385. Rouletted Ware excavated from Pattanam



Figure 6.30 Sherd 586 Rouletted Ware excavated from Trench ASW2

Chapter Seven

Discussion and Conclusion

“Clearly the most dynamic trade network was the one which connected the Mediterranean and India via the Red sea during the first century A. D. This commerce was an immense undertaking in which ancient navigators, financiers and merchants, as well as suppliers and consumers, all played a significant role”

Begley (1991: 3)

7.1 Introduction

The previous chapter combined the data that had been gathered in relation to the two ceramics in this study, Arikamedu Type 10 and Rouletted Ware, therefore completing Objectives Five and Six of the thesis. Objective Five was to analyse the distribution and chronological changes of Rouletted Ware, and Objective Six was to repeat the process for Arikamedu Type 10. Chapter Six then proceeded to complete Objective Seven by comparing the chronological and spatial data from the results of Objectives Five and Six, including the significance of the ceramics in relation to the development of networks of communication, and to propose dates for some of the ceramics in this study.

This concluding chapter will complete the final objectives of this research, namely Objectives Seven, Eight, Nine and Ten. Objective Eight is to interpret the purpose and function of the ceramics, Objective Nine is to present a proposal for the production point, considering existing ideas and those which have arisen through

this study. Finally, Objective Ten will appraise the methodology used in this thesis and discuss its transferability to other ceramics and propose future research projects.

The opening quote of this chapter highlights the perceived dominance of Indo-Roman trade across the Indian Ocean and the Red Sea. However, this thesis has supported the presence of an extensive regional distribution network as earlier highlighted by Coningham (2005: 550). With reference to the vessels in this study, their distribution extended out to a more extensive trade in an easterly and westerly direction. It is clear that the distribution from the port sites in this study do not simply represent a market developed to cater for Roman trade as conceptualised by Wheeler in his 1955 publication "*Rome beyond the Imperial frontiers*", where he mentions the conversion of a village of "*simple fisher-folk*" into an Indo-Roman port (1955: 173–174). The distribution instead aligns with Coningham's theory as proposed in the 2002 paper "*Beyond and before the imperial frontiers: Early Historic Sri Lanka and the origins of Indian Ocean trade*". There was not simply a market to cater for the Roman demand from the west, but one centred on a local network active at comparable times, meeting regional demand. But this demand could also be a stylistically variable one, as that demonstrated by the styles required in the North East of India.

Therefore, while more lucrative and decorative items may have been manufactured to meet the demand and exchange of the Roman empire, there was also a proportion of the workforce concentrating on the output of more functional objects for everyday use. Rouletted Ware was clearly in demand, as shown by the volume recovered at sites such as Trench ASW2 and Pattanam. This workforce would have produced the

Arikamedu Type 10, the more elusive product, always recovered in the presence of Rouletted Ware.

7.2 The function of the ceramics in this study

The function of the ceramics investigated in this study does not seem to be obvious - did it serve a particular function, or were they a general table ware? Howard (Table 1.1: 1981) identifies various characteristics of ceramics and then poses a functional type for the vessels. Rouletted Ware does fit reasonably well into the category "*eating and drinking vessels*". Howard stipulates that vessels in this category have "*open forms for easy access and cleaning; shapes seen to simple flat bases and / or feet, handles common*". The openness of the Rouletted Ware vessel does lend itself to being passed around. Also in this category Howard specifies that the vessels are of a fine fabric, and they are often decorated. She postulates that the reason for decoration is for display, but also to identify the owners. As the Rouletted Ware sherds that have been recovered in this study have varied immensely it is not possible to propose that each design represents various owners. A possible exception to this is the Rouletted Ware and the Arikamedu Type 10 which is recovered in the North East of India, where the decorations are considerably different from other locations in this study. To meet this criteria Howard also notes that the vessels are highly fired (as most of the Rouletted Ware appears to be), and the degree of care in manufacture is also high, however there are some errors in the decoration. The vessels in the category of eating and drinking are recovered frequently in archaeological

deposits, again a factor that is reflected in Rouletted Ware, and Howard does state they are often found in dwelling and rubbish deposits. Unfortunately, for a considerable amount of the Rouletted Ware in this study it is not possible to determine the context where the sherds were deposited. A final category in Howard's table is that no factors are listed in relating the eating and drinking vessels under the column "*contents and clues*"; in this column Howard lists factors which may help confirm the function of a vessel, such as wear patterns or residues, factors such as these have not been recorded on Rouletted Ware.

Rouletted Ware was described as "*an offshoot of the northern Thali*" (Allchin 1959: 257), although it is difficult to comment in relation to the manufacturing techniques and distribution of labour as highlighted by Allchin throughout his article. Coningham *et al.* (2006: 241) classed Coarse Ware Form 29 and its variants from Trench ASW2 as a "*Deep dish or tali*", discussing the similarities between this and the Sri Lankan *tali* as highlighted by Deraniyagala. The thali / *tali* is used as a form of table ware, and Rouletted Ware, with its comparable shape, shares the likelihood of being used for a similar function. This theory is developed with the suggestion made by Coningham *et al.* that possibly the Rouletted Ware bowls were intended for shared use, while the Rouletted Ware that was classed as "*baby*" from Trench ASW2 was intended for individual use (Coningham *et al.* 2006: 133). The "*baby*" Rouletted Ware, was distinguished at Trench ASW2 as having a diameter of less than 15cm. The two sizes of Rouletted Ware do combine to

produce what could be used for food service, however the popularity of the “baby” size is difficult to determine, although at Trench ASW2 it does precede Rouletted Ware, possibly making it an experimental stage in the development of the ceramic to perfect the techniques for a larger vessel. Coningham *et al.* (*ibid.*) note that there is no parallel for the “baby” ware from Wheeler’s excavations, and highlight that it could potentially be difficult to distinguish this smaller version in the archaeological record unless the rim of the vessel is present. The identification of the “baby” sherds has not formed part of this thesis. Should the opportunity become available for analysis on organic remains recovered in either type of Rouletted Ware described here, it may provide more specific evidence as to the function of these vessels.

Proposals for the function of Arikamedu Type 10 presents some problems. When trying to match the vessels up with Howard’s chart of predicted vessel function as introduced above (1981: Table 1.1), difficulty is experienced when trying to assign the characteristics of the Arikamedu Type 10 to Howard’s categories. The function of Arikamedu Type 10 does remain highly debatable, a debate which is intensified by the style of the decoration and the fact that it is a positive imprint on the inside of the vessel. The high sides do make it suitable for carrying liquid, but this would obscure the design. The reduced amount of Arikamedu Type 10 in the archaeological record implies that it was a higher status ceramic than Rouletted Ware. It may have been owned by people who could afford Rouletted Ware, but only in limited quantities. However, there may be some difference in social value

as discussed below, it may be acceptable to repair Rouletted Ware (as demonstrated by the examples below) as it is in everyday use, although the Arikamedu Type 10 is more of a special possession, therefore it is not acceptable to repair it.

On comparing the distribution of Rouletted Ware and Arikamedu Type 10 in the hinterland of Anuradhapura, certain factors occur that provide evidence regarding use and ownership. At the Level One site of Trench ASW2, which is within the walls of the city of Anuradhapura, 1792 sherds of Fine Ware ceramics were recovered, whilst in the Hinterland, only 20 sherds of Fine Ware were recovered, almost 90 percent less (Coningham 2002: 99, Coningham *et al.* 2013: 313). From the Hinterland, only three sherds of Rouletted Ware were found in the entire survey which resulted in the recording of 754 archaeological sites (five undiagnostic sherds were also recovered), and there are no sherds of Arikamedu Type 10 recorded (Manuel *et al.* 2013: 49). Obviously, this presents a considerable variation between the Hinterland and centre, and demonstrates how the two ceramics were concentrated. The Rouletted Ware that was recovered in the Hinterland came from the sites F101 and F102. These neighbouring sites represent “*undiagnostic pillar blocks*” (F101) and “*ceramic scatter w/ slag*” (F102) and the report comments that the Rouletted Ware was recovered “*close to the surface of the trenches*” (Coningham *et al.* 2013: 231) and many of the ceramic scatters had “*little depth*”, and were described as “*ephemeral*” (Manuel *et al.* 2013: 49). F101 does contain other ceramics and also metal

working residues, but the Early Historic ceramics (which would include Rouletted Ware) are the earliest category recorded (*ibid.*: 51). The lack of the ceramics in the Hinterland suggests that in the Anuradhapura region they were ceramics for the urban dwellers.

It is mentioned above how evidence supports the use of the Rouletted Ware as a serving dish and also introduced Allchin's article on Rouletted Ware and *tali* dishes. If both vessels are serving a similar purpose, it could be proposed that as the recovery of Rouletted Ware is so limited in the Hinterland, that the use of the *tali* may increase. Variant 31/A/A/1, is a dish or *tali* is described as a "*dish form with prominent rim and convex upper body*" (Coningham *et al.* 2006: 252-257) which is widely distributed throughout Trench ASW2, and 12390 grams were recorded but there is no evidence of this at all in the Hinterland report. 690 grammes of the variant 31/A/A/2 are recorded at Trench ASW2, whereas 48.1 grammes are recorded in the hinterland, and this is a pattern which appears to be repeated for the more common forms of *tali*. There are some exceptions amongst some of the forms with a more limited distribution. Form 44 and its variants does not vary a great deal in the quantities recovered, being represented by eight sherds in the hinterland and six at Trench ASW2 (Coningham *et al.* 2006: 265, Coningham *et al.* 2013: 306).

A flat dish with low walls such as a *tali* or rouletted ware bowl was required by some in the Hinterland, but the demand was less than for the centre of

Anuradhapura, this may also reflect the population number. It is clear by its absence that the practices of the Hinterland did not require Arikamedu Type 10, however it is not possible to determine as to whether this was a conscious decision, it was not available, or whether it was not affordable. Various cup shaped vessels are recovered from the Hinterland, but nothing appears to compare with the Arikamedu Type 10, especially with reference to the decoration on the inside of the vessel.

The three volumes of the more recent excavations from Anuradhapura, (Coningham 1999, Coningham, 2006, Coningham & Gunawardhana 2013) present Rouletted Ware as a key Fine Ware in the urban centre, the ‘must-have’ of the Early Historic period. Whereas Arikamedu Type 10 does present itself as the considerably more exclusive vessel, perhaps something that is used on specific occasions, to which the peacock or other features of the decoration may have a certain relevance. However, despite this definite distinction, Rouletted Ware does appear in smaller locations in South India. Suresh describes the presence of Rouletted Ware as “*widely distributed throughout the subcontinent both in the coastal regions and in the interior areas*” (2004: 90), and the map in Schenk’s 2006 article also demonstrates a wide distribution (Schenk 2006: Figure 3). Although the presence of these vessels has not been verified to show that they are Rouletted Ware as investigated in this study (see Section 7.6) here is a wide distribution which must encompass rural and urban settlements, some being from excavations and some being surface finds (Suresh 2004: 90). As detailed below, Rouletted

Ware often appears in small excavations in South India, but for some reason it appears to have a very limited expansion beyond the urban centre in Anuradhapura. This may be linked to it being a ceramic for a specific group, possibly the elite, whereas in South India, as it was produced in this region it circulated more widely.

If the sherds that were recovered from Berenike do represent an Indian trader's belongings as discussed earlier (Tomber 2000), this could imply that it was the norm for the two ceramics in this study to be used together, forming part of the basic dining set, with Arikamedu Type 10 playing a smaller, or more elitist part. Whoever took these vessels has picked out a representation of what they believed they would require.

7.3 Where were the ceramic Types in this study made?

Since the publication of Wheeler's Arikamedu excavation report, the origin of the ceramics in this study has been discussed. Debates have included proposals by Ford *et al.* who postulated that the vessels were produced in South East India, and the need for "*extensive survey*" was paramount to find the paraphernalia associated with pottery production (2005: 218). The controversial theories proposed by Gogte (1997) are often mentioned but also dismissed. This study argues that production is likely to take place close to its concentrated places of recovery, not in a region where a limited selection of the sherds was found as proposed by Gogte (1997), both Begley (2004:

631) and Bellina & Glover (2004: 78) present similar points of view. Begley proposed that Rouletted Ware was produced at regional centres where the greater volumes have been recovered such as Arikamedu and Alagankulam, but the whole debate is hindered by limited information (Begley 2004: 634). Bellina & Glover (2004: 78) state “*it is generally agreed that rouletted ware was locally made only a few centres, probably in Tamil Nadu since the fabric is very homogenous*”, supporting the consensus for a South India production site. However, the papers quoted by Ford *et al.* (2005), Begley (2004) and Bellina & Glover (2004) were all published prior to the excavations at Pattanam, which has produced a great volume of Rouletted Ware, and is situated on the western coast of India.

Tables 4.6 and 4.7 in Chapter Four investigated the degree of diversity in the Design Codes across the sites in this study; Chapter Six illustrated the variation within these codes, but the tables do present data which can be used to make a case for the production location. As mentioned in Chapter Four, the site closer to the production site is more likely to have a wider variety of designs, and Table 4.6 in Chapter Four does imply greater variety in the sites in South India. The figures are slightly distorted by the sherds from the north of India which have several completely different designs.

Replacement through wear of the vessels may have an impact on the distribution of sherds. If Rouletted Ware was more commonly used than Arikamedu Type 10, then it is highly likely that the vessels will be discarded

more often. To propose more theories here would require more information than what was available to this study, such as data on the interval between breakage and replacement – often a potter would be unaware that he was selling a vessel to replace one that was broken, and it is unlikely that the vessels are replaced at an equivalent rate (Rice 1987: 303).

Traits such as the guidelines on Rouletted Ware discussed in Chapters Four and Six, and along with the blank sherds of Arikamedu Type 10, can all be linked to people learning how to make these vessels. Both of these traits are recovered at several locations in this study but principally in the south of India. With reference to some of these vessels having a wider distribution, there may be a connection with wealth – if the neighbour of a potter is poor, he may be willing to take the pots rejected by other customers.

7.4 Review of the method

Section 3.8.1 of this thesis, discussed the method used for the impressions – it was a ‘method in a box’. The method does not rely on external sources (i.e. electricity / Wi-Fi reception) just a set of equipment, a flat surface to keep the setting latex on, and the forethought to provide a suitable receptacle to store any impressions in. The versatility of the impressions allows for further analysis, including cross sections and photography in studio lighting conditions. The method has also encompassed the use of original photographs and published images, presenting a solution

which can be used on collections that are no longer accessible or have been lost, providing there are some reasonable quality images available.

The method used in this thesis was expanded from that used by Shoebridge (2009) with regards to the Arikamedu Type 10, and also considered Blair's research into Rouletted Ware (2010). In addition to the drawing technique developed by Shoebridge, the impression technique used by Blair was also considered but a different moulding compound was decided upon.

Sherds of Rouletted Ware were available from Trench ASW2, as well as from Pattanam and a very limited number from Arikamedu. Impressions were taken of the highly fired sherds from Trench ASW2 these produced excellent impressions – the only hindrance being where there was only a small part of rouletting on a sherd, this would produce a very small cast as the latex used to take the mould could not go right up to the edge. The method allowed extra clarification of the sherds, and particularly helped where decorations on sherds were close together in allowing the breakdown of the rouletted indentations. The method is transferable in that if a spot test of the method is carried out on a small area, it has the potential to be used on a variety of highly fired decorated ceramics, in this study it has only been used on the Rouletted Ware as this was the only ceramic type available. Disappointingly the author was not granted permission to take impressions of the Arikamedu sherds that were held at University College London (UCL). A set of photographs was produced of the Pattanam sherds available

Where it was not possible to take impressions, sets of photographs were taken of the front and the rear of the sherd using a daylight or a LED lamp. These were of sufficient quality using a Canon EOS1100D to allow for significant enlargement in Adobe Photoshop to investigate detail. Original photographs of Arikamedu Type 10 were made available, as were some casts. The original photographs had a scale, but unfortunately no shrinkage data was available for the cast that were made by others, although the author is extremely grateful for the access to these.

In addition to the casts and the original photographs, the data extracted from these documents was supplemented by a series of published images. Although it was not ideal to use drawings as they cannot be verified, some drawings of Arikamedu Type 10 were required to expand the dataset. It is appreciated that the selection of data used in this study does not produce a map like that in publications such as Schenk (Figures Three and Four: 2006), but with the exception of a few of the Arikamedu Type 10 sherds, all the sherds or images have been seen by the author.

Sherds were allocated a code depending on the design of rouletting or the factors that made up the design in the Arikamedu Type 10 as introduced in Chapters Four and Five. The two-level sort system worked reasonably well for the Rouletted Ware, except where some of the codes were very similar,

and areas where further breakdown of the Design Codes would have been useful, for example in the case of the long and short spike rouletting, but they did provide data on general trends. The Component Codes used for the Arikamedu Type 10 highlighted the diversity of features within this small dataset, but did provide some comparable features. The study would have benefitted from access to more ceramics of both types from which impressions could be taken to analyse (see Section 7.7, Future projects).

One criticism of the method could be that the material investigated did not represent sherds from all the sites where Arikamedu Type 10 and Rouletted Ware have been recorded; while this is appreciated the author of the research only used examples where the features could be clearly seen. There are examples in publications where images of Rouletted Wares are represented, but the images are unclear, and the rouletting cannot be distinguished. The study has the flexibility to be expanded should more sherds become available.

7.4.1 Transferable methodology

The method that was used in this thesis, although specifically designed for this research, is potentially transferable for use onto other ceramics with comparable features, following the testing for suitability as mentioned in Chapter Three.

The sherds that were available to have impressions taken from in this study were from the flat bases of Rouletted Ware. If there was a considerable increase in the number of curved sherds available for research, then it may be an option to consider 3D modelling or printing being introduced to develop the method, and it is acknowledged that the introduction of such technology would enhance the transferability of the method. However, issues such as cost, time and knowledge available would need to be considered.

The code systems that have been used in the study provide a relatively straight forward arrangement, which on being produced in the correct format, could provide a ‘user guide’ to sites and museums that encounter Rouletted Ware and Arikamedu Type 10. With the aid of examples and diagrams, museum staff or archaeologists in the field could follow a series of flow charts tailored to the levels of sort in this study, and see if they could match up the ceramics recovered from excavations or kept in collections, and possibly identify where else it has been recorded or a suggestion of the date. There are many publications which detail locations of where Rouletted Ware has been recovered (for example Schenk 2006: 130), but although these publications are useful, and often presenting the data in the form of a map, they do not highlight which design was found where, or any indication of chronology.

7.4.2 Cultural transmission

Chapter Two introduced the ceramic Arikamedu Type 10 and also the concept of the vessel as a skeuomorph, as discussed by Coningham (2006b: 334). Coningham compared the decoration on the Arikamedu Type 10 to that of later Hellenistic and early Roman Glass as noted in Chapter Two. Chapter Five briefly discussed the idea of cultural transmission in relation to Arikamedu Type 10. Further research could investigate a chain of potters who observed a design on a vessel, then on returning to their workshop they recreated the design from memory and compared the result to the original. The result could be swayed by the skill of the potter and it may be noticed that specific traits (perhaps characteristic of an area) regularly used by the potter are subconsciously included in the vessel, even though they may not have been on the design of the vessel that is being replicated. This research could also be staged over different periods of time to investigate the rate of forgetfulness, in addition to just a straightforward replication. The potter would need to work out details such as spacing and the hardness of the ceramic to take the stamp (or the rouletting in the case of Rouletted Ware), although for this he may have previous experience to call upon. This experiment could be used on other examples of material culture, but ceramics are obviously more relevant here.

In addition to geographical transmission of ideas, ideas may have also been passed through various generations, which may have allowed for similar patterns to be produced at first, then variations introduced. If the ceramics in this study were produced at one production point, different skills may have been passed down through generations and stylistic influences introduced from elsewhere, depending on what other work was available and if the role of a potter was full time. There could possibly have been a set of rules linked to an emic perspective which had to be abided by, especially in relation to the symbolic links to the peacock, and a range of alternative designs which could have been chosen. Unfortunately, the limited data available for this study does not allow further investigation into this (Rice 1987: 245).

7.5 Reuse of material culture in manufacture, and reuse of the vessels in this study.

As discussed in the previous chapter, Schenk (2006), proposed that Rouletted Ware was produced over a shorter timespan but was then treated as an heirloom – being passed down through generations, explaining its later deposit in the archaeological record. This personal value of the Rouletted Ware is obviously difficult to prove or deny, Schenk does provide the evidence of a repaired sherd which was recovered in the 2004 campaign at Tissamaharama (Schenk 2006: 123), suggesting intangible value to the piece. This is a repair on a vessel which appeared to have been in daily use, so there may have been a personal or practical worth as mentioned above in Chapters

Two and Three. An example of a repaired piece of Rouletted Ware was also recorded in Begley's excavations at Arikamedu (Begley 1996a: 31) this sherd has holes drilled in it which allowed the sherds to be wired together. This piece recorded by Begley does also have some Tamil-Brahmi graffiti, which is postulated to being from the Third Century AD. It can be debated that the piece was repaired because of an intangible value, because of the writing or a combination of both? Begley and Tomber refer to a "*fragment of Fine Ware I with two pierced holes*" (1999: 163) which was recovered from the excavations at Arikamedu and believed that this was used as a pendant.

Trench ASW2 does not appear to contain any sherds of Rouletted Ware or Arikamedu Type 10 which were repaired in antiquity. In relation to Schenk's theory discussed as above, Rouletted Ware was recovered in later phases at Trench ASW2 but often where the site had been disturbed. However, the other area of reuse that was discussed in this study has been identified at Trench ASW2 (Coningham *et al.* 2006: 150f) – the use of turning sherds into discs. As discussed in the previous chapter, these discs were commonly interpreted as gaming counters, and are not exclusive to South Asia.

7.6 Contribution to the discipline from this research

The opening quote of this thesis stated, "*I would also argue that virtually all new data on this trade are likely to come from archaeology, which has barely started to research the problem, rather than literary and*

historical sources which seem to be finite and mostly known” (Glover 1996: 368). A large proportion of research regarding trade in the region discussed in this study stems from being related to literature such as the *Periplus*, as archaeologists such as Wheeler tried to match their findings to Roman ports, in his case Poduke – and more recently the deliberations in relation to Muziris (Shajan *et al.* 2004, Srivathsan, 2013), with previous theories being that it was located at Kodungallur (Craganore). Glover does state that the texts are mostly known, with the emphasis on the mostly, there is potentially more to discover, and this can include gaining data through scientific advancement, for example as dating techniques change. However, in addition to the movement linked to Indo-Roman trade, there was also movement of goods within the region linked to various other factors as discussed in Chapter Two.

This research has contributed both a method for the analysis of decorated ceramics, along with results which demonstrate the distribution of the ceramics in this study during the Early Historic period. Due to limitations of data it has not always been possible to present chronological results, but there have been occasions when brackets proposed for certain sherds have been narrowed. It has identified methods for further research as discussed elsewhere in this chapter.

Regardless of the volume or detail of data available for this study, it is unlikely that it would be able to determine what type of trade was being conducted. The Level One site in this study was the capital city of the island

of Sri Lanka for centuries and a focal point for Buddhist pilgrimage (as it still is today), whereas the two Level Two sites (Arikamedu and Pattanam) were primarily port sites. However, several of the other sites in the study share the common factor with the Level One site of Trench ASW2 of being a key location for Buddhist pilgrimage. These two factors of the ports and Buddhism, however, can be combined. The Jataka stories provide evidence to support the involvement of Buddhists in maritime trade (Tripathi 2011: 1080), this is visible in statues such as that of the Goddess Tara at Ratnagiri which includes a panel showing a shipwreck scene, and a medallion from Bharut which shows a sea monster. Tripathi, in his article, plotted a range of Rouletted Ware in Figure 9 (2011: 1083). His map included the sherds from Beikthano, which, if using the reference seen by this study (discussed in Chapter Two), are not the type of Rouletted Ware associated with this current research. Therefore, this raises reliability issues over the other sherds that have not been viewed, although this study has contributed data which is convincingly representing the two ceramics in this study as defined by Wheeler *et al* (1946).

However, while there may be some evidence to support the role of Buddhism and trade, as noted by Prickett (1990a: 151), there are few inscriptions that produce clues towards trade networks, and she stated “*It is extremely difficult to differentiate archaeologically between a formalized trade and other forms of international contacts accompanied by more casual forms of exchange*” (*ibid.*). Whereas there is evidence to support certain types of distribution for

example the Indian trade in Berenike as discussed above, it is difficult to explain the reasons why the ceramics were distributed.

The vessels recovered at port locations may have been waiting to be shipped from the location, and they may have been produced close by or simply been in transit, again it is difficult to draw any conclusions due to the bias in available evidence from various locations. When considering the South Indian ports, large amounts of sherds from the 2007 and 2008 excavations at Pattanam were available to this study, but what is not so clear is the total that came from other ports such as Arikamedu, Alagankulam or Kaveripattinam. Some of the sherds at port sites may have been the property of merchants, some may have been moving to meet customer demand. Sherds that passed through the port of Mantai through to Anuradhapura may have belonged to pilgrims, or headed to the islands capital to be sold. Rouletted Ware is recorded at Trench ASW (Deraniyagala 1990) in addition to Trench ASW2, with references also being made to “*Rouletted Ware storage jars*” from Jetavana stupa in the Jetavana treasure (Ratnayake 1990: 37).

When considering previous research into the ceramics in this study, it can be highlighted that in addition to areas discussed before, this study has made contribution to the knowledge available of Rouletted Ware and Arikamedu Type 10 through the investigation of the designs on the ceramics, a trait which has not been investigated in such depth before, leading to proposals about manufacturing points. As mentioned previously, this thesis is not a gazetteer

of all Rouletted Ware and Arikamedu Type 10, but unlike most distribution studies in the past, it can firmly be stated to be distributing these ceramic types.

7.7 Future projects

This thesis has highlighted ideas for further projects which have been briefly mentioned at the appropriate points. This further work can be divided into three sections, further research, reviews of previously published work, and a project of a more practical nature to aid research in the future.

7.7.1 Future research: varying types of ceramics

Rouletted Ware is recovered on sites in South Asia on a regular basis, in particular throughout South India. Arikamedu Type 10 does not get the same level of recorded recovery, but this may be a result of lack of recognition in the archaeological record as discussed elsewhere in this thesis. While creating awareness of Rouletted Ware, reports such as that on Pattarai Perambudar (The Hindu 4.07.2016) described how the appearance of Rouletted Ware at this inland site demonstrated the activities of Roman traders who travelled beyond coastal towns, with no reference to local traders.

With regard to another report, Jaffna on the northern tip of Sri Lanka does produce some images of sherds with rouletting, however they are rather

different to many of the sherds seen in this study, as images in the 2011 article show (Tamilnet: 2011). The sherds were recovered at the Queen's House at Jaffna Fort by a team of archaeologists from Jaffna University led by Professor P. Pushparatam (Gunawardhana *Pers. comms*: 2016). The Rouletted Ware in the report shows vessels with rouletting on the internal base but also on the internal sides of the vessel up to the rim. The images are not particularly clear, but the rouletting design may be the long spike design as discussed in Chapters Five and Six. These sherds again raise questions as to what is Rouletted Ware. Sherds with similar rouletting have been recorded as surface finds at Phu Khao Thong (Bouvet 2011: Figure 3.5), and also at Manikapatna in Orissa (Behera 2005: Figure 1.8). The images of sherds from Jaffna, Manikapatna and Phu Khao Thong share an additional common factor in that there are grooves around the rim in addition to the rouletting and they warrant further investigation. There was also mention of the recovery of “*amphora ware*” in the Tamilnet report, but no mention of Arikamedu Type 10 or any type of stamped ware.

The paragraph above highlights the importance of the awareness of different designs of Rouletted Ware. There appears to be no comparable sherds between Begley's article (Begley 1967), and the drawings in Ragupathy's volume (Ragupathy 1987) on Jaffna. There are some similarities that can be noted when comparing the images of the “Rouletted Ware” from Jaffna and Phu Khao Thong with Wheeler's Type 141 from Arikamedu. Figure 36 from Wheeler *et al.*'s excavation report (1946) shows the rim of the vessel with

some grooves and indentations, and Type 141 also has a floral design stamped on the base. A photograph of a sherd of Type 141 can be seen in Begley's article on rouletting and chattering (1986: Figure 15) which demonstrates some similarities, but only one row of indentations.

A survey of museum collections in the northern region of Sri Lanka may highlight further sherds with similar features, and allow comparisons with other types. The principle work on the ceramics of the region by Ragupathy (1997) is difficult to obtain, and Begley's work on Kantarodai is referred to in relation to the region (for example in Coningham *et al.* 2006: 133) but that was published in 1967. Excavations have been carried out more recently at the port of Mantai (Carswell *et al.* 2013), but since the end of the military conflict on the island in May 2009, travel restrictions have been lifted, making the area more accessible.

This study has demonstrated that the term Rouletted Ware can be used in a very general way. From the discussion in Chapter Two where it has clearly been incorrectly identified, through to the discussion above, where there is a variation. It can be proposed that the term Rouletted Ware may need to be revisited to encapsulate these variations. This will be assisted by clear recording and publication. The publication on Mantai mentioned above contains no inventory of the Rouletted Ware recovered at the site, although it does contain images (Mohanty 2013: 213ff), however there is a full inventory

of the “*Chinese, Islamic and other imported pottery*” (Carswell 2013: 229: 270).

7.7.1.2 Coarse Wares

Wheeler *et al.*'s description of Rouletted ware in the Arikamedu excavation report in 1945 includes Rouletted Ware in Section A of the report, which is “*wares imported from the Mediterranean*” (1946: 45). In this section of Wheeler *et al.*'s report it is grouped with “*imported*” Amphorae and Arretine Ware (*ibid.*: 34, 41). After describing the Rouletted Ware in the report Wheeler *et al.* define a type which they deem to be “*unmistakably inferior*” (*ibid.*: 48), as it is comprised of a thicker fabric without a slip or polish. The report detailed how this inferior quality Rouletted Ware had a poorer decoration, and portrays the vessels as not as refined as the Rouletted Ware detailed earlier in the report.

These lower specification sherds are described as being “*locally produced*”, and although there are more manufacturing discrepancies noticeable in Plate XXVIB in Wheeler *et al.*'s excavation report, some of the sherds appear to be considerably well worn. It is hard to judge the condition and design by the available photographs; however, an example can be noted in Plate xix A of Soundara Rajan, and Raman's report on the excavations at Kaveripattinam (1994). In their chemical investigations, Ford *et al.* noted that the coarse wares that they investigated were “*distinctly different chemically from the fine*

wares” (2005: 917), but did highlight the difficulties when comparing Coarse Wares and Fine Wares due to inclusions present – these possibly being the feature that gives the fabric of the vessels the gritty texture as discussed by Wheeler *et al.* (1946: 48).

In general, research into locally distributed Coarse Ware (and other non-elite) ceramics is not as common as the investigations carried out into Fine Ware (Rice 1987: 197). Ford *et al.* propose that more work carried out specifically on Coarse Rouletted Ware will aid the identification of the production location and the distribution patterns (2005: 918), therefore demonstrating a shared problem with the fine Rouletted Ware which this current research has contributed towards resolving. To conduct this study effectively, a review of museum collections and, if possible, a survey of the geographical regions highlighted in Ford *et al.*'s report would need to be undertaken. Possibly, even more so than with the Fine Rouletted Ware, there may be sherds of Coarse Rouletted Ware in museum collections which have not been correctly interpreted or simply counted and weighed as bulk Coarse Ware, so awareness of these vessels needs to be highlighted as they have the potential to shed further light on networks of distribution. When discussing finds from Adam, a sherd of a “*delux*” type of Rouletted Ware is mentioned, unfortunately there is no image to aid the interpretation of this description (IAR 1990 – 91: 46). The sherd may be described in this way as the Rouletted Ware at the site is more usually of the coarser variety and this is a piece of exceptional quality, or it is not what this study would class as Rouletted Ware.

It is hard to make any conclusions with the available drawings. However, should sherds become available from museum collections to investigate, it is unlikely that they would be suitable for taking impressions from, as they have not got a slipped, fired finish to the standard of the Rouletted Ware available for this study from Trench ASW2. To attempt to take impressions would probably result in damage to the sherd as parts of the surface may disintegrate, not resulting in a useful impression. However, the sherds could be photographed under a daylight lamp.

To increase the awareness of the Coarse Rouletted Ware in the archaeological record, a page of information could be added to the website proposal mentioned below, therefore increasing awareness of these vessels. This potentially could aid recognition in both museum collections and excavations.

7.7.2 Future research: manufacturing traits

Chapters Four, Five and Six have highlighted the extent of manufacturing errors that are revealed on closer inspection of the two different types of ceramics in this study. This has demonstrated the untapped potential of the area, and there are several ways that this can be considered. However, with any consideration, the issue of what is a manufacturing fault does need to be determined; as mentioned, what is a fault to one person, may possibly be an acceptable flaw to another. In addition to the research idea postulated in Section 7.4.2 where the ceramics could be recreated in an

ethnographic study to investigate cultural transmission, other proposals for future research are listed below.

The research has highlighted that it may be possible, with a greater quantity of ceramics, to track the development of the skill of a particular craftsman or group. This study has emphasised that with certain rouletting indentations it is possible to propose specific designs which may be the work of certain potters or workshops, however, it must be considered that styles are not a fixed concept (Rice 1987: 246). With more data for this study it may be possible to enhance the chronologies proposed by looking at how the design has evolved and been perfected during the manufacturing lifetime of the Type. Such an investigation would enable the monitoring of a single design in a workshop, and depending on the range of data available, possibly be extended to include the work of individuals. It may indicate if people improve on a task they are doing, or possibly maintain an acceptable level. However, it would not have been known if it was the best result they could produce, the best they wanted to produce or the best that they could produce given other constraints such as time pressures. If the study was expanded to carry out the same research process on other ceramics which are believed to come from the same workshop, it may provide data to support the standard of finished goods.

In addition to tracking the development of the ability of a worker or workshop, the identification of degrees of supposed error on the ceramics has the potential to also be geographical tracking markers. However, from this

kind of tracking it may not be possible from a single data set to deduce whether it was the ceramics that were being distributed, or there was movement of the worker, workers or workshop. For the scenarios listed above it would be possible to extend the current set of Design Codes and Component Codes to include ones with specific errors, to allow for a set of data which could be analysed on its own, or with the set of original Design Codes to produce chronological and geographical developments.

7.7.3 Future research: education and dissemination of results

A recognition aid such as the one mentioned above could also include a guide to allow the user to recognise Arikamedu Type 10 and Rouletted Ware in the archaeological record. Section 2.23 in Chapter Two highlights areas where ceramics have been recorded as Rouletted Ware, but although they may display rouletting they are not Arikamedu Type 1 vessels, and in Chapter Two the lack of recognition of Arikamedu Type 10 is also highlighted. There is possibly an implicit assumption that as Rouletted Ware is so common, many of the archaeologists and museum staff working in and beyond the geographical boundaries of this study will be familiar with it.

A selection of the data resulting from the research by Shoebridge (2009) is currently available on a website (<http://community.dur.ac.uk/arch.projects/arikamedutype10/index.html>).

This website which solely focusses on Arikamedu Type 10 details the

methodology used by Shoebridge (2009) and discusses the distribution and chronology of this ceramic, and is referenced by Shoebridge & Coningham (2011). The scope of the website has the potential to be expanded to include Rouletted Ware, and some of the reference aids discussed above to support in the recognition of the ceramics. The development of the website may lead to the expansion of the data set through greater awareness, archaeologists and keepers of collections may be able to identify sherds that were previously unknown or incorrectly catalogued. The data set could be further enhanced by the confirmation of the accuracy of some of the drawings that have been published of Rouletted Ware and Arikamedu Type 10, but have not been used in this study. In addition to the expansion and development of the website, the article published by Shoebridge and Coningham (2011), could also be reviewed and updated to reflect on the results from this current research.

7.7.4 Future research: missing sherds

From the analysis that has taken place it is clear that there must be a considerable amount of Rouletted Ware and Arikamedu Type 10 still to be recovered. This statement can confidently be made as many of the sherds in this study appear to be a single decorated sherd that has been recovered from a vessel. There may be body sherds and rim sherds which have been recovered, but even so, it is especially noticeable with Arikamedu Type 10 that there should be more sherds recorded. As highlighted above, a guide may make people more aware of what to be aware of. Therefore, it is proposed that further work could include a review of regional museum

collections. In addition to reviewing collections for the types that are in the study, sherds matched to any others that have been recovered could be noted. This is probably a more manageable task when considering the Arikamedu Type 10, and as Chapman (2000: 63) states “*I am convinced that regular searches for re-joins amongst both pottery and other fired clay objects would produce many new and informative data on intra-site movement*”. This opportunity could also be used to look for any reuse of the vessels in this study as discussed above.

7.7.5 Future research: fragmentation

Chapter Six highlighted how many of the sherds of Arikamedu Type 10 are simply the part of the vessel that has the peacock design. Following on from the ideas proposed for the experimental work above, further experimental work could be proposed, as briefly introduced in Chapter Six, to investigate the breakage patterns and attempt to deduce whether the breakage patterns were possibly caused by accidental breakage, or whether, the ceramics broke easily along an impressed line on the vessel. Again, the common theme can be raised - what happened to the rest of the sherds? This is a particularly pertinent question when raised in relation to the sherds of Arikamedu Type 10 from Trench ASW2, where only 45 sherds have been recovered (Coningham *et al.* 2006: 159). Although some are from the same vessel, there is not the equivalent of a complete one.

7.8 Conclusion

The first chapter of this thesis highlighted how one of the common areas of research that has been conducted on Rouletted Ware (and Arikamedu Type 10) is an investigation into the distribution of these vessels. Part of this research has encountered maps such as those by Schenk (2006: 130), Suresh (2004: 91) and also by Triplati (2011: 1083) where the distribution of the Rouletted Ware can be seen through the dots on the map. This thesis has looked at distribution of the vessels in this study, but rather than focus on the dots on the map, it has focused on the dots (and the triangles, spikes and other indentations) on the vessels themselves to form distribution networks. It has demonstrated that there is a wide range of designs of Rouletted Ware being produced, with concentrations in the south of India identifying proposed production points and distribution networks, this is particularly emphasised by maps such as Figure 6.15 where a concentration of data may be proposed to be a concentration of production. The two level code system used for each ceramic type, with the addition of the available casts provided a method that went beyond speculative and could interpret designs to produce results. Maps such as 6.3 also add data to support the statements made by Coningham (2002) and Whitehouse (1991: 216) in relation to imports and exports, in that there is evidence of local distribution networks in addition to longer distance ones.

The boxes in Appendix Four demonstrate the links that can be proposed for the spatial and chronological links in this study, with some clear inter-site

connections, and again, there is support for both internal connections and those within a wider trading network.

The methodology for this thesis has demonstrated that although it is not required to handle the vessels to carry out an image analysis study, it is beneficial to be able to take casts (if not for immediate use, then for the future). However, it is vitally important to be able to see the ceramics that are going to be discussed in the research, advice that is transferable to a whole range of studies. Suggestions have been made above for further work, but this study itself demonstrated its flexibility in that both the Design Code and the Component Code category systems have been developed to accommodate combinations of features that have not been recorded to date, and both can be expanded.

This final chapter has completed Objectives Eight, Nine and Ten of this study. It has discussed possible options for the purpose of the vessels, meeting Objective Eight. It has also proposed a region of production for the vessels which was Objective Nine. With the data that is available for this study, it is not possible to produce a definitive answer for these two objectives. However, proposals have been presented and previous research taken into consideration. Objective Ten has reviewed the methods used in this study, along with discussions of their transferability to other ceramics and the proposal of future research projects.

In Chapter One, the primary and secondary aims of this thesis were stated. The primary aim was the reconstruction of Early Historic networks of communications in South Asia and beyond. Chapter Two introduced the ceramics in this study and Chapter Three introduced the methodology, with the variations developed for the analysis of the two ceramics discussed in Chapters Four and Five. Appendix Four illustrates networks of communication, and this chapter and the previous chapter both discuss why the ceramics may be distributed. The secondary aim of the thesis was the identification of stylistic variances across the geographical and chronological boundaries in this study. This has been identified through Chapters Four and Five for each of the ceramics, then for both ceramics in Chapter Six.

Appendices

Appendix One: Rouletted Ware Spreadsheet and Arikamedu Type 10 Spreadsheet

Appendix One (i)

Originally the spreadsheet was submitted on a disc, it is now found at the end of this document.

Key to Appendix 1.1– Rouletted Ware Spreadsheet

Column heading	Description
Cat. number	Catalogue number used to recognise this sherd in the current study
Site	Where the sherd was excavated
SFN	Special Find Number that was allocated to the sherd at the time of excavation (if available)
RW/RWD/Other	Rouletted Ware sherd or Rouletted Ware disc
Reported location	Location of the sherd at the time of the publication (if known to this study)
Excavations	Excavation team (if known to this study)
Image source (Plate or Figure)	Where the image used in this study came from
Information Reference	Where supporting detail for this sherd has come from

Author's ref	Reference for the image used in this study
Date proposed at source	Date that was proposed in the image / information source
Period (Trench ASW2)	Relevant period from Trench ASW2 (or other location detail)
Initial sort	Code for the Initial / Level One sort
Region	Region Code
Number of visible bands	How many bands of rouletting are on the sherd
Rows inner	Number of rows on the inner band
Rows middle	Number of rows on the middle band
Rows outer	Number of rows on the outer band
Bands complete?	Yes or no
Rows indeterminable inner or outer	If it is not possible as to determine whether the rows on the sherd are from an inner or outer band, this is how many rows are present.
Manufacturing fault?	Is there a manufacturing fault visible on the design on the vessel?
The Design Code single	Design Code allocated to this vessel.

The Design Code multiple rows	Design Code allocated to the multiple rows
Notes	Any further relevant notes

Appendix One (ii)

Originally the spreadsheet was submitted on a disc, it is now found at the end of this document.

Key to Appendix 1(ii)– Arikamedu Type 10

Column heading	Description
Cat. number	The catalogue number used to recognise this sherd in the current study
Site	Where the sherd was excavated
SFN	Special Find Number that was allocated to the sherd by the excavation (if available)
RW/RWD/Other	Rouletted Ware sherd or Rouletted Ware disc.
Reported location current location	Location of the sherd at the time of the publication (if known to this study)
Excavations	Excavation team (if known to this study)
Image source (Plate or Figure)	Where the image used in this study came from
Information Reference	Where supporting detail for this sherd has come from

Author's ref	Reference for the image used in this study
Date proposed at source	The date that was proposed in the image / information source
Period (Trench ASW2)	Relevant period from Trench ASW2 (or other location detail)
Region Code	Region Code
Head	Relevant Component Code
Body type	Relevant Component Code
Feet	Relevant Component Code
'v' symbol	Relevant Component Code
Foliage	Relevant Component Code
Border type	Relevant Component Code
Facing (T10)	The direction the bird(s) are facing
Notes	Any further relevant notes

Appendix Two: Design Codes Master sheet

Design Codes Master sheet - Originally the spreadsheet was submitted on a disc, it is now found at the end of this document.

Appendix Three: unused single sherds


Single sherds which have not been investigated due to difficulty interpreting the designs, originally the spreadsheet was submitted on a disc, it is now found at the end of this document.

Appendix Four

The following pages show the graphs referred to as Boxes one to Seven in Chapter Six. They were originally also submitted on a disc to provide further clarity.

Box 1

Period	Site	Context description	Most common design codes	Level One port	Level Two port
G2 (200 BC - AD 130)	Trench ASW2		DC103	ILB	Triangle
			DC84	IL	Spike
			DC104	ILB	Spike



Period	Site	Context description	Most common design codes	Level One port	Level Two port
Northern Sector - "settled in the first century BC perhaps even earlier, and occupation was continuous through the first century AD (or early second)" (Begley 1996: 21).	Arikamedu		DC83	IL	Triangle
			DC103	ILB	Triangle
			DC104	ILB	Spike

Appendix Four: Proposed connections

Key:

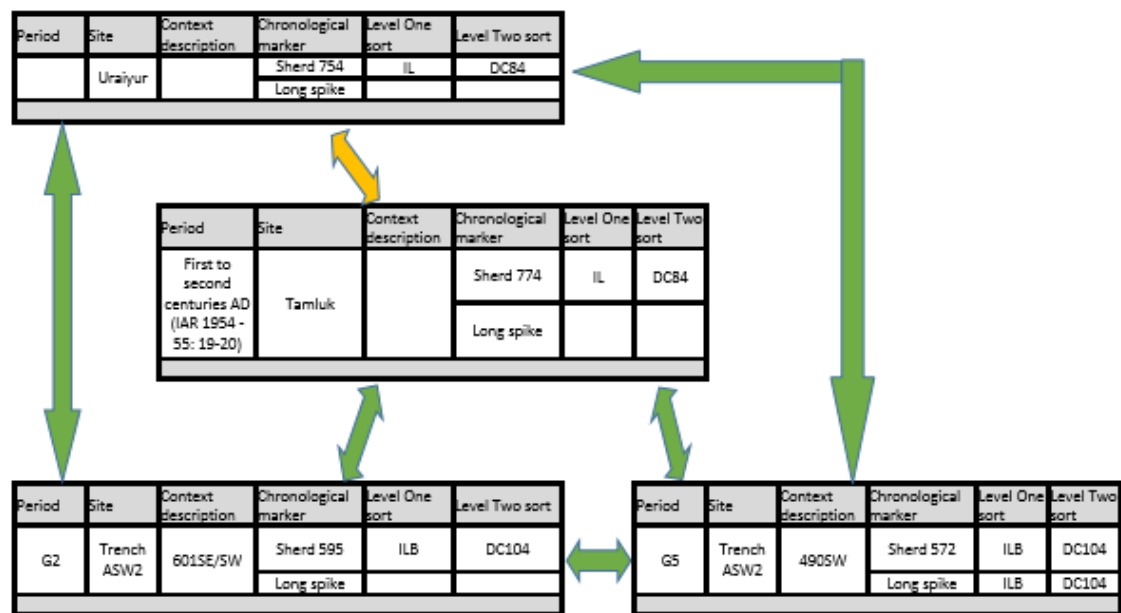
Green arrow - Proposed connection

Red Arrow - No proposed connection

Amber arrow - Possible connection

Purple Arrow - Proposed connection; excellent data

Box 2



Appendix Four: Proposed connections

Key:

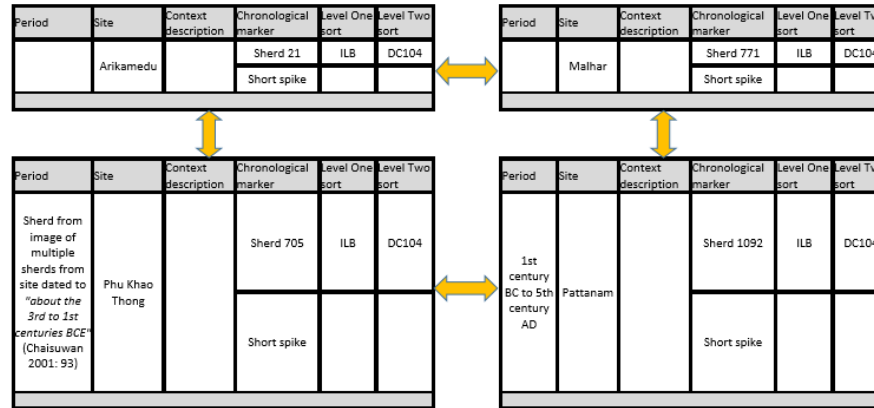
Green arrow - Proposed connection

Red Arrow - No proposed connection

Amber arrow - Possible connection

Purple Arrow - Proposed connection; excellent data

Box 3



Appendix Four: Proposed connections

Key:
 Green arrow - Proposed connection
 Red Arrow - No proposed connection
 Amber arrow - Possible connection
 Purple Arrow - Proposed connection; excellent data

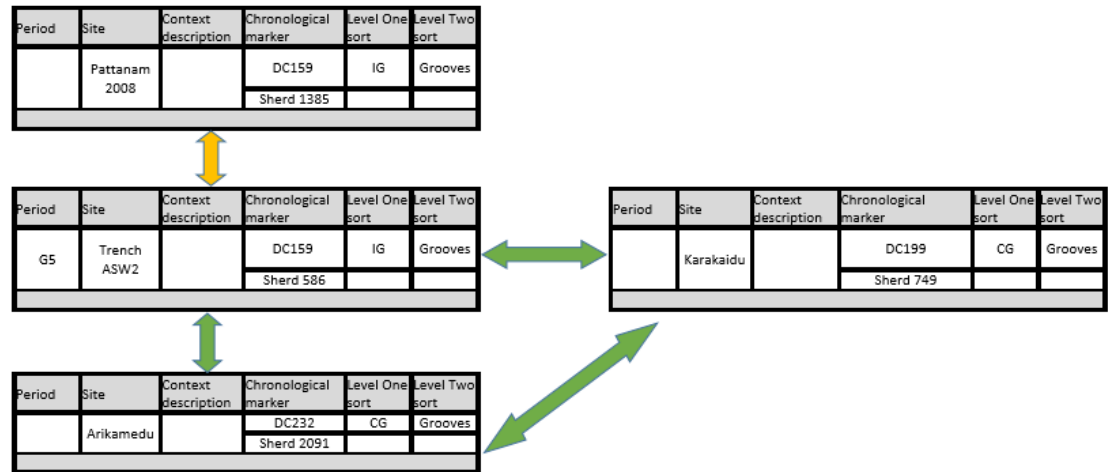
Box 4



Appendix Four: Proposed connections

Key:
 Green arrow - Proposed connection
 Red Arrow - No proposed connection
 Amber arrow - Possible connection
 Purple Arrow - Proposed connection; excellent data

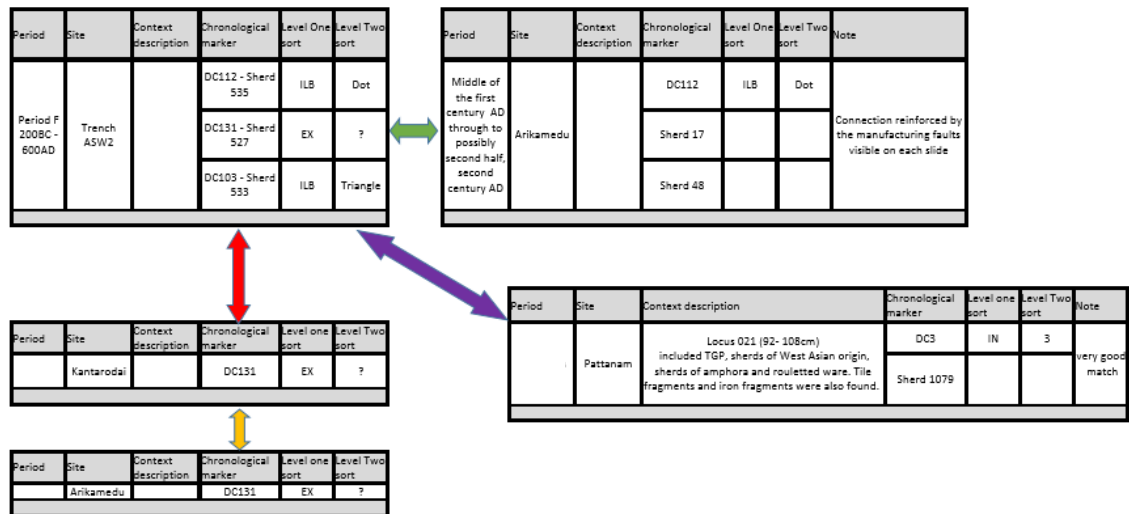
Box 5



Appendix Four: Proposed connections

Key:
 Green arrow - Proposed connection
 Red Arrow - No proposed connection
 Amber arrow - Possible connection
 Purple Arrow - Proposed connection; excellent data

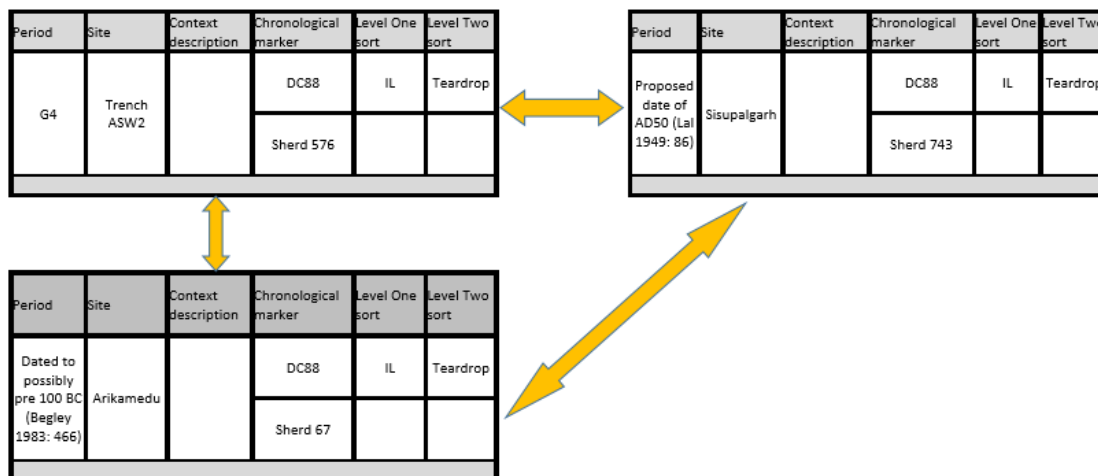
Box 6



Appendix Four: Proposed connections

Key:
 Green arrow - Proposed connection
 Red Arrow - No proposed connection
 Amber arrow - Possible connection
 Purple Arrow - Proposed connection; excellent data

Box 7



Appendix Four: Proposed connections

Key:
 Green arrow - Proposed connection
 Red Arrow - No proposed connection
 Amber arrow - Possible connection
 Purple Arrow - Proposed connection; excellent data

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Disc:

NB. In the original submitted thesis, the disc contained the appendices.

Appendix One(i): Rouletted Ware

Cat. Number	Site	SFN	RW/RWD/ Other	Reported Current Location	Excavations	Image Source	Information Reference	Authors ref: Plate or Figure	Dated Proposed at Source	Period (Trench ASW2 Only)	Initial Sort	Region	No of Visible Bands	Rows Inner	Rows Middle	Rows Outer	Are Bands Complete?	Grooves Indeterminable	Manufacturing Fault	Notes	Design Code Single Row	Design Code Known	
2076	Abhayagiri		RW		UNESCO / Government of Sri Lanka, in collaboration with specialists from Sri Lanka and Czechoslovakia	Bouzek & Deraniyagala 1985	Bouzek & Deraniyagala 1985	2.8		Layer 3b Which is possibly in Pit SBw6-6(7), layers 4a & 4b"	IL	7 1					N	=>9		Authors refer to this as an import, some interlocking	DC83		
2077	Abhayagiri		RW		Sri Lanka / Czechoslovakia	Bouzek & Deraniyagala 1985	Bouzek & Deraniyagala 1985	2.12		Layer 3b Which is possibly in Pit SBw6-6(7), layers 4a & 4b"	IL	7								Authors refer to this as an import	DC91		
2078	Abhayagiri		RW		Sri Lanka / Czechoslovakia	Bouzek & Deraniyagala 1985	Bouzek & Deraniyagala 1985	2.13		Layer 3b Which is possibly in Pit SBw6-6(7), layers 4a & 4b"	ILB	7 1					Y	=>9		Authors refer to this as an import, wave pattern, possible several different shapes	DC110		
2079	Abhayagiri		RW		Sri Lanka / Czechoslovakia	Bouzek & Deraniyagala 1985	Bouzek & Deraniyagala 1985	2.14		Layer 3b Which is possibly in Pit SBw6-6(7), layers 4a & 4b"	ILB	7 2	3				N	=>5		Authors refer to this as an import		DC103 DC112	
730	Alagankulam		RW		Palace Museum, Ramanathapuram	Begley II 2004: 269		3.28			ILB	4					?	2	Yes	Manufacturing fault - over run, long spokes	DC84		
731	Alagankulam		RW		Palace Museum, Ramanathapuram	Begley II 2004: 269		3.28			ILB	4					Y	9			DC239		
732	Alagankulam		RW		Pondicherry Museum	Begley 2004: 271		3.287			ILB	4					N	=>6	Yes	Manufacturing fault - possible interlocking	DC83		
733	Amaravati		RW			Wheeler 1946		XXVII(2)			IS	4					Y	9			DC224		
2073	Anuradhapura (Hinterland)	689	RW		Anuradhapura: the Hinterland	Coningham et al 2013	Coningham et al 2013: 231	9.6		Trench 1	ID	7	Too poor									DC171	
	Arikamedu	30/2785	RW		UCL	Author's photograph					IL	13 2	2				N		Yes	Overlapping		DC84 DC88	
17	Arikamedu		RW		Pondichery Museum	Casal	Begley 2004: 270				ILB	13 2	6				N					DC112 DC103	
18	Arikamedu		RW		Pondichery Museum		Begley 2004: 271				IL	13				7	Y			Almost interlocking	DC83		
19	Arikamedu		RW		Pondichery Museum	ASI: Wheeler	Begley 1988: 431	Begley 1988			IL	13 2	6				Y			Modern drilled holes in the sherd		DC92 DC86	
20	Arikamedu		RW		Pondichery Museum	ASI: Wheeler	Begley 1988: 436				ID	13 1					?	Y		Heavily gouged sherd		DC171	
21	Arikamedu		RW		Pondichery Museum	ASI: Wheeler	Begley 1988: 436				IL	13 2	3				Y		Yes	Inner circle appears to have lots of overlapping		DC84 DC84	
48	Arikamedu		RW		Arikamedu Excavation Project	Begley 2004	Begley 2004: 268	3.278		Middle first century AD to possibly latter half or very end of the second century	ILB	13 2	8				Y					DC112 DC221	
49	Arikamedu		RW		Arikamedu Excavation Project	Begley 2004	Begley 2004: 268	3.278		Middle first century AD to possibly latter half or very end of the second century	ILB	13 1					Y					DC223	
50	Arikamedu		RW		Arikamedu Excavation Project	Begley 2004	Begley 2004: 268	3.278		Middle first century AD to possibly latter half or very end of the second century	IL	13 1					N					DC105	
51	Arikamedu		RW		Arikamedu Excavation Project	Begley 2004	Begley 2004: 268	3.278		Middle first century AD to possibly latter half or very end of the second century	ILB	13 1										DC103	
52	Arikamedu		RW		Arikamedu Excavation Project	Begley 2004	Begley 2004: 268	3.278		Middle first century AD to possibly latter half or very end of the second century	IL	13 1					N			Groove guidelines		DC83	
53	Arikamedu		RW		Arikamedu Excavation Project	Begley 2004	Begley 2004: 268	3.278		Middle first century AD to possibly latter half or very end of the second century	ILB	13 2	7				Y			Inner grooves possibly fainter in parts		DC112	
54	Arikamedu		RW		Arikamedu Excavation Project	Begley 2004	Begley 2004: 268	3.278		Middle first century AD to possibly latter half or very end of the second century	ILB	13 1	7				Y					DC 234 DC224	
55	Arikamedu		RW		Arikamedu Excavation Project	Begley 2004	Begley 2004: 268	3.278		Middle first century AD to possibly latter half or very end of the second century	IL	13 2	?				N					DC91 DC91	
56	Arikamedu		RW			Begley 2004	Begley 2004: 268	3.278		Middle first century AD to possibly latter half or very end of the second century	ILB	13 1					Y					DC224	
57	Arikamedu		RW		ASI New Delhi?	ASI: Wheeler	Wheeler 1946: 46	XXVIB			ILB	13 1					Y		Possibly	Grooves may merge but print is poor		DC224	
58	Arikamedu		RW		ASI New Delhi?	ASI: Wheeler	Wheeler 1946: 48	XXVIB			ID	13	Too poor										
59	Arikamedu		RW		ASI New Delhi?	ASI: Wheeler	Wheeler 1946: 48	XXVIB			ID	13	Too poor										
60	Arikamedu		RW		ASI New Delhi?	ASI: Wheeler	Wheeler 1946: 48	XXVIB			ID	13						9?			Interlocking		DC171
61	Arikamedu		RW		ASI New Delhi?	ASI: Wheeler	Wheeler 1946: 48	XXVIB			ID	13 1						5	Y	Faint		DC226	
63	Arikamedu		RW		ASI New Delhi?	ASI: Wheeler	Wheeler 1946: 48	Begley 1983: 461-466	XXVA (1)	Between 150 BC & first quarter of first century AD (Begley 1983: 461-466)	ILB	13 1					9	Y		Almost interlocking		DC103	
64	Arikamedu		RW		ASI New Delhi?	ASI: Wheeler	Wheeler 1946: 48	Begley 1983: 461-467	XXVA (3)	Between 150 BC & first quarter of first century AD (Begley 1983: 461-466)	ILB	13 3	3				Y		Yes	Grooves on inner - uneven rouletting on outer		DC226 DC103 DC227	
65	Arikamedu		RW		ASI New Delhi?	ASI: Wheeler	Wheeler 1946: 48	Begley 1983: 461-468	XXVA (2)	Between 150 BC & first quarter of first century AD (Begley 1983: 461-466)	ILB	13 1					N			Almost interlocking, spiky triangles		DC103	
67	Arikamedu		RW		ASI New Delhi?	ASI: Wheeler	Wheeler 1946: 52	Begley 1983: 466	XXXB	Possibly pre 100 BC (Begley 1983: 466)	IL	13 2	5							Graffiti - flower		DC88 DC88	
68	Arikamedu		RW		ASI New Delhi?	ASI: Wheeler	Wheeler 1946: 48	Begley 1983: 466	XXVIB	Between 0 - 200AD (Begley 1983: 466)	ILB	13 1						6?	Y	Faint		DC224	
69	Arikamedu		RW		ASI New Delhi?	ASI: Wheeler	Wheeler 1946: 48	Begley 1983: 466	XXVIB	Between 0 - 200AD (Begley 1983: 466)	EX	13 1						12	Y	Lines, but scattered		DC123	
72	Arikamedu		RW		Pondicherry Museum	Arikamedu Excavation Project	Begley 1996: 244	Begley 1996b: 226ff	4.257		IL	13 1					N		Yes	Possible apprentice piece? indentations, accidental or intentional removal of pointed tool in upper row		DC83	
73	Arikamedu		RW		Pondicherry Museum	Arikamedu Excavation Project	Begley 1996: 244	Begley 1996b: 226ff	4.258		IG	13 1		9?				Y		Decoration on interior centre with rows of dot-like indentations which appear almost like grooved concentric lines. Exterior: grooved concentric circle in the centre. Potters Identification mark?		DC 232 DC191 DC191	

74	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	ILB	13 1				6	Y		Possibly		DC104	
75	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	ILB	13 1				8	N				DC108	
76	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	IL	13 1				12	Y		yes	Uneven grooves	DC83	
78	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	IL	13 1				5	N				DC83	
79	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	ILB	13 1				9	Y				DC103	
80	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	ISB	13 1				8	Y			Erratic design	DC63	
82	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	ILB	13 1				7	Y			Interesting horizontal pattern	DC104	
83	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	ILB	13 1				11	Y				DC104	
84	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	EX	13 1				10	Y			Almost interlocking	DC123	
85	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	IL	13 1				7	Y				DC83	
86	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	IL	13 1				4	N			Fan style	DC228	
87	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996a: 21, Begley 1996b: 226ff	4.255	Northern sector - seems that the Northern sector was settled in the first century BC, perhaps even earlier, and occurs through the first century AD or early second	ILB	13 1				9	N			Wavy lines	DC229	
89	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 245	Begley 1996b: 226ff	4.259		IL	13 1				4	Y			Eroded same vessel as 90	DC230	
90	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996b: 226ff	4.259		IL	13 1				4	Y			Same vessel as 89	DC92	
91	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996b: 226ff	4.259		ILB	13 1				4	Y				DC104	
92	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 245	Begley 1996b: 226ff	4.259		IN	13 1				?				Fan style? Photo at a strange angle	DC11	
93	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996b: 226ff	4.259		CGB	13 1	6			Y				Possible guidelines	DC231	
94	Arikamedu		RW	Pondicherry Museum?	Arikamedu Excavation Project	Begley 1996: 243	Begley 1996b: 226ff	4.259		ID	13 2	2							Two bands of decoration in fine red ware, as at Alagankulam (Begley 1996: 245)		DC171 DC163

756	Oraiyur, Tanjore district		RW	Madras University Museum		Photo: author	Impression by Professor Glover			IL	5								DC171	
757	Vanagiri, Kaveripattinam		RW		K. V. Soundara Rajan & Raman	Soundara Rajan & Raman 1994	Soundara Rajan & Raman 1994: 42ff	xix		ILB	5	=> 3		=>2	N					DC84 DC84
758	Vanagiri, Kaveripattinam		RW		K. V. Soundara Rajan & Raman	Soundara Rajan & Raman 1994	Soundara Rajan & Raman 1994: 42ff	xix		ID	5				Y	=>4			DC244	
759	Vanagiri, Kaveripattinam		RW		K. V. Soundara Rajan & Raman	Soundara Rajan & Raman 1994	Soundara Rajan & Raman 1994: 42ff	xix		ID	5				N	=>5		Rows of spikes and then grooves in the middle? Is this rouletted ware?	DC243	
760	Vanagiri, Kaveripattinam		RW		K. V. Soundara Rajan & Raman	Soundara Rajan & Raman 1994	Soundara Rajan & Raman 1994: 42ff	xx		ID	5				Y	1		Appears top only be a single row	DC84	
761	Vanagiri, Kaveripattinam		RW		K. V. Soundara Rajan & Raman	Soundara Rajan & Raman 1994	Soundara Rajan & Raman 1994: 42ff	xx		ID	5				N	=>2		Possible guideline on the outer edge there may be a groove (guideline?)	DC164	
762	Vanagiri, Kaveripattinam		Row		K. V. Soundara Rajan & Raman	Soundara Rajan & Raman 1994	Soundara Rajan & Raman 1994: 42ff	xx		ID	5				Y	=>7			DC171	
783	Vasavasmadrum		RW		Nagaswamy & Majeed	Nagaswamy & Majeed 1978	Nagaswamy & Majeed 1978: 12f	v		ID	5									
77	Wari-Bateshwar		RW		International Centre for Study of Bengal Art (ICsBA) 2000	Haque et al. 2000	Haque et al. 2000	23.5	Early Historic	IL	12.1				N	4		Described as being from 'excavation'	DC83	
81	Wari-Bateshwar		RW		International Centre for Study of Bengal Art (ICsBA) 2000	Haque et al. 2000	Haque et al. 2000	23.6	Early Historic	IL	12.1				?	2		Described as being from "'exploration'	DC84	

Appendix Three: uninterpreted sherds

Design Code	Berenike	Arikamedu	Sumhuram	Phu Khao Thong	Tamluk	Karaikadu	Vanagiri, Kaveripattinam	Rajhat	Vasavasmadrum	Sisupalgarh	Ayodhya	Uraiyur	Chandrapur	Pakhanna	Nasik	Brahmagiri	Chandrapur	Pattanam 2007	Pattanam 2008	Mantai	Kantarodai	Tissamaharama	Anuradhapura (hinterland)	Abhayagiri
DC11		92																						
DC102																			115					
DC110				701															144					
DC111																						2048		
DC123		84. 69																	1849,					
DC124																			1074					
DC131																						2065		
DC135	4																				2058			
DC138																						2062		
DC159					780																			
DC163																		1307 1319						
DC161																			1604					
DC170																			1612					
DC171					779		758, 761, 759, 760, 762	773	783									239	1683, 1883			2063	2048	2073
DC178																						2066		
DC199						749																2060		
DC223		49																						
DC224		57, 68, 56					757																	
DC225		2107																						
DC228																			468					
DC226		2094 61																						
DC230		89																						
DC231		93																						
DC232		2091																						
DC235				712																				
DC236		2087		718															443					
DC237										738 (FAN)														
DC238										739(rw)														
DC239											755													
DC241												764		761										
DC243					776								768	772										
DC244					775										782					1809				
DC247																			151					
DC248																			189					
DC249																			192					
DC250																								
DC251																			242					
DC252																			457					
DC253																			467					
DC254																				1066				
DC3																				1079				
DC4																						2050		
DC50																								
DC51																								
DC63	5																							
DC108		75																						
DC91		2090														737. 734	745		1798, 1587, 1660, 1926			2068		2077