Chapter 4 -
RESULTS

Introduction

The chapter hereby outlines the results of the research undertaken. The first part of the chapter (4.1) records the 'West Asian' findings from the excavated sites within Western India; this includes both regions of Gujarat and *Dakshina Gujarat*-Maharashtra (discussed in earlier chapter 3). The sub-chapter 4.1 deals with displaying the temporal and spatial context of the West Asian finds within the archaeology of western India with the period being delimited to the 10th c. A.D. Firstly, the West Asian finds from previously excavated sites such as Vallabhipur, Nagara, Lothal, Kanmer, Vadnagar, Taranga, Siyot, were recorded. Further, the researcher was part of an excavation at Nani Rayan, Kachchh District in 2019 conducted by the Department of Archaeology and Ancient History, The Maharaja Sayajirao University of Baroda funded and collaborated with The British Museum and Honor Frost Foundation surveyed (total station, geo-physics).

Meanwhile in Maharashtra, Torpedo Jars were found in the excavations at the Vakataka capital of *Nandivardhan* (present day Nagardhan) which is near Nagpur (Sontakke *et al.* 2016). Material from two seasons of excavations were recorded. Torpedo Jars (Sontakke *et al.* 2016: 49) and a variety of Tin Glazed Ware was identified from the excavations. Most importantly, owing to the relatively undisturbed nature of deposits and well stratified deposits and their recording, at Nagardhan, the finds could be set into a tighter chronology. West Asian material from Chaul was studied and recorded which had yielded a plethora of Indian ocean trade material (Gogte 2003) (Map 4.1).

Further, surveys were undertaken at a site-specific level as well as region specific depending on the research questions at hand. The Initial surveys (4.2) were carried out on the site of Vallabhipur which was a major urban and trade centre during the phase of the Maitrakas from the 5th to the 8th centuries A.D. As it was a second capital of Gujarat after the shift from Girnar, it was imperative to locate and further understand the nature of the finds from the site to corroborate the West Asian findings. (Map 4.1).

Further, regional surveys were also taken up; namely surveys (4.3) around the Gulf of Kachchh encompassing the modern Districts of Jamnagar and Devbhoomi Dwarka in Gujarat. The Jamnagar exploration was undertaken to analyse the role of the Gulf of Kachchh within the trade sphere especially dealing with West Asia. The exploration yielded Torpedo Jars from the exploration of the reported sites within Jamnagar and Devbhoomi Dwarka areas. (Map 4.1). The second regional survey included the sites in South Gujarat (*Dakshina Gujarat*) as well as Coastal Maharashtra (4.4). Previously excavated sites such as Sanjan, Chaul, Kamrej, were re-explored to compare with the findings from West Asia with the the findings from previous reports and publications. This was undertaken to understand whether surface surveys would yield more similar or different material (Map 4.1).

The sub-chapter (4.5) is dedicated to understanding some of the Sasanian and Early Islamic Wares recorded from the region of Susiana. This includes the finds stored at the National Museum of Iran, Pottery Research Department and from the collections of Prof. McCormick Adams. Previous studies have suggested this region as one of the find spots for sources of bitumen lined on Torpedo Jars. This validated a typo-technological comparison and shows the results of the findings.

The major tangible source of West Asian contact as understood from all the above studies are ceramics. Following the Ware identifications on a macroscopic level, the chapter incorporates the results of thin-section studies on the representative ceramics (4.6). This sub-chapter shows the results for the thin-section studies and the petro-fabrics for Glazed and Non-Glazed Wares of West Asian origins, which were sampled across ancient sites situated in Western India.

Map 4.1: Map of Sites which indicate archaeological and art historical evidence of contact of West Asia from Western India

4.1. Finds from Excavations

4.1.1. Vallabhipur (N:21°53'14.9", E:71°52'24.0"E), District Bhavnagar, Gujarat

Vallabhipur was the ancient capital of the Maitrakas. The earlier excavation had reported 'Roman Amphora' as one of the imported finds from the site. But a review of excavated material from the site suggests that all amphorae that are previously reported are in fact Torpedo Jars. The Torpedo Jars yielded from Vallabhipur amounted to 80 sherds (75 from the Department excavations and 5 from the survey) – see Table 4.1. The most dominant fabric is the PWWS (Pink Ware White Slip) fabric (same as Sandy Torpedo; TORP.S in Priestman 2013: 496-497) which amounts to 59 sherds (diagnostic are 4; 1 base and 3 rims). Torpedo Jar is also found in a buff fabric and amounts to 4 sherds (diagnostic is 1 rim). From the survey, two different localities yielded Torpedo Jars numbering 4 in total: 1 from Maya no Khado and 3 from the Water Tank area. The surface collections and the acquisitions due to digging for a water tank in 2015 explorations yielded materials from the aforementioned periods. The variety of ceramics include, Plain Red Wares, Painted Red Wares, Micaceous Red Ware, Red Polished Ware, Burnished Black and Red Ware, Black Wares which were the indigenous finds belonging to the Early Historic and Early Medieval periods. Along with them, the Torpedo Jars was the imported find (Figures 4.1 – 4.2). Apart from the ceramics, iron objects, shell wasters (T. pyrum), shell bangles were also found.

The explorations and excavations around Vallabhipur yielded archaeological materials from different periods namely, Middle Palaeolothic (Period I), Harappan (Period II from Nesadi), Early Historic-Early Medieveal (Period III from Maya no Khado) Period III was further divided into three phases, Phase I (1st c. A.D. – 4th c. A.D.), Phase II (4th c. A.D. – 5th c. A.D.), and Phase III (5th c. A.D. – 7th c. A.D.) (IAR 1979-80: 23-24). From the researcher's review of the material study of the excavated material, it was clear that, there are no 'Roman' Amphoras from the site. The chronology of the excavated site at Vallabhipur was majorly dependent on the 'Roman' Amphoras for relatively dating Phase I (1st c. A.D. – 4th c. A.D.) especially. In the absence of chronometric dates, one has to depend on the relative dates. Therefore, one can assign the relative date of Torpedo jars from Vallabhipur to period contemporary to the Sasanians, as typologically, the Torpedo Jars from the site belong to the wide time frame between 3rd - 9th century A.D. Therefore, one may rule out the West Asian finds going beyond the 3rd century A.D. time phase, and the Torpedo Jars found in the earliest layers may have been due to inter layer disturbances.

Table 4.1: Provenance of Torpedo Jar finds and find-spots from Vallabhipur

Locality - Vallabhipur	Total Torpedo Jar Sherds	Torpedo Jar Fabric	Layers	Phases of Period III
Maya no Khado (excavation) Trench A	2	PWWS	7 and 10	I and II
Maya no Khado (excavation) Trench B	11	PWWS	2, 3, 5, 6, 7, and 9	I, II, and III
Maya no Khado (excavation) Trench C	43	PWWS	3, 5, 6, 7, 8, 9, and 10	I, II, and III
Maya no Khado (Provenance unknown)	12	PWWS	-	-
Maya no Khado (excavation) Trench B	1	Buff	9	I
Maya no Khado (excavation) Trench C	6	Buff	3, 7, 8, 10	I and III
Maya no Khado (Exploration)	1	PWWS	surface	-
Water Tank Area (Exploration)	4	PWWS	surface	-
Total	80			

As reported from the excavations, the excavated areas in Vallabhipur (Maya no Khado) don't go beyond the 8th century A.D., which is contemporary to the fall of the Maitraka empire. The major associated Ware along with Torpedo Jar is Red Polished Ware (Rao 1966) which has been relatively dated to latest to the 5th century A.D. and the Micaceous Red Ware which is found around the 6th century A.D. to 10th c. A.D.

The chronology which was established using the 'Roman amphora 'and Red Polished Ware by previous excavations needs to be re-examined. Red Polished Ware has a long chronology from 1st to 5th century A.D. or even beyond. The occurrence of Red Polished Ware with Micaceous Red Ware is perplexing when we consider the chronology given by Jairath (1986: 138) which places Micaceous Red Ware within the 'Historic Period III 'dated to post the 6th century A.D. and mentions the absence of Red Polished Wares and other ceramics. Vallabhipur needs fresh excavations to confirm the chronology, and the lack of report makes it even more difficult to comprehend the nature of the finds and the contexts.

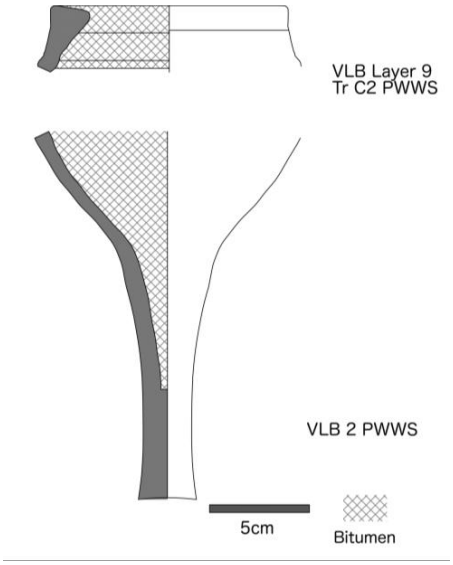


Figure 4.1: Torpedo Jar base and rim from Vallabhipur

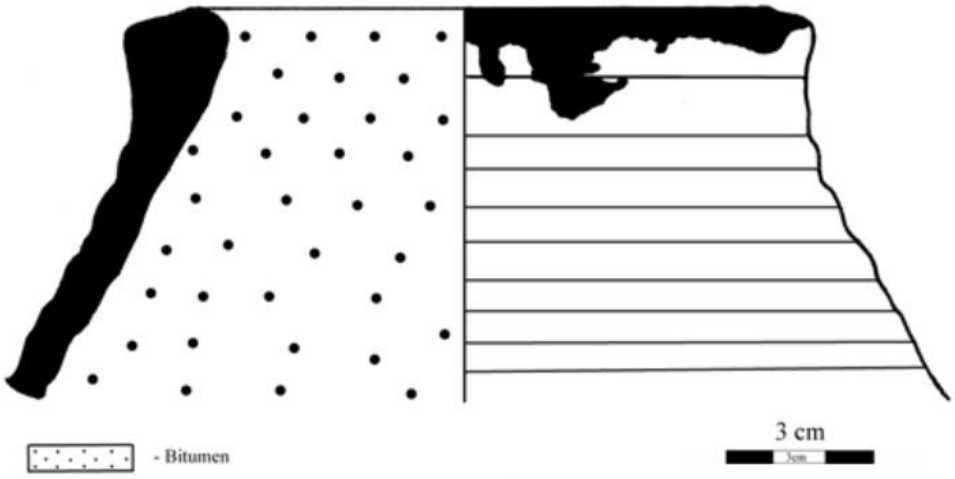


Figure 4.2: Torpedo Jar rim from Vallabhipur with high ribbing

4.1.2. Nagara (N: 22°41' E:72°38') District Kheda, Gujarat

The imported finds from Nagara have 'Roman' amphoras (see Figure 4.3; Mehta and Shah 1968). Apart from these, most of the other carrier vessels are West Asian in origin. The Torpedo Jars are all from the PWWS (TORP.S in Priestman 2013: 496-497) fabric and all are body sherds. Seven sherds of Torpedo Jars were found from the Nagara excavations. The sherds were found from both Ratan Khan area as well as Mud House mostly from layers 7 and 8 (see Figure 4.4; Mehta and Shah 1968). The location of site in central Gujarat also suggests, the evidence of trade has also been found in this region.

Figure 4.3: Amphora Handle from Nagara. (Courtesy: Department of Archaeology and Ancient History, The Maharaja Sayajirao University of Baroda)

Table 4.2: Torpedo Jar finds from different localities at Nagara

Locality - Nagara	Total Torpedo Jar Sherds	Fabric	Time Period from Nagara
Ratan Khad (Mound 3 – Trench IV)	5	PWWS	Period III – (early centuries A.D. – 8th-9th century A.D.)
Mud House (Mound 2 Trench III)	2	PWWS	Period III – (early centuries A.D. – 8th-9th century A.D.)
Total	7	-	-

Figure 4.4: Torpedo Jar body sherds from Nagara

All the West Asian finds (Torpedo Jars) from Nagara belong to Period III (Mehta and Shah 1968: Fig. 4- Fig.5) which has been dated from the early Christian centuries to 8th – 9th century A.D. The associated material with the Torpedo Jars from both Ratan Khad (Mound 3) Burnished Red ware , dominated Plain Red Ware, Coarse Red and Black Ware, Burnished Black Ware, Amphora, Plain Red and Black, and Red Polished Ware (Mehta and Shah 1968: Fig.5). The associated material with the Torpedo Jars, from Mound 2 at Nagara is Burnished Red Ware, Plain Red Ware, Burnished Black, Plain Black Ware, Crude Black and Red Ware, Glazed Ware, Amphora, and Painted Black on Red.

Moreover, the excavators at Nagara note a marked expansion of the habitation in Period III, which even covers the earlier bunds and restrictive architecture by habitational deposits. They note that, this Period III was full of intense building activities, as suggested by multiple phases of construction, and an expansion of the township to about an area of 1 sq km. The excavators report that this is the most prosperous phase of the site with long distance trade and sophisticated objects such as seals, coins, shell bangles, terracotta objects, stone objects, beads of glass and stone which suggests contact with Rajasthan, Saurashtra, Central Asia and the West (Mehta and Shah 1968: 167).

4.1.3. Lothal (N:22°31'23.8", E:72°14'57.3"), District Ahmedabad, Gujarat

The site museum of Lothal has an almost complete Torpedo Jar (rim is missing) which has been displayed as Roman Amphora (registered number 2950) (Figure 4.5). The find-spot of the Jar itself is a question, as there is no official document suggesting the same. The Jar is completely lined with bitumen on the inner walls but is missing the rim. The fabric it belongs to is Pink Ware with White Slip (PWWS). It has a narrow toe base, and it is wheel made. The base end

of the jar is visibly asymmetrical from where it tapers. This happens because of the manufacturing methods involved in making the jar. Complete, or near complete ceramics, give valuable information for re-constructing the manufacturing and technology of the ceramic type in question. This information in turn helps in giving further clarity towards the typo-technology. Keeping that in mind, an attempt was made at reconstructing a 'Torpedo Jar' similar to the one from Lothal. In 2014, J. M. Kenoyer and the Department of Archaeology and Ancient History, conducted an experimental workshop on Ceramic technology and Metallurgy. Initially when the Jar is shaped on the wheel it is kept as cylinder, and one half is allowed to dry, and another half is kept partially moist. After drying, the Jar is again kept on the wheel and the wet part is 'squeezed' together to form the tapering body and toe base. The squeezed areas are seen clearly within the interiors of the jar which then become inaccessible to the potter once the height of the Jar is increased by luting the top half. [1]

4.1.4. Kanmer (N:23° 25 '4.6" , E:70° 51 '49.7") Rapar Taluka of Kachchh District, Gujarat

West Asian evidence in the form of Torpedo Jars and Sasanian Glazed Ware has been found at the site of Kanmer. The excavations at Kanmer have yielded Sasanian Glazed Ware; out of a total of five sherds, three of these glazed sherds had partially degraded and h ad lost the original colour of the glaze albeit one sherd (bowl) retains a hint of bluish glaze (Figure 4.6: 5). Two glazed handles were also found from the site (Figure 4.6: 1-2). The Glazed Ware rim had a thickened outer surface and a thin rim with a small ledge suggesting that it could be a part of a small vessel (Figure 4.6: 3) (Balvally *et al.* 2018: 302). This Glazed Ware was found mostly from the centre of the mound, and from conical storage pits from layer 5b (ashy) which was sealed by 5a which the excavators claim is a storage area (Kharakwal *et al.* 2012: 154).

Torpedo Jars were also reported from Kanmer (Kharakwal e*t al.* 2012: 23; 37,) As a part of research project/dissertation, the researcher studied, recorded nearly hundred sherds of Torpedo Jars that were found from the excavations (which includes twelve rims and one large base (excluding one complete Torpedo Jar) (see Figures 4.7 - 4.8). Twelve of these were the buff variety and the majority belonged to PWWS fabric. The Torpedo Jar finds are found from disturbed deposits, attesting to their finds from layer 1 in various trenches (Table 4.3). From, secure stratified contexts such as Z 30, Z 31, and Y 17, the Torpedo Jars were found associated

[1] A Torpedo Jar was experimentally recreated under the Experimental workshop held by Prof. J. M. Kenoyer along with the Maharaja Sayajirao University of Baroda in Vadodara, Gujarat.

with Sasanian Glazed Ware (Table 4.3). These deposits may be dated to after the 5th century A.D and later, as radiocarbon dates for earlier levels of Z30 (layer 10) are dated to 3rd-4th centuries A.D. (Kharakwal *et al* .2012: table 13.4, 826).

Figure 4.5: Torpedo Jar from Lothal (Courtesy: The Archaeological Survey of India, Vadodara Circle)

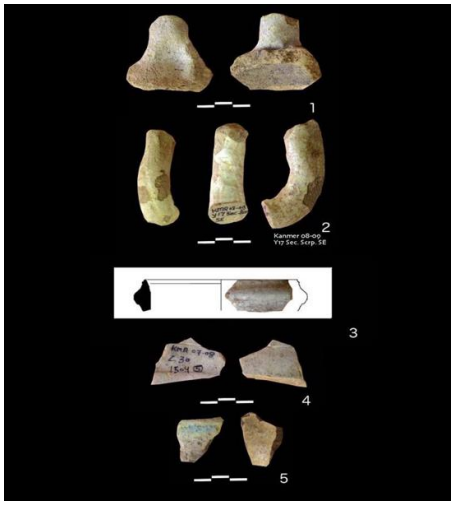


Figure 4.6: Sasanian Glazed Ware from Kanmer. (Courtesy: Jeewan Kharakwal).

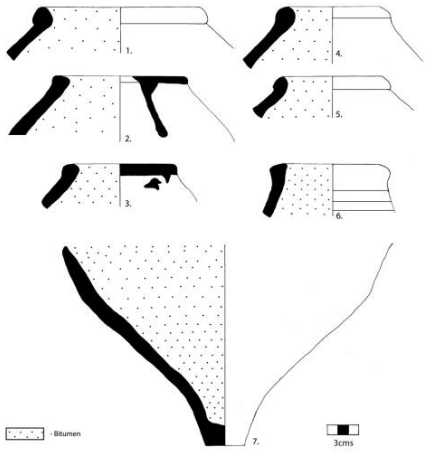


Figure 4.7: Torpedo Jar rims (1-5 sub-rounded and 6-triangular) and base (7) from Kanmer (all PWWS fabric).

Figure 4.8: Reconstructed and refitted Torpedo Jar from Kanmer (PWWS fabric).[2]

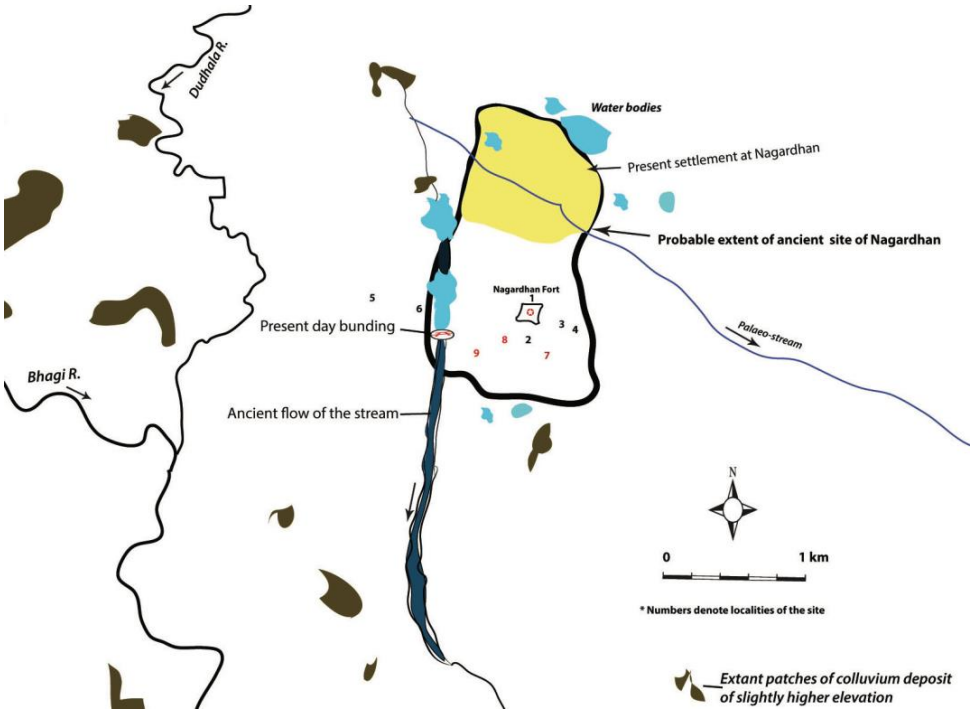
[2]Courtesy: Institute of Rajasthan Studies, Sahitya Sansthan, Janardhan Rai Nagar Rajasthan Vidyapeeth University, Udaipur

Table 4.3: West Asian ceramics and quantification from their trench locations from the site of Kanmer

Kanmer - Trench	Total Torpedo Jar sherds, Fabric and Layer	Total Sasanian Glazed Ware sherds
AA15	1 (PWWS) – layer 1	-
AA16	8 including 1 rim (PWWS)– layer 1; 1 (Buff) – layer 1	-
AA28	1 (PWWS) – layer 5	-
AA33	1 (PWWS) – layer 6	-
EE 29	3 (PWWS) including 2 rim - layer 1	-
EE 30		1 – layer 5
FF 29	2 (PWWS) includes 1 rim – layers 2-3	-
FF 30	4 (PWWS) - layer 1	-
J 22	3 (PWWS) – layers 4, 5 and 6	-
No matrix	7 (PWWS) includes 2 rims	-
P-993	1 (BUFF)	-
P-995	1 (PWWS)	-
X 31	2 (PWWS) including 1 sherd with bitumen in core; 1 (BUFF) – all layer 5 –	-
Y 17	-	1 handle from section cutting
Y 30	7 (PWWS); 2 (BUFF)	-
Y 31	17 (PWWS); 3 (BUFF) – layer 5	-
Z 16	6 (PWWS); 4 (BUFF) – layer 1 includes 1 rim	-
Z 17	1 (PWWS) – layer	-
Z 18	1 Large Sherd (PWWS) + 1 small PWWS sherd - Layer 3	-
Z 28	1 Fully Reconstructed Jar (PWWS) + 1 body sherd - all layer 6	-
Z 29	1 sherd (BUFF)	-
Z 30	6 (PWWS), 2 (BUFF) – layers 2 and 5	2 – including 1 rim – layer 5
Z 31	6 PWWS including 1 3 rims – layer 5	2 – 1 handle, 1 rim – layer 5
Total	93	6

4.1.5. Nagardhan (N: 21° 21′, E: 79° 19″) Nagpur District, Maharashtra

Torpedo Jars are found from the excavations and were reported from the early medieval period (Sontakke *et al* .2016: 49) and is the most inland Torpedo Jar so far found from South Asia. In the recent excavations (2016-17, 2017-18), Torpedo Jars was found from the Vakatakas phase as well as a sherd of Early Islamic; Tin Glazed Ware (see Figure 4.12). As a pilot study, the researcher conducted recording of Torpedo Jars from Nagardhan, which was the imperial capital of the Vakatakas. The site has also yielded various urban features such as monumental architecture, public spaces (markets), and evidence of long-distance trade.



Map 4.2: Map of Nagardhan site and it's localities. Localities 1, 2, 3, and 9 have reported Torpedo Jars (Courtesy: Virag Sontakke)

The 2016-17 and 2017-18 season's excavations have yielded Torpedo Jars in the early historic phase (Figure 4.9) of the site from the Vakataka phase from two different localities (Trench H in Locality 1 and Locality 3) (Table 4.4 -4.5). Locality 1 is located within the fort and Locality 3 is located east of the fort. Locality 3 has structures of the Vakataka and Satavahana phase with the early phase having more of domestic architecture and the later phase had one very long wall of 13 m and of six brick courses, and finally seven walls, nine alignments, one pavement, and two partition walls were found in the upper phase (Sontakke *et al.* 2016: 47; Map 4.2). Locality 3 (dated between 300 and 600 AD) has evidence of manufacturing of shell, ivory, and bone artefacts. There is no evidence of hearths and other household areas, so it must be a state defined area given to the manufacturers or

artisan/craftsman. There is public architecture in the form of ring wells and large community sized platforms (Figure 4.11). Maximum number of Torpedo Jar sherds as well as coins are found in this locality suggesting it might have functioned as a market place.

Figure 4.9: Torpedo Jars from Nagardhan with inner bitumen lining[3].

All the Torpedo Jar sherds found from the excavations are body sherds except for one rim sherd (Figure 4.10). All the Torpedo Jar sherds from Nagardhan belong to the PWWS fabric. The associated pottery includes Red Polished Ware (of the late phase), Mica Washed Red Ware and un-slipped Red Ware. Stratigraphically the Torpedo Jars at Nagardhan can be dated to a period between 400-650 A.D. Locality 9 (Trench P18) habitation doesn't go beyond 600 A.D. The phase at Nagardhan dated to 400-650 A.D., reveals considerable cultural changes. The site is at its greatest extent in this late Vakataka - Early Vishnukundin phase. There is also evidence of carnelian bead industry in this phase as well as increased production of local pottery. The sculptural fragments of this phase are also typically Vakataka in style such as the

[3] Courtesy: Nagpur Division, Directorate of Archaeology and Museums, Maharashtra and Department of AIHC and Archaeology, Deccan College Post Graduate Research Institute, Pune

Narasimha (around 5th c. A.D.) and Ganesha. Coins of the Vakataka and Vishnukundins are also found in this phase.

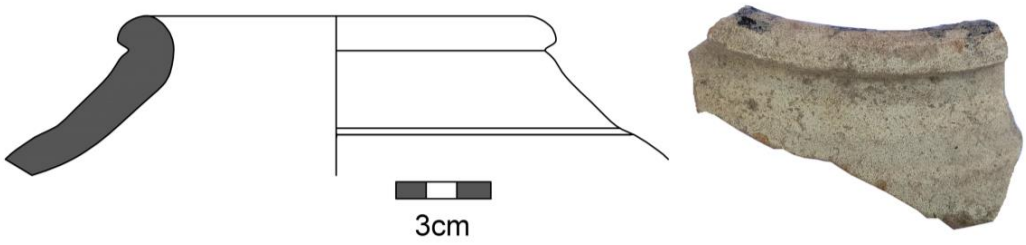


Figure 4.10: Illustration of Torpedo Jar from Nagardhan sub-rounded rim with a shallow groove under the rim, with some ribbing on the shoulder. (Courtesy Virag Sontakke)

Figure 4.11: Structures from the excavations at Nagardhan from locality 3 (XM Qd1). The marker in blue indicates the Torpedo Jar yielding levels dated to around 5th century A.D. relatively. (Courtesy: Virag Sontakke)

Trench H (Locality 1) boasts monumental architecture with a large structure of the Vakataka period which had a large room with an adjoining smaller room. A clay sealing bearing the name of Vakataka queen Prabhavati Gupta was found over this structure along with other clay sealing having the Srivatsa symbol belonging to the late Vakataka period deposit in Trench H (Sontakke *et al.* 2016: 45).

Table 4.4: Quantification of the Torpedo Jar sherds from Nagardhan 2016-2017 Season

Locality	Trench and Locus	Total Torpedo Jar Sherds (PWWS)
1	HQd4	2
3	M1Qd4	34
3	XMQd1	3
3	XMQd2	1
	total	40

Table 4.5: Quantification of the Torpedo Jar sherds from Nagardhan 2017-2018 Season

Locality	Trench and Locus	Total Torpedo Jar Sherds (PWWS)
2	VQd2	3
2	VQd3	2
3	YMQd2	12
3	IMQd2	6
3	IMQd3	2
9	P18Qd3	3
9	S10Qd1	1
9	PQd1	6
9	PQd2	1
3	M1Qd3	5
3	El2Qd4	2
	total	43

Early Islamic pottery from Nagardhan

In the 2017 season, apart from the Torpedo Jars, a single rim sherd of Tin Glazed Ware dateable to around 9^{th} -10^{th} century A.D. was found from the trench GQd4 (depth 2.5m). This deposit has been dated relatively to 10^{th} - 11^{th} centuries A.D. (Shantanu Vaidya Personal Communication) It has a yolky core and opaque glaze (Figure 4.12). The sherd belongs to the

Samarran variety of ceramics, which were produced around Basra while Samarra was the capital (Iraq) for a short period within the 9th century A.D. The sherd is a part of White Opaque Glazed Ware and its shapes are mostly restricted to bowls (YBTIN in Kennet 2004: 39, CP. 1: 174). This type has also been reported from the site of Sanjan in south Gujarat (Nanji 2011: 34-35).

Owing to the lack of a good number of samples and the extremely small size of the sherd represented here, it becomes difficult to pin-point the exact variety of the Tin Glazed Ware found from Nagardhan. It is interesting to note that, the trade route continued from western coast of Maharashtra to the inland sites such as Nagardhan in the Early Islamic period. Some scholars state that the phase after the Satavahana period (i.e. the Vakatakas period) in Maharashtra lacks trade and shows a decline in trade networks (Thakuria 2017: 181-186), whereas, some others claim that most early historic sites in Vidarbha were deserted after the Vakataka period till the Medieval period (Sawant 2006 c.f. Sawant 2010: 57). The excavations at Nagardhan and the finds of the Torpedo Jars within the Vakataka's phase thus exhibit the continuation of trade or/and cultural contact well in to the Vakatakas phase with the Sasanians, and even in the period contemporary to the Early Islamic period circa 9th-10th c. A.D.

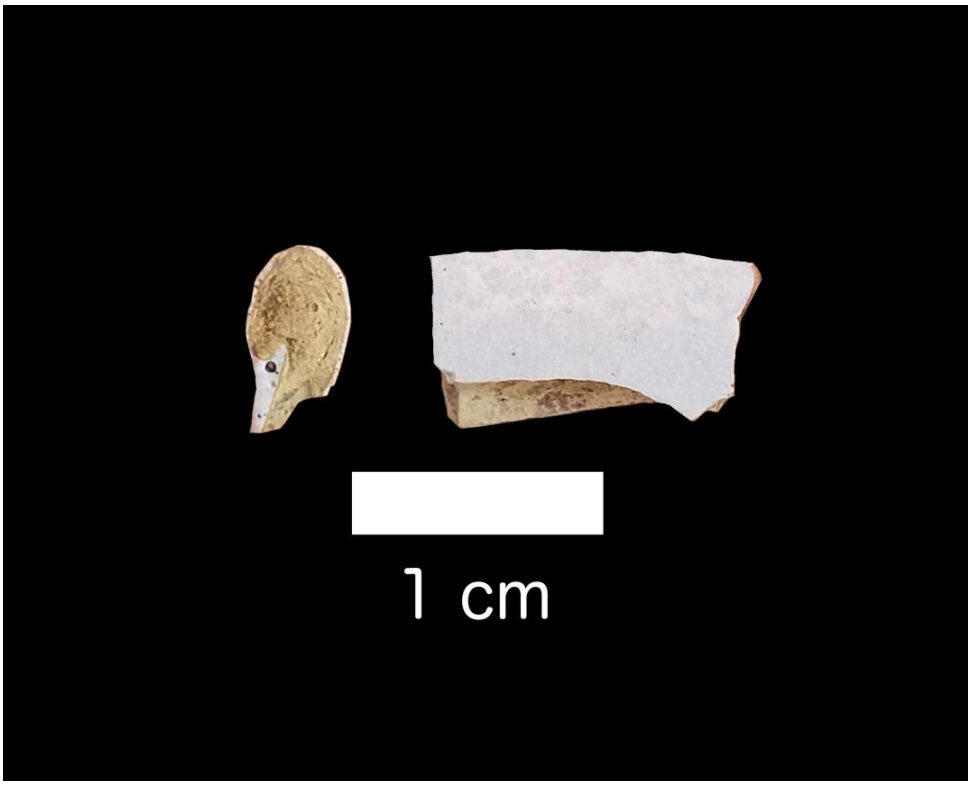


Figure 4.12: Tin Glazed Ware (Samarran) rim from Nagardhan (Courtesy: Virag Sontakke)

4.1.6. Chaul (N:18°33'16.8", E: 72°56'26.3") Raigad District, Maharashtra

Chaul in the northern Konkan, was a trade centre from the very beginning of the 1st millennium A.D. The earliest ceramics in terms of trade are represented by Amphora sherds and are part of the Indo-Roman exchange between the two regions (Gogte 2003: 70). In the later part of the early historic period, there is an exchange of Torpedo Jars (and Sasanian Glazed Ware?) which comes to this region. A large number of Early Islamic ceramics (from west Asia) are also found from the excavations namely; Eggshell Wares (Grey type – GEGG and White type WEGG). Eggshell Wares are extremely thin-bodied, unglazed ceramic, with incised decorations ranging from pseudo-calligraphy to naturalistic and geometric designs. The type was widely produced in the Early Islamic phase (8th- 10th c. A.D.) in Iran-Iraq with the site of Siraf as one of its possible production centres (Nanji Personal Communication). Eggshell ware varieties were first reported in India from the excavations at Chaul (Gogte 2006-2007: 172), and Sanjan (Nanji 2011: 55-57) There are also a variety Sgraffiatos Wares found from the site (Gogte 2006-2007: 171-172) Table 4.6). The Late Medieval ceramics from Chaul show considerable variety (coming from Arabia, West Asia, South-East Asia) and warrant a separate study, additionally the timeline of this thesis is delimited to 10th c. A.D. ceramics, thus they would be published separately as a report. The localities are all based in Katkar alley in Chaul, near the mouth of the river, on the mud flats. The localities P, V, C, R, and G are named after the farm owners, for example Locality P is named after Patil, and V after Vartak. Localities P and V were larger trenches, measuring 2x 4m and 4 x 4m. According to the excavators, the stratigraphy at Chaul has been completely disturbed by a number of anthropogenic, natural, and sometimes a combination of both factors (Abhijit Dandekar Personal Communication). Thus, only a rough estimate of the site could be grasped from the temporal view-point.

Sasanian Glazed Ware

Three sherds form a part of this elusive group of ceramics. All the sherds come from a single context which is disturbed. The glaze is extremely deteriorated, and crumbly. All of them have a blue glaze on both side of the vessel (Figure 4.13). The body is creamish and has a lack of inclusions, it is a light fabric. Similar examples have been seen from other sites in western India (Balvally *et al.* 2018).

Torpedo Jars

Eight sherds of Torpedo Jars have been reported from Chaul. All the Torpedo Jar sherds from Chaul have the same fabric i.e., Pink Ware with White Slip (PWWS) variety as defined in earlier studies, Present researcher was given permission to record and analyse the Torpedo Jars. (TORP.S in Priestman 2013: 496-497). One sherd from Chaul has some post firing cross hatchings (Figure 4.14).

Turquoise Glazed Ware

Turquoise Glazed Ware is a characteristic ceramic manufactured in West Asia with a turquoise blue glaze with a range of shape from handled jars, handled pots, bowls and dishes. The examples with appliqué decoration are dated to the eight/ninth century (Whitehouse 1979a: 881, Mason and Keall 1991: 52). Only a few body sherds (3 in total) were found from the excavations, all of which are body sherds (Figure 4.15). Due to the lack of diagnostic sherds, it is difficult to bracket them into a specific period, therefore they have been put into the time frame of Sasanian-Early Islamic period.

Figure 4.13: Sherds of Sasanian Glazed Ware from Chaul

White Eggshell Ware (WEGG)

White Eggshell Ware (WEGG) represents the largest number of imported ceramics from West Asia at Chaul (57 body sherds, 10 rims and 4 bases). This Eggshell Ware type is made up of finely levigated light cream coloured clay and a very light body owing to the extremely thin walls (usually 2-4mm). No large inclusions are seen in the core with some sherds being self-slipped as a part of the surface treatment. The examples found at Chaul have many incised designs. The bases are mostly flat (probably later as suggested by Costa and Wilkinson 1987: 187 from Nishapur) but there are also examples found of bases with foot ring from Chaul (Figure 4.16). The rims are usually sharp, and they also have handles. The Eggshell Ware can be dated from 8-10th c. A.D. which is well into the Early Islamic period and were produced mostly in southern Iraq. White Eggshell Ware has different incised patterns on the body as seen from the examples at Chaul. The incisions are deep and done with a very sharp and tiny instrument, but the horizontal incisions are shallower and done on the wheel (Figure 4.17). The designs found from Chaul include semi-circular (long U shaped) patterns which look like leaves incised between two parallel horizontal incisions (similar ones seen on BUFF.I in Priestman 2013: 685 plate 13).

The White Eggshell Ware has been reported from the Indian sub-continent; Sanjan (Nanji 2011: 55:56) and from possibly from Vizhinjam (Ajit Kumar *et al.* 2013). WEGG has been reported as EGG.PI (Plain or Incised Eggshell Ware) in Priestman (2013: 485), where he has compared it to collections from Kush (Kennet 2004: 61, table 2, fig. 28: 'Types 67-68'), and Susa (Kevran 1977: fig. 30:1-6). Priestman (2013: 485) also notes the absence of a type of small Eggshell Ware jar from Siraf, 'squared or slightly indented sides sometimes with vertical linear indentations.' which is found at Susa (Kevran 1977: fig 30: 1-6).

Grey Eggshell Ware (GEGG)

Grey Eggshell Ware is the second most prevalent of the imported ceramics found at Chaul (27 in total; 1 rim and 3 bases). It is usually found associated with the WEGG and is almost as thin or thinner (2-3mm). This type although shares similar traits when it comes to the shape and rims (Figure 4.18), is very distinct when it comes to the colour of the core and body, and the extremely complex incised designs. Owing to the disturbed deposits at Chaul, it is difficult to assign a date to these Wares, but, typologically they come under the Egg shell associated with

the White Eggshell Ware. Grey Eggshell Ware is an enigmatic find, because this variety has not been reported from anywhere in the Indian sub-continent. (Figure 4.18-4.19).

Buff Plain and Incised Ware (BUFF.PI)

Buff Wares with horizontal incisions and wavy patterns on the body (Figure 4.20). Body thickness is different from WEGG and GEGG with 6-7mm thickness. The designs also vary and are mostly simpler compared to Eggshell Wares. Unlike the Eggshell Ware class, these ceramics are wheel made. Eight sherds were discovered from the excavations. Illustrated examples include a base (Figure 26:10, 13) and rims (Figure 25: 6, 14).

Figure 4.14: Torpedo Jar sherds from Chaul. Broken part of base (top) and a body sherd with cross-hatched incisions (bottom)

Figure 4.15: Turquoise Glazed Ware from Chaul

Figure 4.16: Flat White Eggshell Ware base from Chaul

Figure 4.17: White Eggshell Ware with leaf-like designs from Chaul

Figure 4.18: Grey Eggshell Ware rim and base from Chaul

Figure 4.19: Grey Eggshell Ware with different types of designs

Figure 4.20: Buff Plain and Incised Ware rims from Chaul with handle (broken off) and another with wavy incised designs and horizontal incisions close to the rim

White Opaque Tin Opacified Glazed Ware (Tin Glazed Ware)

White Opaque Tin Opacified Glazed Ware (YBTIN in Kennet 2004: 39) is a ceramic type specifically related to the Abbasid capital site of Samarra (Sarre 1925). The ceramics from the so-called Samarra Horizon class were produced in the 9th c. A.D. while some forms continued into the 10th c. A.D. (Northedge & Kennet 1994). The shapes of the white opaque tin glazed Ware found from Chaul are mostly everted rim bowls (Figure 4.21, Figure 4.26.8).

Figure 4.21: White Opaque Tin Opacified Glazed Ware bowls from Chaul

Champlevé Sgraffiato

Three sherds of Champlevé Sgraffiato was found at Chaul. The type is part of a larger class of ceramics which can be termed Sgraffiato. The distinctive feature of this type is thick (1 to 1.5cm) shavings, cut out of the slip on the interior of the vessel. The example at Chaul has a greenish slip near the rim followed by a lead glaze (Figure 4.22). Traditionally the Champlevé has the typical Champlevé decoration of the wide cut outs along with the incised sgraffiato lines forming horizontal bands around the top of the rim, base interior or running along with the shaved cut out elements (Priestman 2013: 585-586). The vessels have a fine orangish red body (2.5 YR 6/6) with no visible inclusions. This type is widely reported in deposits dated to 11th to 13th century A.D., from sites such as Siraf (Priestman 2013: 586) in Iran, Kush from late phase circa 13th century A.D. (Kennet 2004: 37-38) in Arabia, Manda and Kilwa (Chittick 1984: 79, pl. 32: c, f; Chittick ii.1974: 303, pl. 111: c-d) and at Shanga (Horton 1996: 'Group 5b', 284, table 14) in East Africa. The centre of production of these is at the site of Tiz (Iran),

Makran Coast (Stein 1937: 90-91) but other centres of production are also plausible due to the variability in the material assemblage as seen studied from Siraf (Priestman 2013: 586)

Figure 4.22: Champlevé Sgraffiato rim sherd from Chaul

Green Monochrome Sgraffiato (GSGR)

Two body sherds (bowls) of green monochrome Green Monochrome Sgraffiato (GSGR) are reported from the excavations. One of those sherds (Figure 4.23) has monochrome green lead glaze with some swirling sgraffiato design which is seen cut through the white slip to give the desired effect on the inner side of the vessel (same design from Kush as described as 'Swirls loosely drawn concentric ovals and circles' in Kennet 2004: 36). The outer wall of the sherd has no surface treatment. The sherd has orangish red fabric and minimal inclusions. According to Priestman (2013: 592) the main fabric group i.e. (one represented at Chaul as well) is associated or even same as another type which he names as Late Polychrome Splashed Sgraffiato (GRAF.LP), though he also discusses another cream coloured fabric with Coarser inclusions which is not found at Chaul. This Ware type is dateable to mid 11th to 13th century as seen from Kush (Kennet 2004: 35-36 called as GGRAF), and in Williamson collection GRAF.G (Priestman 2005), Manda and Kilwa (Chittick 1984: 79, Chittick ii.1974: 303), and

Shanga (Horton, 1996: 284, 286, table 14). The source area is southern Iran with site such as Lashkari Bazaar (Gardin 1963 pl. XXVIII: 525-530) early part of the period 1100 A.D. to 1220 A.D. (Gardin 1963:136) and also from Qaleh-i-Saravan (Priestman 2005: 123).

Figure 4.23: Green Monochrome Sgraffiato sherd from Chaul

Hatched Sgraffiato (HSGR)

Hatched Sgraffiato is very commonly found from the excavations at Chaul (amounting to 25 sherds; 4 rims and 5 bases). It is a very definitive class of ceramic within the Later Sgraffiatos (reported as Style III Sgraffiato - Siraf in Whitehouse 1979a: 58), which have typical hatched incised decorations and heavy splashed green and yellow (occasionally brown) colours (Figure 4.24). The hatched designs are predominantly floral or pseudo-calligraphic in nature (Kennet 2004: 35) and plain zones are left un-decorated between two panels and below the rim, whereas the closely spaced hatching (c.1mm) which fill the letters or the background to the letters (Priestman 2013: 584). The sherds have hardly any inclusions and similar fine texture and feel (orangish red fabric) as the other Late Sgraffiatos in the Indian sub-continent.

Hatched Sgraffiato has also been reported from Sanjan (Nanji: 2011: 44-46) in western India (south Gujarat) as well as Banbhore (Mughal 1990: 59-60 Pl. I and Pl. II; Mughal 2012: 337, Fig 6, Fig 7.) in Pakistan where it has been found in deposits dated to 10^{th} - 12^{th} c. A.D. - labeled as Late Abbasid (Khan 1976). In Kush, Kennet (2004: 35) dates it to 11^{th} to 12^{th} century A.D. This Ware has also been found widely in Arabia; Sharma (Rougeulle 2005: 228, figs. 3:

1-19; 4: 1-11) and al-Shihr (Hardy-Guilbert 2001: fig. 4: top right) and in Oman at Ras al-Hadd (Whitcomb, 1975: 126, fig. 8: a-g, i, n-q, s), Sohar (Cleveland, 1959: fig. 4: 6; Williamson, 1973: 19; Kervran, 2004: figs. 29: 12; 33: 1-3; 34: 8-13; 36: 2, 7-11). In East Africa, it was found at Kilwa (Chittick 1974: pl. 11: d), Andaro (in Madagascar) (Priestman 2010), Shanga (Horton 1996: 284, fig. 206: a-l) and Manda (Chittick 1984: pl. 32: a-b). The site of Tiz in southern Iran is the centre of production for this Ware type (Stein 1937: 90-91).

Figure 4.24: Hatched Sgraffiato from Chaul. Bi-chrome variety on top with green-yellow splashes and with playing white glaze in the lower right sherd

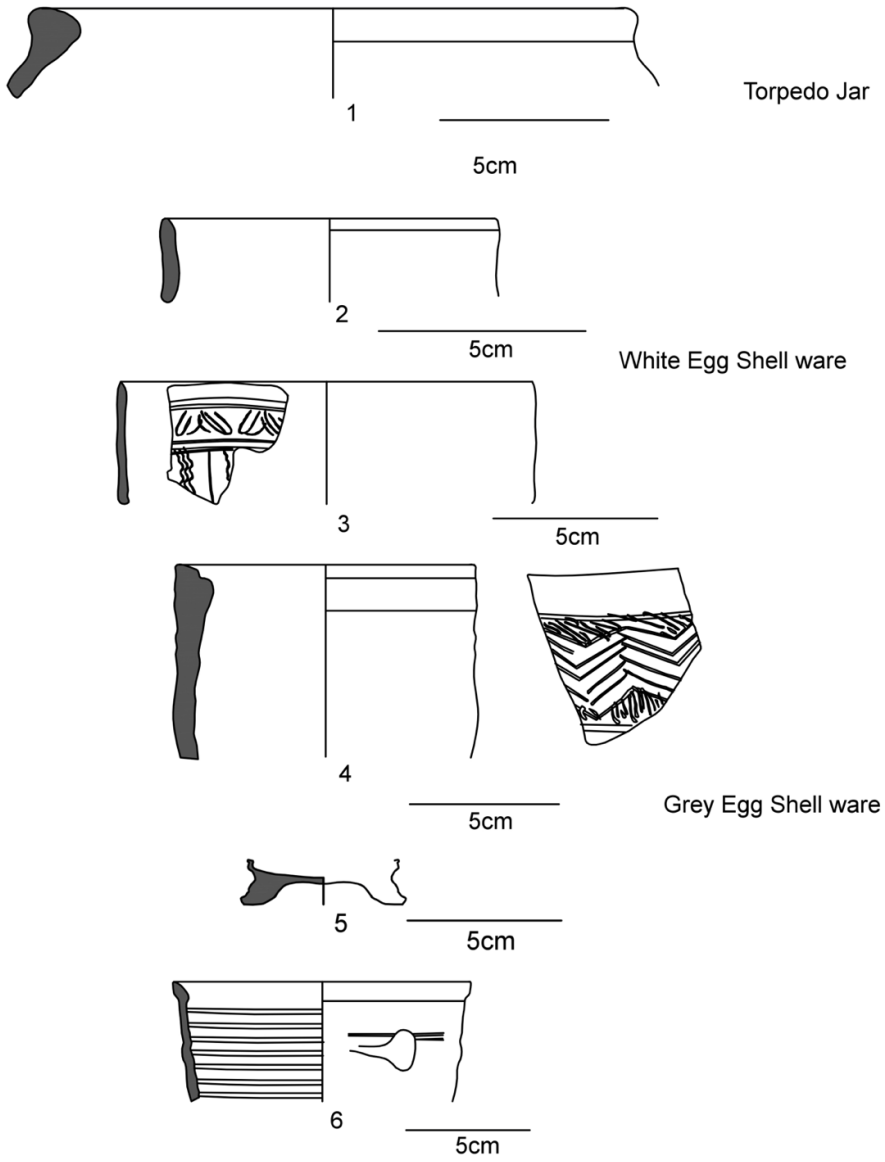


Figure 4.25: Illustration of Sasanian and Early Islamic Ceramics from Chaul from CHL – C-2006, Trench F. Description of the Wares given below.

4. 25.1 - Torpedo Jar (PWWS fabric) - Sasanian

4. 25.2 - White Eggshell Ware bowl - Early Islamic

4. 25.3 - White Eggshell Ware with incised designs; leaf type designs (upper register) and vertical wavy lines (lower register) - Early Islamic

4. 25.4 - Grey Eggshell Ware vessel with internal ledge, with parallel v shaped incised partially overlapped with slanting wavy lines top and and bottom - Early Islamic

4. 25.5 - Grey Eggshell Ware base with hollowed out base - Early Islamic

4. 25.6 – Buff Plain Ware with slightly out turned rim, light fabric broken handle and parallel horizontal ribbings on the inner wall a sign of wheel made production - Early Islamic

4. 26.7 - Buff Ware basin. Sasanian-Early Islamic?

4. 26.8 - Opaque Tin Glazed Ware bowl with everted rim (same as 'Serpent' type in Mason 1997 fig. 3: 44 and BR3 rim type from Siraf in Priestman 2011: table 2, 97) interesting BR3 seems to be more for the Cobalt splashed type so might be typically Early Islamic Ware.

4. 26.9 - Turquoise Glazed Ware Sasanian rim (similar to

pottery from Ram Hormuz -106 Alizadeh 2014: Plate 175 C)

4.26.10 – Buff Plain and Incised Ware - ring type base - Early Islamic

4. 26.11 - White Eggshell Ware with dimpled base - Early Islamic

4. 26.12 - White Eggshell Ware base - Early Islamic

4.27.13 - White Plain Incised Ware flat base

4.27.14 - White Plain Incised Ware handled jar

4.27.15 – LISV? (Line Incised Storage Vessel)

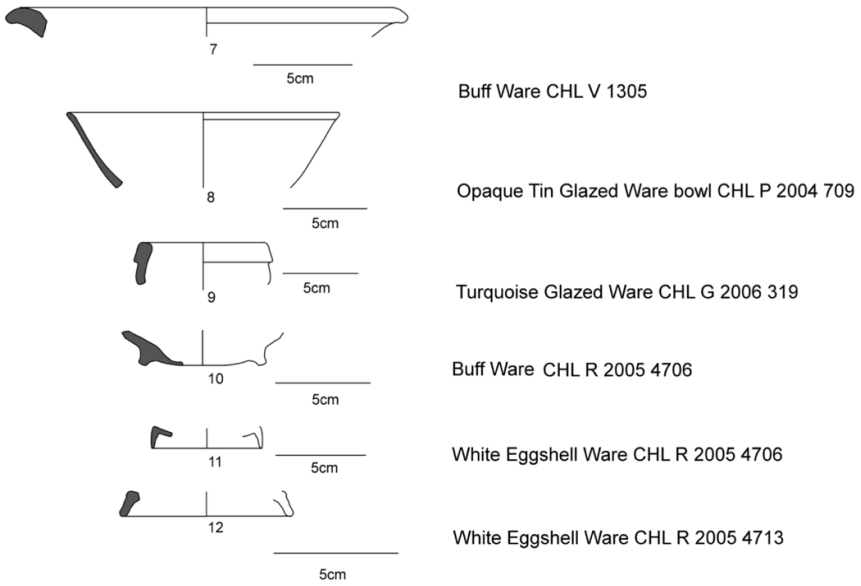


Figure 4.26: Illustration of Sasanian and Early Islamic Ceramics from Chaul

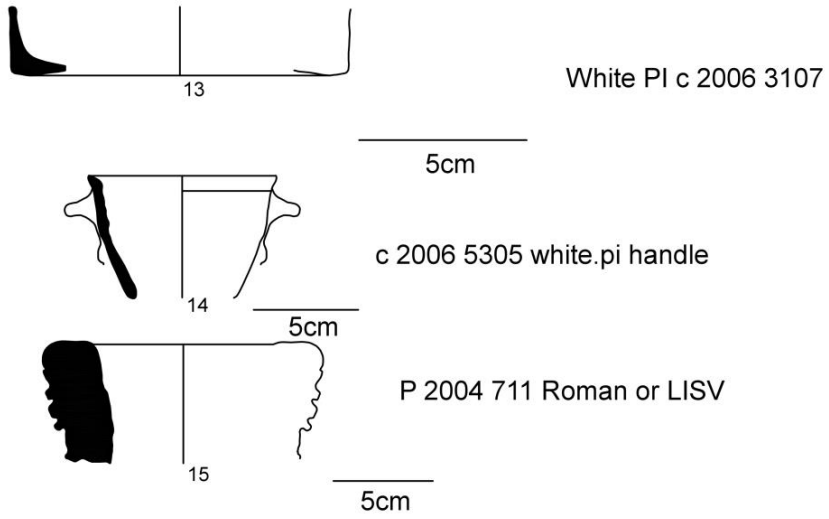


Figure 4.27: Illustration of Sasanian and Early Islamic Ceramics from Chaul

Table 4.6: Quantification of West Asian Ceramics from Chaul

Ware Type	Body Sherds	Rim	Base	Lid	Total	Locality	Trench	Layers	Internal Chronology (Gogte 2006-07)
Grey Eggshell Ware	23	1	3	-	27	A	C	1	Disturbed
						C	F	(1-3)	Disturbed
						G	D	(1-2)	Disturbed
White Eggshell Ware	57	10	4	-	71	A	C	1	Disturbed
						C	F	1-2	Disturbed
						G	D	1-2	Disturbed
Hatched Sgraffiato	14	4	5	2	25	A	C	Humus	Disturbed
						C	F	1-3	Disturbed
						G	D	1	Disturbed
						P	A	5-6	(7^{th} -13^{th} centuries A.D.)
Green Monochrome Sgraffiato	2		-	-	2	C	F	2-3	Disturbed
Champlevé Sgraffiato	1	2	-	-	3	C	F	2-3	Disturbed
Torpedo Jars	6	1	1	-	8	C	F	2	Disturbed
						G	D	2	Disturbed
						P	A	4-5	(7^{th} -13^{th} centuries A.D.)
Sasanian Glazed Ware	2	1	-	-	3	V	B	4	Disturbed
Buff Plain and Incised Ware	4	2	2	-	8	C	F	1	Disturbed
						G	D	2	Disturbed
						P	A	5	(7^{th} -13^{th} centuries A.D.)
						R	E	1	Disturbed
White Opaque- Tin Glazed Ware	4	-	-	-	4	P	A	4-5	(7^{th} -13^{th} centuries A.D.)
Turquoise Glazed Ware	3	-	-	-	3	C	F	3	Disturbed
TOTAL	117	21	15	2	155				

4.1.7. Vadnagar (N: 72° 38′ 21.9" E:23° 46′ 56.1") Mehsana District, Gujarat

Torpedo Jars

Torpedo Jars were first reported from Vadnagar by the Directorate of Archeology & Museums, Government of Gujarat (IAR 2009-2010: 41, Rawat 2011: 231), which the excavator has dated to the period between 3rd and 5th centuries A.D. (IAR 2009-2010: 41). The Torpedo Jars were found from two localities of the State Department Excavations namely Ghaskol Darwaza (8 body sherds) and Durgamata Area (11 body sherds), all of which are PWWS fabric as defined earlier (refer to 3.1, Table 4.7, Figure 4.28). Some sherds were also recorded by the excavators in the Primary School Area but could not be located by the researcher. Some ceramics of the Torpedo Jars recorded by the excavators are possibly not Torpedo Jars, but indigenous in nature, and were omitted from the sampling record.

Figure 4.28: Torpedo Jar Body Sherds from Vadnagar, (Courtesy: IAR 2009-2010, Figure 41: 41)

Further, the researcher also recorded the Torpedo Jars found from the on-going Archaeological Survey of India (Excavation Branch V- Vadodara) excavations from the 2017-2018 season. The current excavations have yielded 80 sherds of Torpedo Jars; including 2 rims (Figure 4.29: 3-4) and 2 bases (Figure 4.29: 5-6) all of which belong to the PWWS fabric. 58 sherds were found from Valmiyo no Mahad and 22 from Amba Ghat (Table 4.7, Figure4.29).

Table 4.7: West Asian ceramics and their locations within Vadnagar

Vadnagar Locality	Torpedo Jar Sherds	Sasanian Glazed Ware Sherds
Ghaskol Darwaza	8 body (PWWS)	1 large jar with handles
Durgamata Area	11 body (PWWS)	6 including 2 rims and 1 base
Primary School Area	11 unconfirmed not recorded by researcher	-
Valmiyo no Mahad	58 sherds including 2 rims and 2 bases (PWWS)	-
Amba Ghat	22 including 1 rim and 1 base (PWWS)	8 including 1 rim and 1 base
Total	110	15

Sasanian Glazed Ware

The Directorate of Archaeology & Museums, Government of Gujarat excavations yielded 8 sherds of the Sasanian Glazed Ware. From the Durgamata Temple Area; 6 sherds were found including 3 body sherds, 2 rims, and 1 base of a bowl. A huge Jar with handle has been found Sasanian Glazed Ware has been found also been found from the excavations at Vadnagar from Ghaskol Monastery excavations (Balvally *et al.* 2018: 302-304). The ASI excavations (season 2017-18) have yielded 8 sherds including 6 body sherds, and 2 diagnostic sherds (1 rim and 1 base) (Figure 4.30: 1-2) all of them from Amba Ghat. One of the sherds was re-used in the later period.

The associated pottery along with Torpedo Jar and Sasanian Glazed from Vadnagar are primarily Red Polished Ware (RPW), Red Ware, Red Slipped Ware, Mica Washed Red Ware, Black and Red Ware. The major shapes include, bowls, jars, pots and globular pots (includes most Wares), and spouts and sprinklers (restricted to RPW and Red slipped Ware) (Figure 4.33, Figure 4.34). [4]

[4] The Ware descriptions and Ware types have been kindly shared by the ASI, Vadodara Excavation Branch V. Special Thanks to Dr. Abhijit Ambekar (Dy. S.A.) from the Archaeological Survey of India and Dr. Amol Kulkarni, from Dr Babasaheb Ambedkar Marathwada University, Aurangabad.

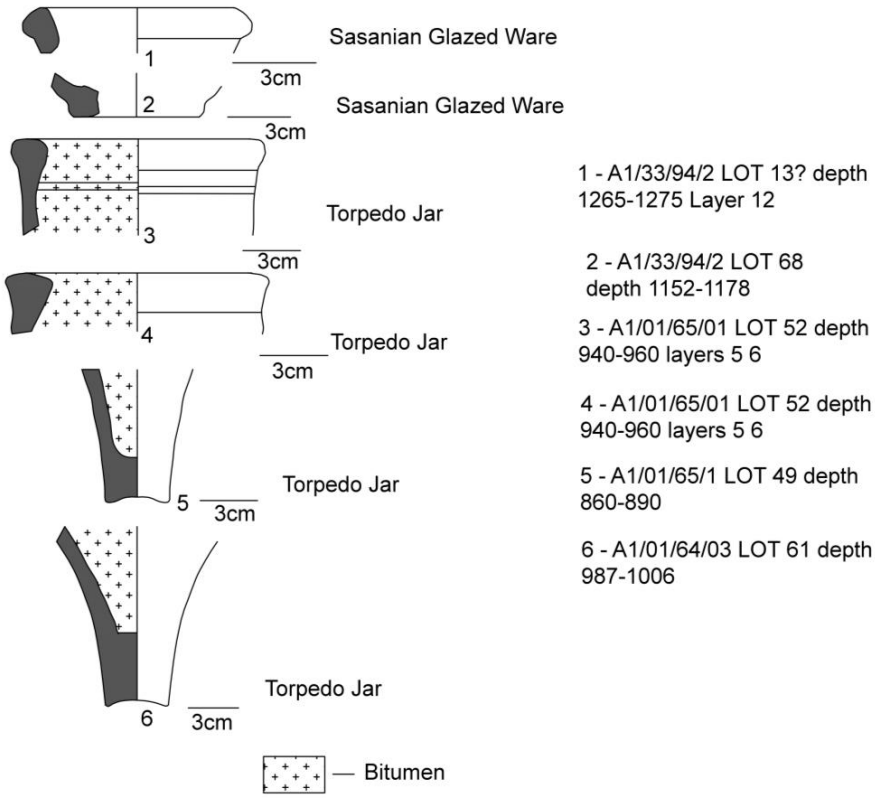


Figure 4.29: Torpedo Jar and Sasanian Glazed Ware Illustrations from the ASI Excavations. (Courtesy: The Archaeological Survey of India). (1-2 - from Amba Ghat Area; 3-6 - from Valmiyo no Mahad Area)

Figure 4.30: Sasanian Glazed Ware from Vadnagar from the Directorate of Archaeology and Museums, Government of Gujarat

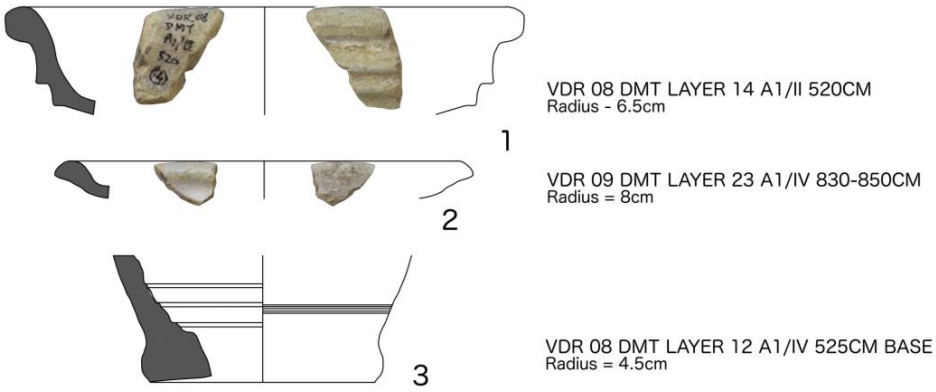


Figure 4.31: Illustration of Sasanian Glazed Ware rims and base from Vadnagar - the Directorate of Archaeology & Museums, Government of Gujarat

Figure 4.32: Glazed Ware Handled Jar from Vadnagar with an Iridescent Remnant of Glaze - the Directorate of Archaeology & Museums, Government of Gujarat

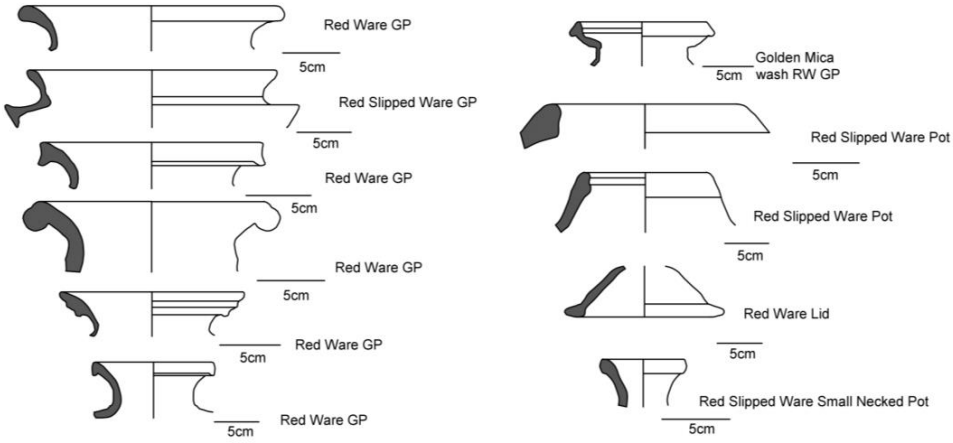


Figure 4.33: Pots and Globular Pots (GP) from Vadnagar ASI Excavations, 2018 season. (Courtesy: ASI, Vadodara Excavation Branch V)

The Excavations at Vadnagar have been important in understanding the spread of West Asian trade in northern parts of Gujarat. The findings of trade vessels within the sacred spaces such as the monastery complex, also, do paint an interesting picture on the connection that existed between religion, economy, and power. The excavations have also helped to temporally situate these Wares within the western Indian cultural context, specifically Gujarat. The Torpedo Jars

and Sasanian Glazed Wares can be dated to between 3rd to the 7th centuries A.D. as suggested by the evidence from Vadnagar excavations, in particular from Ghaskol Darwaza.

Figure 4.34: Red Polished Ware Sprinkler from Vadnagar ASI Excavations, 2018 season. (Courtesy: ASI, Vadodara Excavation Branch V)

4.1.8. Taranga Hills (N:23°, 58' and N: 23°, 59' N; E: 72°, 48' and E: 72°, 45') Mehsana District, Gujarat

The excavations at Taranga, have also yielded Torpedo Jars – 1 sherd (Abhjit Ambekar Personal Communication). Taranga probably also acted as a 'pit-stop' for merchants, and/or the populace who stayed in Taranga might be consumers of wine.

4.1.9. Siyot (N: 23° 46' 26.0 ", E:68° 52' 34.8") District Kachchh, Gujarat

The Directorate of Archaeology and Museums, Government of Gujarat, under the directorship of Shri Y. S. Rawat, excavated the site in the month of September 2018. The excavations from the trench yielded two different phases of construction at the site, one being the older deposit (containing Kshatrapas moulded Wares along with Rangmahal Wares) and a 9th -10th century A.D. deposit which shows an expansion of the site and also large-scale construction in stone. (Y. S. Rawat Personal Communication). The excavations yielded Torpedo Jars (15 sherds) from two trenches (A and B) all of which belong to the PWWS fabric (see Table 4.8, Figure 4.36)

from all the layers mixed with Rangmahal Wares, Kshatrapas period pottery and other Coarse Wares.

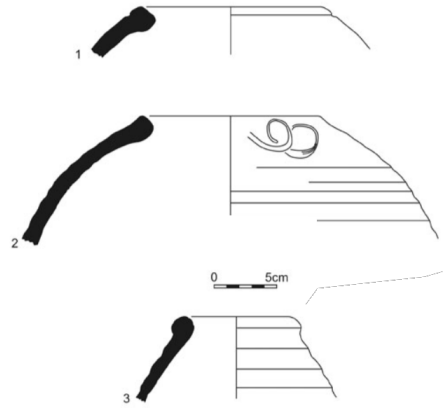


Figure 4.35: Torpedo Jar diagnostic rims from Siyot (Modified from Tomber 2007: Figure 3: 975)

Figure 4.36: Torpedo Jar from the Excavations at Siyot 2018. (Courtesy Y S Rawat, Directorate of Archaeology and Museums, Government of Gujarat)

Apart from the local ceramics, the excavations yielded Torpedo Jars. From the surface context, Torpedo Jars (21 body sherds including one partial base) were also found along with Sasanian Glazed Ware sherds numbering two; 1 part of neck one face of which is reused (Figure 4.37: 1) and another neck sherd with a blue glaze with inner glaze weathered (Figure 37: 2) (see Table 4.8).

Figure 4.37: Sasanian Glazed Ware from Siyot Surface Collections (Courtesy: Y S Rawat, Directorate of Archaeology and Museums, Government of Gujarat)

Table 4.8: West Asian ceramics from Siyot

Siyot	Torpedo Jar Sherds	Sasanian Glazed Ware Sherds
State Directorate Excavations	15 body (PWWS)	-
State Directorate Surface Collection	21 body (PWWS)	2 neck sherds
Total	36	2

4.1.10. Nani Rayan (N: 22° 52' 13.8", E: 69° 21' 20.7") District Kachchh, Gujarat

Explorations by the researcher in 2015, yielded Rangmahal Ware (Black on Red Ware) along with Torpedo Jars and Kshatrapa (Moulded Wares). Earlier researchers (Bharucha Irani 1996-97) mention these Moulded Wares as 'Stamped Wares'. Sasanian Glazed Ware was also found from the site in the shape of handles and bowls. The previous research (Bharucha Irani 1996-97) mentions, 'Turquoise Glazed Ware' and 'Muslim Glazed Ware', none of which were reported from the current explorations more so ever, terminologies such as Muslim Glazed Ware should be done away with.

In 2019, A joint team led by The Maharaja Sayajirao University of Baroda (Mr. Prathapchandran, Director) assisted by the present researcher and students of the Department

of Archaeology Ancient History, collaborated with a British Team (led by Dr. Roberta Tomber) and her team of experts carried out excavations at the site of Nani Rayan. The Excavations were preceded by a geo-magnetic survey (courtesy Jack Pink - University of Southampton) with a flux-gate radiometer, and areas to excavate were chosen accordingly.

Map 4.3: Site Map of Nani Rayan with NRN 1 representing the centre of the mound, NRN 2 the Northern extent, S denoting the Southern extent and E denoting the Eastern Extent.[5]

The site was divided into two localities;

NRN - 1 (Temple Area), Trench 1 (22° 52' 13.6" N ; 69° 21' 17.1" E)

The trench was located in the middle of the mound adjoining the river (Map 4.3). The excavations at NRN 1 (5 x 5m) yielded mostly disturbed deposits from the top layers, very ashy habitation deposits with mix of pottery such as Grey Ware, Moulded Wares (Kshatrapa), Rangmahal/Vasai Ware types, Red Polished Ware, Black Slipped Ware, along with non-indigenous Wares such as Torpedo Jars, Sasanian Glazed Ware and one sherd of Late Roman Amphora (see Table 4.9). A structure was found from the Trench from the last phase of the occupation. From the earliest level of the trench, there was a Red Polished Ware sprinkler found (Figure 4.38). A cut bangle of the Solanki period was found from the surface at NRN 1.

The indigenous wares from the Locality NRN 1 totalled 3969 sherds in total with Red Ware (1228) and Vasai Ware/ Rangmahal (1356) representing the dominant wares. The imported ceramics included Late Roman Amphora (1 sherd), (Sasanian Glazed Ware (3 sherds),

[5] Base Map Courtesy: Apple Maps

and Torpedo Jars (46 sherds including 1 rim and 1 base – Figure 4.40 :1-2). Thus, imported ceramics formed 1.13 percent of the total ceramics recovered from NRN 1.

NRN - 2 (White House), Trench 2 (22° 52' 20.5"N ; 69° 21' 24.8" E)

The locality NRN2 is one of the northern most stretches of the ancient site at Nani Rayan. (Figure 4.3). A separate grid was made from NRN2 with the same basic layout as explained before. Initially, a random point roughly in the centre of the locality was selected as Point 1 (Station point marked by nail and cemented) for the Total Station survey, and Point 2, 25 metres west of the P1 was taken as a back-sight. Point 1 was the N100 E 100 point for NRN2. Using these points, and the total station, the locality was gridded with wooden pegs and flagged canes in the north, south, west, and east of P1 which were numbered accordingly. This facilitated the setting up of the trench and also assisted the geo-physical surveys, and the bore-holes. Use of metal pegs was avoided as they would disturb the geo-physical surveys. The Excavations at Trench 2 (N 95 E 85 NW peg) was within a grid of 5x5m, 1 metre was left as a baulk. Initially the trench cut was 4m x 4m, was later restricted to 2m x 4m (after context 3 was excavated). The site yielded a copper working workshop with a number of different working levels and furnaces filled with charcoal, vitrified receptacles, and slag.

The recording of excavated artefacts and the archaeological layers and features was done using single context method of recording (Harris Matrix) at NRN2. The single context method implies strictly isolating a deposit (which could be a layer/working level etc.) and singularly focusing on the said context. This prevents inter-mixing of archaeological materials of different time phases, and thus gives a greater control on data. The contexts are marked in a numerical fashion within a circle; for example ②. The contexts are filled into the context register to avoid repetitions of numbers. The contexts are recorded in a context recording sheet **(**Appendix III). A cut within single context recording is defined as any activity which disturbs the temporal integrity of any contexts, or even other cuts. Cuts were isolated and given different numbers and are displayed numerically within a square; for example [28]. Cuts include pits, post-holes etc. The fill/s within the cuts were also treated as separate contexts. Masonry (if any) would also be recorded separately and includes walls, and other structural evidence.

The major evidence at NRN2 suggests that it was an industrial zone for copper working. Copper working furnaces have been found extensively often inter cutting each other

in different phases within this trench. For example, Furnace no. 22 cuts furnace 28 and also furnace 44 (Figure 4.39) (note: the cutting of 28 is not seen in the section but was seen horizontally whilst excavating). Most furnaces, show the evidence of an ashy top and charcoal in the base (which was collected for C^{14} dating) (Figure 4.39). Many of the furnaces had in-situ crucibles/receptacles (instances with copper embedded on it), copper fragments, and glassy slag. The earliest excavated furnaces were slightly larger in size, and often longer some like no. 22 were almost a metre long. The furnaces of the last phase are mostly semi-circular and have a 30-40 cm diameter and much shallower (Figure 4.39) The furnaces of the later phase of copper working, as mentioned earlier, are circular and sometime cut each other, for example furnace no. 20 cuts furnace no. 18 (Figure 4.39). The digging was stopped, when we reached context 40 which showed extensive burnt surfaces and broken receptacles/crucibles. The borehole taken within the trench suggests, a further 70cm of archaeological deposit.

At NRN 2, the furnaces belong to the Maitraka contemporary phase (circa 6^{th}-7^{th} centuries A.D.) (as suggested by the associated artefacts such Shell bangles, and ceramics such as Torpedo Jars, Sasanian Glazed Ware, Rangmahal/ Vasai Ware types, Red Polished Ware) (Figure 4.39). The indigenous wares were again dominated by Red Ware (1157), and Vasai Ware/ Rangmahal (468) and including other types such as Grey Wares, and Red Polished Ware totalled to 2294 sherds. Sasanian Glazed Ware (8 sherds) and Torpedo Jars (6 sherds) were found from Locality NRN 2. The West Asian wares from the locality total 14 in number and 0.6 percent of the total ceramic assemblage found from NRN2. Apart from the ceramics, both trenches yielded Copper artefacts (coins corroded), Iron chisel, shell bangles, shell wasters, cowrie shells, glass, carnelian beads, and terracotta beads.

Glass Vessel

A Glass vessel with rim (internally thickened), and a flat base has been found from the excavations (Trench 2, context 8). The Glass vessel (Figure 4.41) is covered with a patination. The Glass is blue in colour. Further, comparative analysis with reference collections is necessary to understand the exact period of the Glass vessel. Glass vessel could also be similar to the corpus of material from Sanjan (Mitra and Dalal 2005) dated to between 8^{th} to 10^{th} centuries A. D., but it attests a further enquiry.

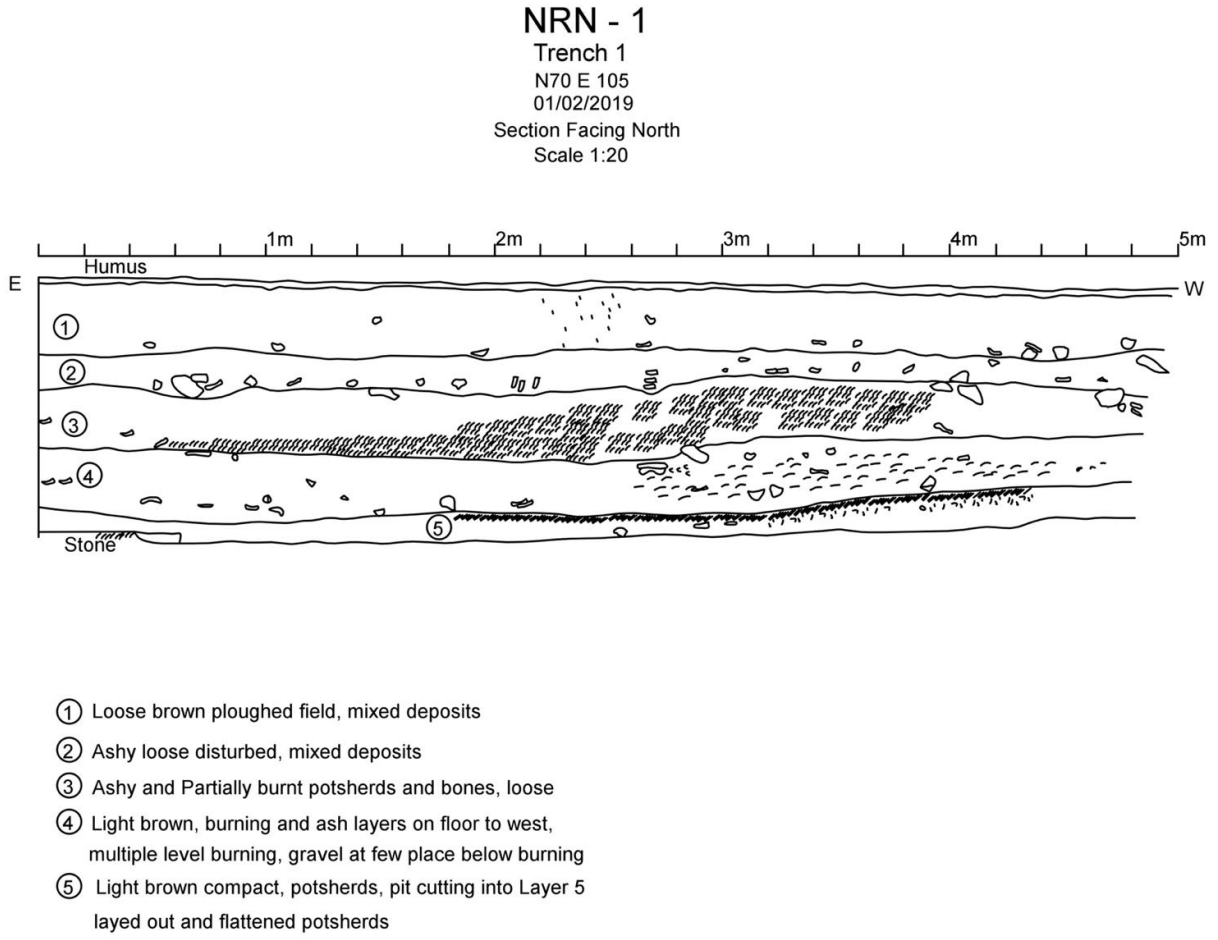


Figure 4.38: NRN 1 Trench 1. Section facing North.

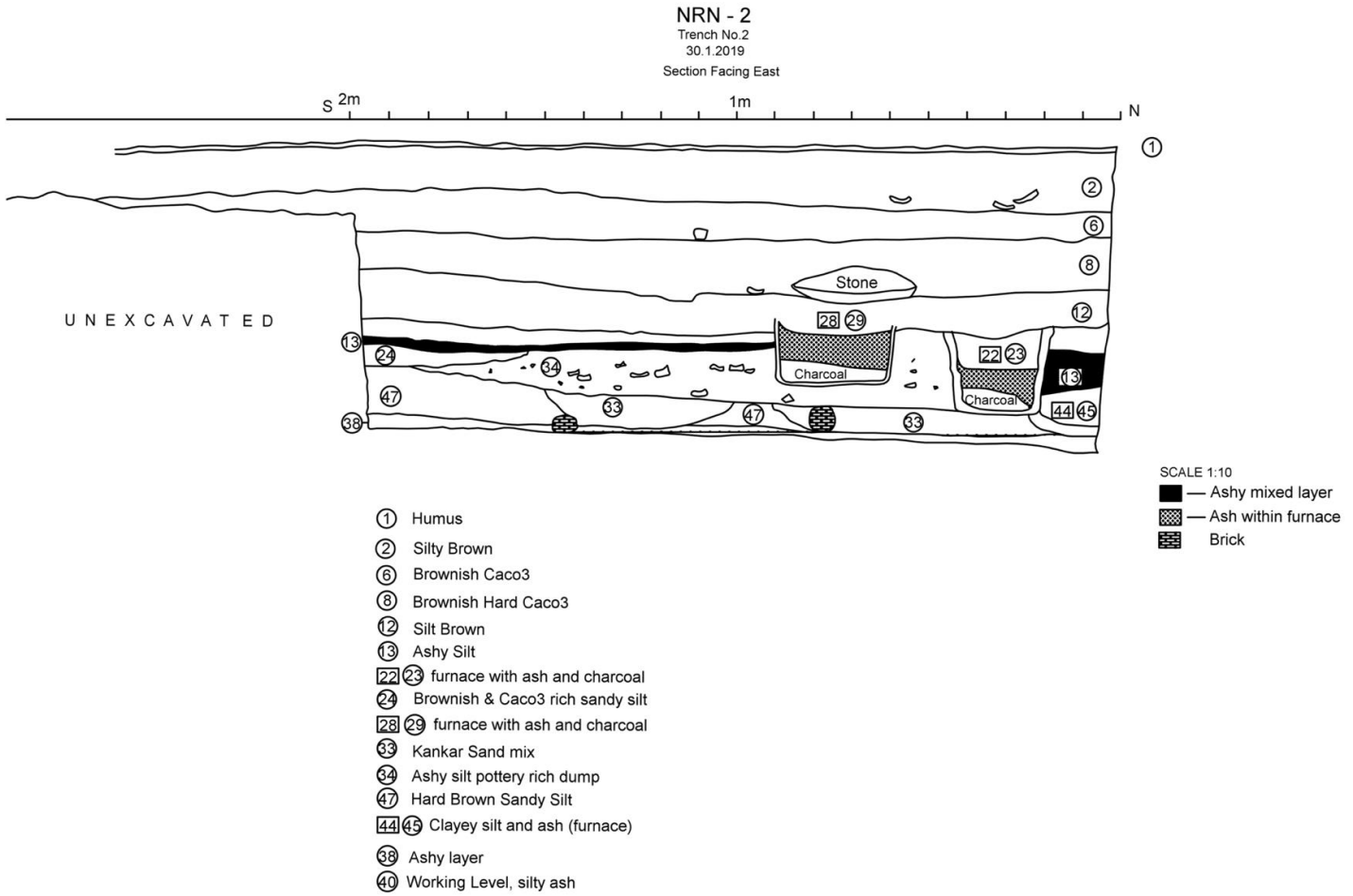


Figure 4.39: Trench 2. Section Facing East. Furnace 22 is the latest, followed by 28, and then 44

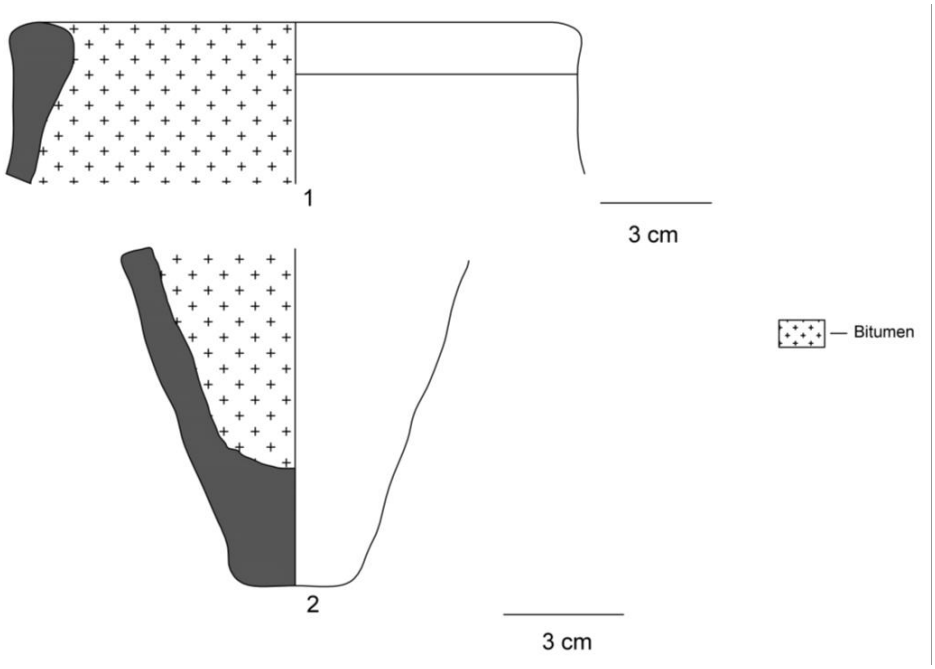


Figure 4.40: Torpedo Jar Rim (1) and Base (2) from Nani Rayan Excavations (2019)

Figure 4.41: Glass vessel from Nani Rayan 2019.

Table 4.9: West Asian Ceramics from Nani Rayan.

Nani Rayan - Locality	Layers (NRN 1) Contexts (NRN 2)	Torpedo Jar Sherds	Sasanian Glazed Ware Sherds	Time Phase
NRN 1	1	6 body	0	Upper Levels disturbed
NRN 1	2	4 body	0	Upper Levels disturbed
NRN 1	2 & 3	3 body	0	Upper Levels disturbed
NRN 1	3 & 4	5 (1 rim, 4 body)	0	Disturbed
NRN 1	4	18 body	0	Disturbed
NRN 1	5	8 body	1 body	6^{th} – 9^{th} centuries A.D.
NRN 2	3	3 body	0	Upper Levels disturbed
NRN 2	6	1 body	1 body	Upper Levels disturbed
NRN 2	12	0	1 body	8^{th} – 9^{th} centuries A.D.
NRN 2	13	1 body	1 body	6^{th} - 8^{th} centuries A.D.
NRN 2	27	0	5 body	6^{th} - 8^{th} centuries A.D.
NRN 2	33	1 body	0	6^{th} - 8^{th} centuries A.D.
Total	-	50	9	-

4.2. 1. Explorations in and around Vallabhipur

An initial exploration was done in association with Dr. Anna MacCourt and Mr. Prathapachandran at the site of Vallabhipur in Saurashtra. The exploration was done primarily to understand the extent of the site and to compare the exploration finds from the earlier excavations near Maya -no- Khado locality (IAR 1979-80: 24).

Iron fragments were found from the explorations. The exploration yielded early historic as well as early medieval ceramics (namely Red Wares and Micaceous Red Ware) and along with them Torpedo Jars (4 sherds) and Red Polished Ware. From the survey, two different localities yielded Torpedo Jars numbering 4 in total; 1 from Maya no Khado (which was excavated earlier) and 3 from the Water Tank area. No Early Islamic Wares or Early Islamic Glazed Wares were found from the site, and none have been reported from the site even earlier. The site eerily has many vitrified bricks in the last phase of occupation of the site as seen from the explorations. The excavation report suggests that the site was inhabited only till the 8th century A. D. (IAR 1979-80: 24) and the burnt bricks might correspond to probable burning of the city, but this is still hypothetical and needs further archaeological proofing through excavations. The villagers have stored some precious objects in the government office which also includes a fragment of a copper plate inscription, fragments of sculptures. There were also coins (belonging to the Gupta and Maitraka period) which are kept by the locals under their custody (Personal communication Jackysinh Chauhan).

4.2.2. Paliyad (Paliyat Timbo) (N:22°10'0'', E:71°35'0'') District Bhavnagar, Gujarat

Torpedo Jars were found from the site of Paliyad. Seven sherds were found from the Jairath's (1986) survey all the sherds are non-diagnostic. The Torpedo Jars from Paliyad belong to the Pink Ware with White Slip fabric (PWWS) (Figure 4.42). Two sherds have some remnants of bitumen lining (Figure 4.42).

Figure 4.42: Body sherds of Torpedo Jars from Paliyad (Paliyat Timbo)

4.3. Explorations around the Gulf of Kachchh - Jamnagar

An exploration around the Gulf of Kachchh was planned accordingly, to understand the role that the Gulf would have played in the contact and trade with West Asia (Figure 4.43). Sites such as Nani Rayan on the Kachchh side of the Gulf were known to have these trade Wares from West Asia such as Torpedo Jars; as well as sites such as Dwarka and Bet Dwarka which are in Devbhoomi Dwarka District of Gujarat (Map 4.5).

The exploration was initiated in April 2016, which revealed majority of the sites in Jamnagar District and some sites which fell in on the eastern side of the Devbhoomi Dwarka District were selected for surveys. Bhan (1986) synthesised and reported many new sites from his surveys which dealt with village-to-village surveys of Jamnagar District (which at the time also included the District of Devbhoomi Dwarka). The present researcher explored some of these known sites in the above-mentioned region for any possible west Asian evidence which are tabulated below according to sites visited chronologically (Table 4.10, Map 4.4 - 4.5).

Map 4.4: Sites Explored in the Jamnagar and Devbhoomi Dwarka Districts. The sites in Red yielded Torpedo Jars

Table 4.10: Sites explored by the researcher around the Gulf of Kachchh

Site	Taluka	District	Co-ordinates for the site	Period (Bhan 1983, 1986)
Lakha Baval	Jamnagar	Jamnagar	N: 22 25' 00.1 " E: 69 59' 41.22"	Early Historic, Early Medieval, Late Medieval. Chalcolithic -Harappan (Rangpur IIB-IIC)
Amra	Jamnagar	Jamnagar	N: 22 25' 07.2" E: 69 56' 08.5"	Early Historic (Red Polished Ware)
Vasai	Jamnagar	Jamnagar	N: 22 25' 54.9 " E: 69 56' 02.1"	Harappan IIC, Early Historic, Early Medieval, Late Medieval.
Gangajala	Jamnagar	Jamnagar	N: 22 25' 40.5" E: 70 13' 59.3"	Early Historic (Red Polished Ware)
Bada	Jamnagar	Jamnagar	N: 22 27' 26.3" E: 70 13' 15.4"	Early Historic (Red Polished Ware)
Hadiyana II (Fulwadi)	Jodiya	Jamnagar	N: 22 36' 59.5" E: 70 15' 48.7"	Early Historic (Red Polished Ware), Early Medieval and Late Medieval. Chalcolithic Harappan (Rangpur IIB?).
Ari Khan I	Lalpur	Jamnagar	N: 22 15' 28.8" E: 70 00' 50.3"	Chalcolithic Harappan (Rangpur IIB IIC)
Ari Khan II	Lalpur	Jamnagar	N: 22 15' 34" E: 70 00' 51.7"	Early Historic (Red Polished Ware)
Gajana	Lalpur	Jamnagar	N: 22 14' 32.3" E: 69 58' 05.1"	Early Historic (Red Polished Ware)
Kota I	Khambhaliya	Devbhoomi Dwarka	N: 22 10' 05.1" E: 69 41' 40.8"	Chalcolithic Harappan (Rangpur IIB)
Kota II	Khambhaliya	Devbhoomi Dwarka	N: 22 10' 09.78" E: 69 41' 40.9"	Early Historic (Red Polished Ware) and Early Medieval
Bharana I	Khambhaliya	Devbhoomi Dwarka	N: 22 25' 57" E: 69 42' 17.2"	Early Historic (Red Polished Ware) and Early Medieval
Fatepur I	Bhanvad	Devbhoomi Dwarka	N: 21 56' 34.4" E: 69 49' 21.2"	Early Historic (Red Polished Ware)
Sai-Devaliya	Bhanvad	Devbhoomi Dwarka	N: 21 58' 33.2" E: 69 47' 29.9"	Early Historic (Red Polished Ware)

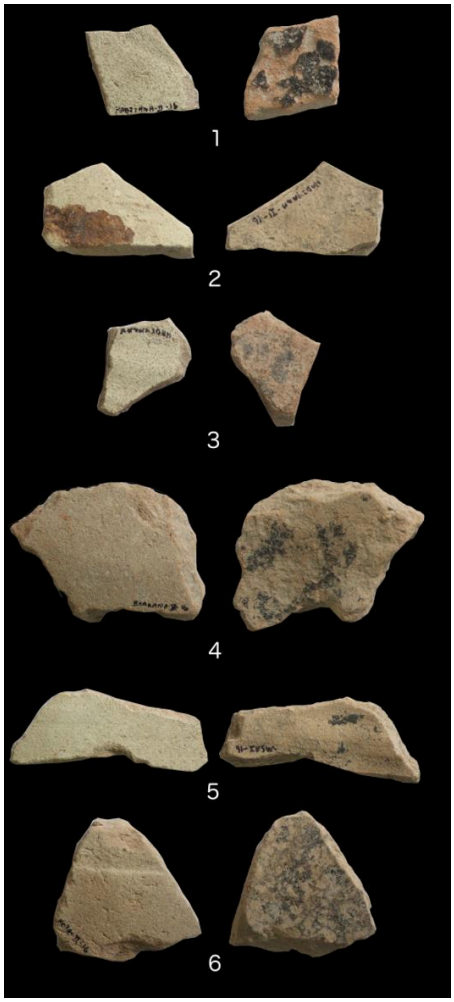


Figure 4.43: Torpedo Jars found from the current survey. (1-3 - Hadiyana I, 4 - Bharana I, 5

4.3.3.1. Vasai (N: 22 25' 54.9 "E: 69 56' 02.1") District Jamnagar, Gujarat

Vasai is a village which is located north of Amra and lies on the River Sosai, 12 kms from Jamnagar. The site is locally known as '*Timba'*. Both are on opposite sides of the road as one drives/rides down taking the NH 947 from Jamnagar. The site was located by M.N. Deshpande and M.G. Diskhit (Bhan 1983: 156) and was later excavated in February 1951 by the Government of Gujarat. The site yielded three periods, Harappan, Early Historic (Rangmahal imitation-Vasai Ware) and Medieval (Glazed Ware) (Bhan 1983: 76). Two clay sealing were also reported from the site (Bhan 1983: 77) and microlithic cores (Bhan 1983: 78).

Bhan (1983: 157, 1986: 17) records the site was being 300x200 m in extent. He recorded Harappan Wares (Red Ware, Buff Ware, Lustrous Red Ware) and ceramic shapes like

Rangpur IIC and III. He also recorded early historic and early medieval ceramics (Black and Red Ware, Red Polished Ware, Red Slipped Ware, Coarse Black, Coarse Red and Glazed Wares) from the site. The site was thus initially a chalcolithic site and later inhabited from the early Christian centuries till the medieval period. Bhan stresses on the importance of two Kshatrapa seals and thus it would have been an important site in that period. Vasai, and 6 - Kota II)

Map 4.5: Sites in Western India yielding West Asian ceramics [6]. Sites from the current survey are demarcated in smaller legend.

Figure 4.44: Part of the higher mound with Late Medieval *Paliyas* and modern temple

[6] Adapted from Balvally, R. 2013: Figure 19, p.36. Base Map Courtesy: https://mapmaker.nationalgeographic.org

The current exploration showed that the mound is extensively damaged and is ashy. The site lies around 70m from the river Sosai which immediately drains into the Gulf. The coast is 4-5 kms away from the site thus stressing its importance in trade. A surviving part of the mound is about 3 m in height but completely riddled with household construction, a shrine and ethnographic evidence in the form of *Paliyas* (Figure 4.44). The surface collection from the mound yielded just a few kiln bricks of the early historic period (30cmx12cmx5cm) but not much of recognisable pottery. The farm to the north of the mound yielded much more ceramic evidence. Red Polished Ware, Red Ware (fine) and Coarse Red Ware were found all belonging to the early historic period. But the major find from the exploration was a sherd of a Torpedo Jar (PWWS) (Figure 4.45). The sherd has some remnants of bitumen on the inner walls. Apart from the ceramics, there were also flakes of carnelian and other crypto-crystalline silicas and also metal slag. Slag mostly of iron, and this might indicate some metal working activity near or at the site which was previously un-reported. The closeness of the coast and the river meant it was an important settlement and acted in the exchange with West Asia.

Figure 4.45: Torpedo Jar sherd from the surface at Vasai

The site also yielded strong ethnographic indicators in the form of more than a dozen open and enshrined *Paliyas* stones in rows and a couple of Sati stones, all laced with vermillion (Figure 4.46). Most of the *Paliyas* had inscriptions with Nagari script on it and some inscriptions went underground due to cementing. Only one *Paliya* had a loin cloth over it. Most of the inscriptions were not legible due to preservation and also vermillion application.

Figure 4.46: Row of Paliyas Hero Stones and a Sati Stone from the higher mound area.

4.3.3.2. Hadiyana II (Fulwadi) (N: 22 36' 59.5" E: 70 15' 48.7") District Jamnagar, Gujarat

Hadiyana is a village located in Jodiya taluka of Jamnagar District and is located 32 kms north-east of Jamnagar near the coast. Hadiyana hosts three different archaeological sites namely Hadiyana I, Hadiyana II and Hadiyana III for convenience (Bhan 1983: 163, Bhan 1986: 17). The traditional occupation of the village is farming (mostly cotton).

Hadiyana I is a small mound measuring 90x50 m of Harappan cultural phases Rangpur IIB and II C, Lothal B and Rojdi I and is located 1km away from the village near Sureshwar Mahadeva temple on the southern side of the river Kankawati. The site though has been extremely disturbed (Bhan 1983: 163-164).

Hadiyana III is located on the south of Hadiyana I and is 100x150m in dimension with the major finds being variety of ceramics and discs made from re-used pot sherds. The ceramic assemblage included Burnished Red Ware, Coarse Red Ware and Coarse Black Ware. The site was active in the historic period III to IV (i.e. from 600 A.D to 1200 A.D.) (Bhan 1983: 165, Bhan 1986: 17;)

Hadiyana II (Fulwadi) is located 500 metres south of the village and is spread into an area of 150x72m with a height of 1 metre. The site yielded Red Polished Ware, Burnished Red

Ware, Black-on-Red Ware, Coarse Red Ware, Burnished Black and Black Ware were collected. The site was active from historic period I to III ($1^{st}/2^{nd}$ centuries B.C. to around 1000 A.D. approximately) (Bhan 1983: 164, Bhan 1986: 17).

Figure 4.47: View of the mound at Hadiyana from north-east looking towards south-west

Of all the three sites, Hadiyana II looked mostly likely to yield Torpedo Jars or other West Asian materials, thus only Hadiyana II was explored by the researcher. The site presently lies south of *Satvara Samaj*, and the mound has been cut by a road (Figure 4.47). The section of the mound can be seen from the road which showed early historic ceramics and kiln bricks. Coins, bones, and large jars were unearthed previously (Parmar Ranchod Ramji Pers. Comm.). The surviving part of the mound which is surrounded by a road to its north and west is an agricultural field. The mound has a house and a temple of the *Sonagra* family dedicated to *Surapura Bapa* on its southern side. The mound is partially disturbed and flattened but retains some features of a mound. The soil is ashy and is a contrast with the surrounding black cotton soil. The indigenous ceramic evidence from the site was of Red Ware (fine), Coarse Red Ware, Burnished Black Ware. Three Torpedo Jar non-diagnostic sherds were also recorded from the site. All the three belonging to the Pink Ware with White Slip (PWWS) and showed bitumen lining inside (Figure 4.48). Shell in the form of a grooved bangle (two grooves), wasters of *T.pyrum* was also reported. The site, thus being close to the coast approximately 6 kms by the riverine route showed a trade indicator in the form of the Torpedo Jar. Another key point is that another riverine system (apart from the Sosai system) yielded a foreign trade Ware, thus showcasing the importance of the Gulf in the whole chain of exchange system within western India.

Figure 4.48: Torpedo Jar sherd from Hadiyana II. The bitumen on the inner wall can be seen

4.3.3.3. Kota I (N: 22 10' 09.78" E: 69 41' 40.9") and Kota II (N: 22 10' 09.78" E: 69 41' 40.9"), District Devbhoomi Dwarka, Gujarat

Kota is village located 6.5 kms south-east of Khambhalia (Devbhoomi Dwarka District and taluka headquarter) and 67 kms south-west from Jamnagar. Bhan (1983: 231-233, Bhan 1986: 11, 19) reported two sites/localities as part of his village-to-village surveys. The localities are on the river Ghee right on the riverbank.

Kota I was well preserved, 90x90m in dimension and had many ceramics (Red Ware, Buff Ware and Coarse Grey Ware), besides, a few microliths were also collected. Variety of shapes such as perforated jar, dish-on-stand, convex sided bowls, dishes, basins, and storage jars etc. were reported as being from the Rangpur IIB sequence. (Bhan 1983: 231)

The present exploration noted that the site is now extensively damaged and is located 100m east from the house of Kheera Jusa Musa (Figures 4.49 - 4.50). The two sites were now separated by a road passing east-west. The ceramics from the site also showed Red Ware, Buff Ware, perforated jar as well typical Rangpur IIB shapes such as the straight sided bowls as well as convex bowls. Apart from the Harappan ceramics, there was a single non-diagnostic sherd of Gritty Red Ware part of the Anarta tradition. The site is right on the northern riverbank of

river Ghee and rests on the bed rock, fluvial activities probably destroyed a part of it as the river meanders near the site.

Figure 4.49: Kota I flattened due to agricultural activities

Figure 4.50: A mature Harappan bowl from Kota I

Kota II was recorded to be around 200x100 metres with ceramics ('roman amphorae', globular pots in Red Polished Ware, Black-on-Red Ware, Burnished Red Ware, Black Coarse Ware and Coarse Red Ware), fragments of shell bangles, shell slices and the columella with sharp cutting marks indicating a local chank industry. The site has been dated to historic period II (0-600 A.D.) and III (600 A.D.-1000A.D.) (Bhan 1983: 232).

Figure 4.51: The mound of Kota II flattened due to ploughing

The site is currently located on the farmland of Kasam Abdullah and lies north of Kota I (Figure 4.51). The ceramics which are found from the site are Red Polished Ware, Red Ware (fine), Coarse Red Ware, Coarse Black Ware and interestingly an early medieval Micaceous Red Ware. The shape of the MRW from Kota II is a '*handi*' and is made on wheel and then finally shaped with paddle and anvil to give the sharp carination. Mica flakes are crushed and deliberately added to the clay, thus giving a sparkling effect but mostly to aid in the heating process. Shell wasters are also seen from the site apart from that a whole shell *C. Ramosus* was found from the site. The most important find from the site though is a non-diagnostic sherd of Torpedo Jar (Pink Ware with White Slip PWWS). The site was active in trade of goods coming from overseas as well as from within India. Also, as Bhan (1983:232) has recorded 'Roman amphorae 'from the site, it very well matches the description of the Torpedo Jar, thus imposing that most probably the 'Roman amphorae 'reported by Bhan are probably all Torpedo Jars.

4.3.3.4. Bharana I (N: 22 25' 57" E: 69 42' 17.2"), District Devbhoomi Dwarka, Gujarat

The village of Bharana is 25 kms north from Khambhalia on the coast and 50 kms west of Jamanagar. Two sites Bharana I and Bharana II were explored by Bhan (1986: 11, 19) east of the village.

Bharana I 1km east of the village was measured at 1000x900m, and whole of the site was already under cultivation. The exploration yielded Red Polished Ware, Burnished Red Ware, Red Slipped Ware, Coarse Red Ware and Coarse Black Ware among the ceramic finds. Apart from the finds, a shell columella with sharp cutting marks was among the finds. (Bhan 1983: 228-229)

Figure 4.52: View of the 'slag hill 'under the Banyan tree at Bharana I

Bharana II was located nearly 0.5km east of the village and extremely disturbed but yielded ceramics (Burnished Red Ware, red slipped Ware, black Burnished Ware, Coarse Red Ware Coarse Black Ware and Glazed Ware), stone sculptures (3 sculptures, 1 male head 9th c. A.D.), terracotta ram (1st/2nd c. A.D. compared to the find at Rangmahal) and a Navagrah panel belonging to 10th c. A.D. then kept in the the Talati office. The current exploration also yielded significant information about the site. The site of Bharana I was taken up for exploration owing to its size and higher probability of finding an evidence of overseas trade owing to the close distance to the coastline. The location of the site is right on the coast and the habitation sits half a meter from marshy areas and inlets and extends inland. This is the biggest site, which was explored so far during the whole exploration season. The roughly central portion of the site is

where Kiritsi Parbatji Jadeja's farmland (survey no. 425) is located. His relatives own the land to the north and near the coast. Here, under a massive Banyan tree the researcher saw what can only be termed as a 'slag hill '(N 22 25 '57" E 69 42 '17.2"), where a small mound which rises shows high concentration of 'flowing slag 'or 'tap slag 'pieces of slag which easily outnumber the ceramics found from the same area (Figure 4.52). The area near the 'slag hill 'is also noticeably darker in shade compared to the ashier loose soil around the site. There is a road which passes parallel to the slag hill and goes eastwards, towards this east side, the material suddenly stops, thus indicating a boundary for the site.

The site is more rectangular in shape. As we go westwards the coastline is 400m from the 'slag hill 'and there is a Masjid located there; right in front of the Masjid is a sort of a landing for small sail boats and larger fishing boats from where an inlet connects to the Gulf of Kachchh. The site extends all the way till the Masjid and a few metres away, the researcher came across a non-diagnostic sherd of Torpedo Jar (Figure 4.54). Apart from the Torpedo Jar sherd, Red Polished Ware, Red Ware (fine), Coarse Red Ware, Coarse Black Ware were also reported along with shell wasters of different species.

Figure 4.53: General view of the site Bharana, photo taken from the north facing south

The site of Bharana I would have been an impressive site at its peak, it was one of the many doors to Gujarat from which man and material from overseas passed for centuries. The industrial level of production of possibly iron is interesting to note. Also, it is worthy to notice

the way in which the fisherman was sailing down the inlet using the wind. A similar method would have been used by sailors/boatman to travel down the river against the current by using a sail probably (Figure 4.55). The site needs to be explored and excavated to understand the chronology and could be a major port of the early-historic and early medieval period.

Figure 4.54: Torpedo Jar sherd with bitumen on the inner wall from Bharana I

Figure 4.55: The photograph of the inlet and fisherman with their sail boats coming ashore after a day's catch at Bharana I

4.3.3.5. Concluding Remarks

Four sites Vasai, Hadiyana II (Fulwadi), Bharana I, and Kota II yielded Torpedo Jars and apart from Kota II, all the other places it was un-reported. Bhan (1983: 103) had reported 'Roman amphora 'from Fatepur I, and he describes it as, 'It has a thick gritty and compact appearance and has a Coarse surface. Black incrustation was found on the inner surface, which actually is dried resin mixture of Roman wine. 'The black incrustation on the inner surface is most probably bitumen which is applied to the Torpedo Jars to leak-proof them. Bhan's publication (1986) mentions the same description for all the 'Roman amphorae', thus most of the Roman amphorae that has been mentioned are most probably Torpedo Jars. Spatially speaking all the different sites are based parallel from each other on different rivers such as Sosai (Vasai), Kankawati (Hadiyana) and Ghee (Kota), whereas Bharana is located right on the coastline thus functioning more as a port more probably than anything else.

The other important and interesting find to note is the Rangmahal imitation Ware (Vasai Ware or Bhan's Black-on-Red Ware). It is curious to see, an imitation of a ceramic from a type site which is located very far north at Rangmahal (Rydh 1959, IAR 1960-61:7) in Rajasthan. The classical Rangmahal type pottery is not found south of Ajmer or even near it. It was not found in excavations at Gilund, Ahar and Balathal (Jeewan Kharakwal Pers. Comm.). But rather it is found in the western Rajasthan route then it suddenly makes a comeback in western Kachchh and north-western Saurashtra in its imitated form. Thus, this apart from Torpedo Jars is an interesting ceramic to behold as it might suggest a type of diaspora to the region after the decline of the Kushanas. This poses an interesting question as to the coming of Rangmahal imitation Ware to Gujarat and understanding the diaspora and/or change in the trade patterns that sailed through (Figure 4.56). The sea-route and the monsoon winds which was being utilised for trade in the period as mentioned in *Periplus Erithrae Marie* would bring in different goods to be exchanged, and also mostly importantly, new markets being established on the backbone of already established sites within Gujarat.

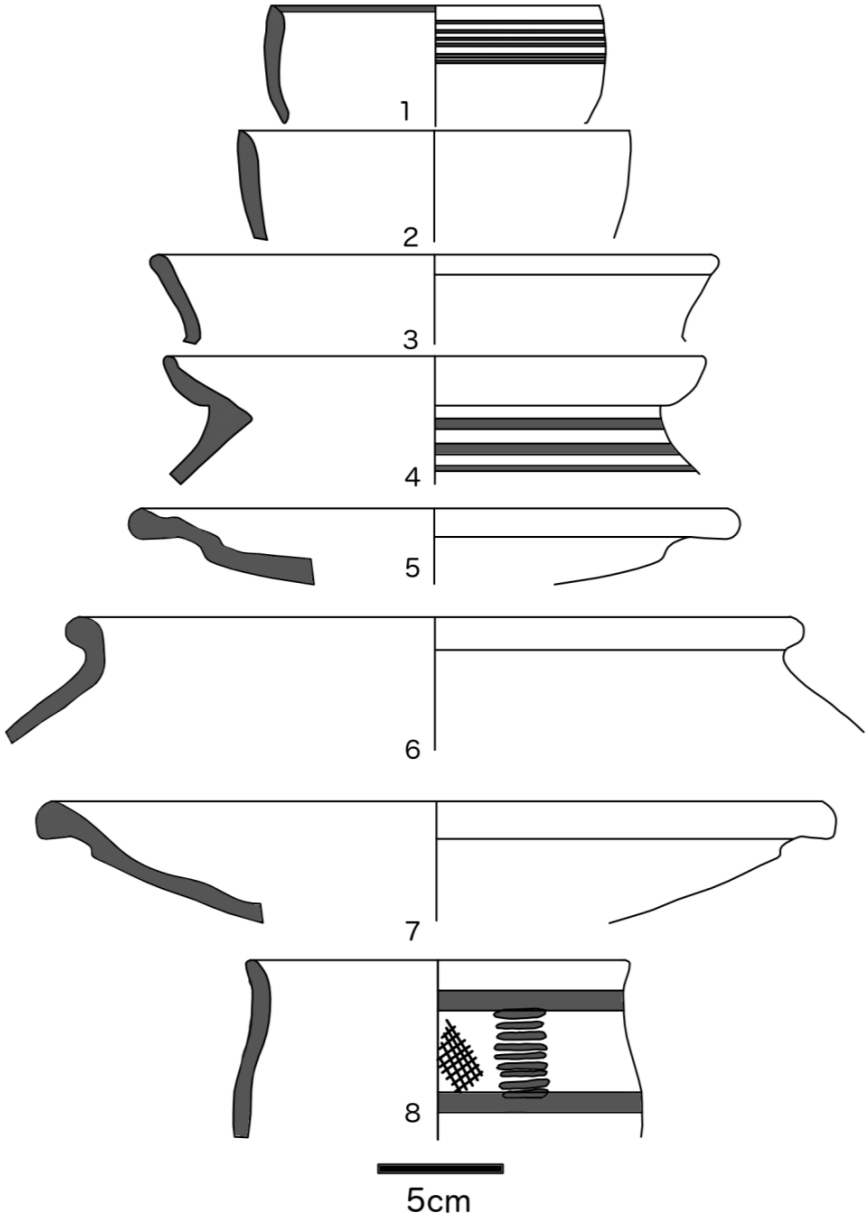


Figure 4.56: Illustration of Diagnostic ceramics from the Jamnagar exploration. Sorath Harappan (1-2,5-8), Micaceous Red Ware (Early historic-medieval) (3) and Rangmahal Ware (5)

4.4. Explorations in *Dakshina Gujarat* and Maharashtra

4.4.1. Kamrej, (N: 21°16'58.5", E:72°57'59.1") District Surat, Gujarat

The site of Kamrej is located on the southern bank of the Tapi river, 15 kilometres upstream from Surat. The site maybe co-related with the ancient Kammoni from the *Periplus Maris Erythrae* and was explored by Sunil Gupta (1993) where he mentions Red Polished Ware and

variety of Early Historic pottery on the surface datable to around 1st century A.D. The site was excavated under the directorship of S.P. Gupta; where the site was divided into different mounds according to the activities around it such as cliff mound, tower mound, and temple mound with many archaeological features such as a jetty, walls, furnaces, kilns, pottery (glazed and unglazed), beads, bangles etc. being found (Gupta *et al.* 2004b: 19-37).

The researcher visited the site of Kamrej in the June 2018. The area was completely overgrown with thorny bushes and the gradient was steep. The mound features are disturbed. The local Wares found from the survey include Red Polished Ware, Burnished Grey Ware (basin and jar), Red Slipped Ware and Red Ware (v shaped bowl). There was also considerable slag from the mound, which has already been reported from previous excavations (Gupta *et al.* 2004: 19-37) and explorations (Gupta 1993). Apart from these Wares, the researcher was able to locate a single sherd of a Torpedo Jar from the 'Cliff Mound' (Figure 4.57). No glazed Wares were found from the survey, but glazed Wares were found from the excavations which are claimed to be dating between 9th - 10th century A.D. (Gupta *et al.* 2004b: Plate II C.). One of these sherds, according to the researcher which a black paint and blue splash maybe much later in timeframe and could belong to the pottery of the Gujarat Sultanate period and other sherds need a closer look in terms of Ware classifications. Another interesting ceramic reported from Kamrej is a sherd of Aksumite (East African) pottery (Tomber 2005).

Figure 4.57: Torpedo Jar from Kamrej discovered from the researcher's exploration

4.4.2. Sanjan, (N:20°11'59.0", E:72°48'00.0") District Valsad, Gujarat

The site of Sanjan is the one which is connected with the diaspora of a group from Iran who eventually became Parsis. Material of various natures have been reported from Sanjan. Amongst these the Glass found from Sanjan (Mitra and Dalal 2005) and adds to a unique corpus

of material rarely studied within early medieval archaeology of western India. The corpus from Sanjan includes beads, bangles, and a variety of vessel and bottle fragments with distinct bases (from small, rounded ridge or ledge to one square base and one with a polygonal multifaceted base) with colours ranging from deep blue to green. The authors also define different glass artefacts; facetted bottle, rectangular bottle, round bottle, tubular necked globular flask, flat topped finial, globular finial, footed plate etc. which come from layers 2, 3, and 4 of the 2002 excavation seasons and are comparable to glass from Mesopotamia, Persian Gulf and Iran dating to the 9th to 10th centuries A.D. (Mitra and Dalal 2005: 64-68, Plate VIII).

An exhaustive study of the imported ceramics of Sanjan have been conducted by Rukshana Nanji (2011) which was one of the more successful early studies in understanding early medieval ceramics. A large variety of ceramics has been reported from Sanjan from various corners of the globe such as West Asia to the Far East. The assemblage is restricted to between 8th century to 13th century A.D. (Table 4.11) The assemblage from West Asia shows a rich variety of ceramics listed below.

Glazed Varieties - Turquoise Glazed Ware, Samarran Related classes (White Glazed Ware, Splashed White Glazed Ware, Cobalt Painted Ware, Lustre Painted Ware), Sgraffiato Wares (Hatched Sgraffiato Ware, Hatched Sgraffiato Ware Bichrome, Hatched Sgraffiato Ware Monochrome, Hatched Sgraffiato Ware White, Hatched Sgraffiato Ware Yellow, Yellow Sgraffiato, and Champlevé). Monochrome Glazed Pink Ware, Monochrome Glazed Buff Ware, White Glazed Pink Ware. (Nanji 2011)

Unglazed Varieties - Eggshell Ware (white) Eggshell Ware (pink), Eggshell Ware (red), Buff Ware, Torpedo Jars (Buff), Buff Ware (Storage vessel), Unglazed Pink Ware, White Slipped Pink Ware, Line Incised Storage Vessels (LISV). (Nanji 2011)

The explorations by the researcher yielded the following ceramics; Glazed Varieties - Turquoise Glazed Ware (5 body sherds), Sgraffiato Wares (Late Sgraffiatos and 1 Champlevé ? rim, 1 sherd of Hatched Sgraffiato Ware), Samarran Wares - White Glazed Ware (2 rims of

bowls and 1 body sherd) and Turquoise Splashed White Glazed Ware (4 bases and 2 body sherds of bowls), and Unglazed Varieties - Buff Ware (Storage Vessel - 1 body sherd) (Figure 4.58) and Torpedo Jars (PWWS fabric - 2 body sherds)

Table 4.11: Survey by the researcher in June 2018 have yielded the following Wares from the surface context from Sanjan

Ware Type	Period	Body	Rim	Base
White Tin Glazed Ware	Early Samarran		2 bowls	
Turquoise Splashed Painted Tin Glazed Ware	Late Samarran	7		4
Turquoise Glazed Ware	Sasanian-Early Islamic	25		
Torpedo Jars	Late Sasanian?	2		
Buff Ware Storage vessels	Sasanian?	1		
Hatched Sgraffiato	Early Islamic	2		
Champlevé Sgraffiato	Early Islamic		1	
Unidentified Late Sgraffiatos	Early Islamic	3	1	1 base paint
Total		39	4	5

Torpedo Jars

Torpedo Jars have also been reported from the excavations at Sanjan (2011: 59-60) where it has been termed as Buff Ware (Torpedo Jars) in the previous publications. Tomber (2007: 978 table 1) earlier, studied and recorded the Torpedo Jars (around 15 in number) from Sanjan. In terms of different fabric groups, Torpedo Jars found in south Asia have two distinct varieties (Buff, and Pink Ware with White Slip 'PWWS') from which both are represented at Sanjan. The explorations by the author have yielded Torpedo Jars of the PWWS variety (Figure 4.59). Sanjan could be one of the sites from which Torpedo Jars are found comparatively late (i.e., dated from the Late Sasanian to the Early Islamic phase) compared to other find spots in western

India, by the excavations at the site. Thus, it was important to conduct explorations to confirm the fabric of the Torpedo Jars from the site.

Figure 4.58: Buff Ware (Storage Vessel)

Turquoise Glazed Ware

Turquoise Glazed Ware is the most prevalent glazed ceramic from the excavations at Sanjan (Nanji 2011: 27-32). Nanji (2011: 28-32) divides them into six sub-categories at Sanjan with external glaze colours varying from dark, pale, bright, leafy (green) to dark blue and turquoise blue-green and rarely bright green with black under glaze. The Turquoise Glazed Ware with appliqué decoration has been dated to between 8th and 9th century A.D. (Whitehouse 1979a: 881, Mason and Keall 1991: 52) which has been reported from Sanjan (2011 plate 3: 86). The shapes include straight necked jars, neck-less or hole mouthed jars with sloping shoulders, globular jars, jars with handles, bowls, saucer lamps (Nanji 2011: 28). Five body sherds were reported from the exploration by the researcher (Figure 4.60).

White Opaque Tin Opacified Glazed Ware

Three sherds of White Tin Opacified Glazed Ware (2 rims and 1 body) were found from the explorations at Sanjan by the researcher. In terms of fabric and glaze, they are like the ones

found from Chaul and Nagardhan (cited above). But, due to the small size of the sherds, there is always a danger of over-representing this unpainted variety of glazed Ware (Figure 4.61).

Figure 4.59: Torpedo Jar (PWWS) from Sanjan Surface Exploration

Figure 4.60: Turquoise Glazed Ware from Sanjan Surface Exploration

Turquoise Splashed Tin Glazed Ware (Samarran)

Turquoise Splashed Tin Glazed Ware is a distinct Samarran class of ceramic (same as OPAQ.TS - Turquoise Splashed Opaque-Glazed Ware in Priestman 2013: 561-562). In earlier

research these were often mixed into the same category along with the cobalt blue category (Splashed White Glazed Ware in Sanjan 2011: 35-36, Plate 7, 87). The shapes are mostly open mouth in nature such as bowls and lamps (Priestman 2011: Plate 3 92, Priestman 2013: 561). The Ware has been dated from the 9th to the 10th century A.D. found from sites such as Siraf (Whitehouse 1979b: 52, fig. 3) and from surveys around the site of Samarra from areas occupied from 836 A.D. to 885 - 895 A.D. (Northedge & Kennet, 1994: 29 c.f. Priestman 2013: 561-562) and the production centre is southern Iraq. Base sherds were found along with body sherds from the surface exploration at Sanjan (Figure 4.62).

Hatched Sgraffiato

Hatched Sgraffiato was earlier reported from Sanjan (2011: 43-47). Due to the small nature of the sherd, it is difficult to assign it to definite Ware variety but belongs to the cross Hatched class as seen from under-glazed incised decorations on the inner side of the ceramic (Figure 4.63).

Figure 4.61: White Opaque Tin Opacified Glazed Ware (Samarran) from Sanjan, Surface context

Late Sgraffiatos

Due to the degraded nature of the Sgraffiatos found from Sanjan (by the researcher), it is difficult to exactly place them into the specific types. Though, one rim sherd has similarities in terms of fabric and glaze to possibly a Champlevé type, without its characteristic features found

it cannot be exactly deduced. The bowl base found has dots painted between two vertical lines which is similar to Slip Painted Sgraffiato which has green and brown splashes (GRAF.S in Priestman 2013: 591-592) as seen in the example from Sanjan (Figure 4.64).

Figure 4.62: Turquoise Splashed Tin Glazed Ware

Figure 4.63: Hatched Sgraffiato

Figure 4.64: Late Sgraffiato Wares - Champlevé? top right corner and Late Sgraffiato type? Base below

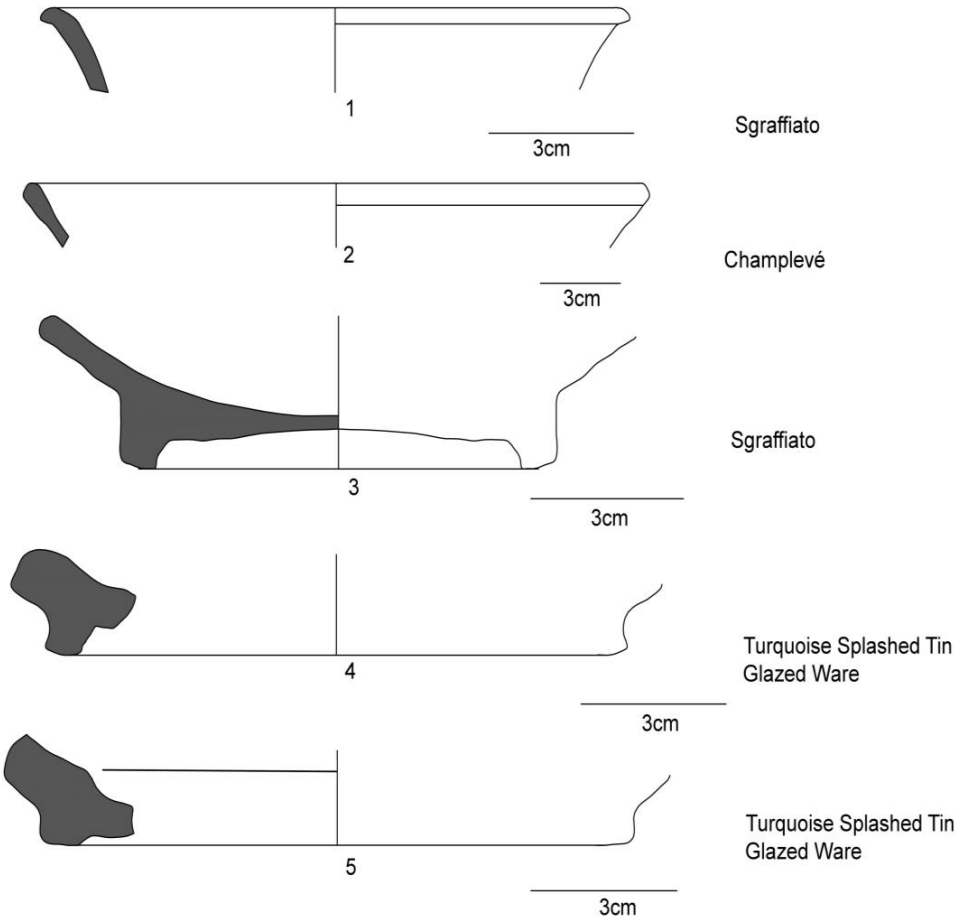


Figure 4.65: Illustrations of West Asian ceramics found from the survey. (1 and 3 - Sgraffiato, 2 - Champlevé, 4 and 5 - Turquoise Splashed Tin Glazed Ware - Samarran)

4.65.1	**Late Sgraffiato ?**	**externally projecting everted rim**
4.65.2	**Champlevé Sgraffiato**	**slightly everted rim rounded**
4.65.3	**Late Sgraffiato (possibly Slip Painted Sgraffiato)**	**non-contiguous vertical sided ring base**
4.65.4	**Turquoise Splashed Tin Glazed Ware**	**non-contiguous vertical sided ring base**
4.65.5	**Turquoise Splashed Tin Glazed Ware**	**non-contiguous vertical sided shallow ring base with an inner circular ridge (similar to White Glazed Ware in Nanji 2011: Bs.72, 99)**

4.5. Sasanian and Early Islamic Wares from Susiana

The present researcher also visited and recorded the collections of the National Museum of Iran, Pottery Research Department based in Tehran, Iran in 2017 (Table 4.12). The researcher recorded some specific ceramics of the Sasanian-Early Islamic period from the sites from the Khuzestan Survey earlier from the material explored by Robert McCormick Adams. The primary aim was to understand the typology of the ceramics from the region and to record the fabric; to confirm the nature and characteristic features of the indigenous ceramics produced there. Secondly, the fabrics from the region were of interest to the researcher as according to previous studies by Connan, it was regarded that the bitumen used to line the Torpedo Jars comes from this region, namely, Lurestan which is close to Susa. Along with Torpedo Jars, the researcher also sampled, 4 sherds of Honeycomb Pithos storage jars (sample nos. 5, 4, and 6 in Appendix II – list of samples).

The researcher also recorded the ceramics from two major Sasanian sites namely, Iwan-e-Karkheh and Jundeshapur which is close to Susa. These sites do have definite evidence of ceramic production. Recent surveys around the area have recorded and seen Early Islamic Wares from these so called 'purely' Sasanian sites (Yousef Moradi Personal Communication). Whitcomb also in his explorations reported Early Islamic Wares from Iwan-e-Karkheh.

Even in the recording of Wenke's collection (1975) by the researcher, there have been definite evidence of Early Islamic Wares from the collection namely Rayy type Wares, Opaque Glazed Wares (Tin Glazed), Eggshell Wares dateable to 8th - 9th century A.D. (Figure 4.68) This poses a challenge for establishing a set chronology for the Sasanian Period distinct from the Early Islamic period.

Earlier studies by the author have compared similar samples from the explorations of Robert McCormick Adams from sites close to Susa such as Sur Ahywat (KS 139) (KS 141, and KS 141S) which seem to match with the samples from Iwan-e-Karkheh and Jundeshapur in the present study in terms of macroscopic examinations (see Map 4.6). Wares studied were Pithos Jar and Torpedo Jars from Ahu Dash region[7]. Even from the collections of the University of Tehran (courtesy Esmaili Jelodar), the assemblage was similar. Only one Torpedo Jar base of the PWWS fabric was found from the collection (Figure 4.69).

[7] "KS" is an abbreviation for "Khuzistan Survey", an acronym introduced by Robert McCormick Adams in 1961, and continued by other surveyors since. Adams numbered sites 1 to 241 and so KS 139 and 141 were first located, measured and dated by him. Robert Marshal Schacht numbered sites from 1400 to about 1434, so site KS 1410 is was located and dated by Schacht.

Table 4.12: Reference list of sites recorded by the researcher from Pottery Research Department Tehran.

KS (Khuzestan Survey)	WC (Wenke Collection)	Assigned Date by Pottery Research Department
72	WC1074	Terminal Susa, Middle and Neo Elamite? Achaemenid? Parthan-Sasanian-Islamic.
428	WC0319	Archaic 8 pieces, PSI Period.
872	?	Parthian-Sasanian-Islamic?
486AC	WC0521	Sasanian, Islamic
929	WC0636	Parthian-Sasanian-Islamic
420	WC0784	Parthian-Sasanian-Islamic
853	WC0366	Parthian-Sasanian-Islamic
709a/709H	WC0778/ WC0237	Neo Elamite? Parthian-Sasanian-Islamic/ Middle Elamite 1, Second Millennium, ? Parthian-Sasanian-Islamic?
486E Area A4	WC0525	Sassanian, Islamic.
1410	-	Parthian-Sasanian-Islamic
141	-	Parthian-Sasanian-Islamic
139	-	Parthian-Sasanian-Islamic
348	07222	Sasanian-Early Islamic
1073	0810	Sasanian-Early Islamic

Map 4.6: Sasanian sites around Susa. (Base Map Courtesy Google Maps)

Figure 4.66: Torpedo Jar from Susiana (Courtesy: Prof. Henry Wright)

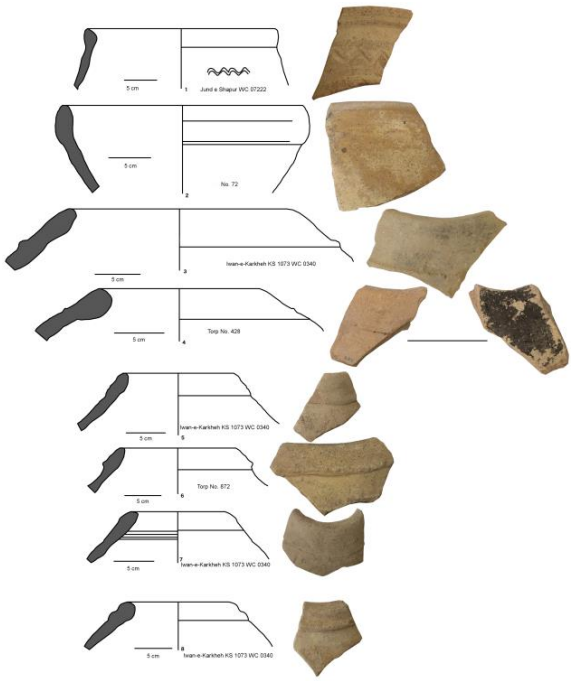


Figure 4.67: Illustrations of Torpedo Jar rims from South-Western Iran (3-8), and related Wares (1-2) with gritty fabric with No. 1 (Wenke 1975: 230, Fig. 12 606), No. 4 and 5 similar to Wenke (1975: 227, Fig. 9 301)

Figure 4.68: Sasanian-Early Islamic Glazed Wares from Jundeshapur with gritty fabric

Figure 4.69 – PWWS fabric Torpedo Jar base from Ewan-i-Karkheh (Courtesy: Esmaili Jelodar, University of Tehran)

4.5.1. Torpedo Jars and other un-glazed Wares- Typology

The local fabric of the ceramics in the region of South-western was gritty in nature with a high density feel to it. Most of the ceramic types; glazed and un-glazed majorly had gritty fabric (Figures 4.66-4.68). The finds from the earlier surveys by Robert McCormick Adams and the collection from the Pottery Research Department shows a similarity in terms of typology and

thus when compared shows that it represents the local fabric (Figures 4.66-4.67). This local fabric is markedly different from the Torpedo Jar and Glazed Ware finds in western India. To further clarify the different nature of the finds from Susiana and the finds West Asian ceramics reported from Western India, the sections were sampled for thin-section petrographic analysis to compare the petro-fabrics (4.6).

The Torpedo Jars which have been illustrated from the Susiana region (Figure 4.67) show peculiar characteristics in terms of shape. The rims of the Torpedo Jars from Susiana (Figure 4.67) exhibit lengthy plumped rims with occasional exaggerated internal thickening (4 and 8 in Figure 4.67) and a ledge on the outer wall, above the shoulder from where the rim was formed. The rims are different when compared with the Torpedo Jars (PWWS and Buff) varieties found from Western India. The PWWS and Buff varieties have narrower necks, thinner walls when compared the Gritty Torpedo Jars from South-western Iran. The collared rims of the PWWS and Buff varieties are common as exhibited from different illustrations with ribbing seen near the shoulder due to it being thrown on a wheel for those areas (Figures 4.1, 4.2, 4.7, 4.10, 4.29, 4.35, 4.40).

The bases of the Gritty Torpedo Jars are more solid and longer in length. Whereas the bases of the PWWS and Buff varieties of Torpedo Jars are semi-hollow and are dimpled at the bottom. The experimental study as elaborated in 4.1.3. helped in understanding the nature of the base for the PWWS and Buff types, which were thrown on the wheel after preferential drying. The shapes of the Gritty Torpedo Jars and the PWWS, and Buff suggest they were most certainly used as transport containers aboard ships.

Eggshell wares were another major variety of ceramics to reach India due to the West Asian contact. The dominant shape of Eggshell Wares have pitchers/jugs with a pointed rim (Figure 4.25: 2-3) and the Grey Eggshell Ware has the same with an internal ledge for a lid (Figure 4.25: 4). Cylindrical vessels possibly pitchers were also prevalent in the Eggshell ware types (Figure 4.19). The typical turban headed handles of Eggshell ware were missing from the assemblage at Chaul but were reported earlier from Sanjan. The bases of Grey Eggshell wares have hollowed out bases (Figure 4.25.5, Figure 4.18) and similar bases are seen for White Eggshell ware (Figure 4.26: 11-12). But a flat variety of White Eggshell ware is mosty found (Figure 4.16) which is slightly later in date closer to 10^{th} century A.D. Slightly thicker varieties of these wares have been defined as Buff Plain and Incised Wares, which have handles (Figure 4.27) and a ring type base (Figure 4.26.10). These wares were possibly used for serving liquid

or storing solid commodities. These would have had their own intrinsic value based on the design and delicate nature.

4.5.2. Glazed Wares - Typology

The variety of Glazed wares from West Asia found in Western India is noted in 3.2.5. The major types is distinguished as Turquoise Glazed Ware, Sasanian Glazed Ware, Tin Glazed varieties (Samarran) and Lead Glazed varieties (Sgraffiato types). Turquoise Glazed ware types are represented by the following shapes from the research – quadrangular rimmed pot (Figure 4.26.9) and other sherds were non-diagnostic in nature. But major types include handled jars, bowls, dishes. Sasanian Glazed Wares showed more variety in terms of finds with Pot (Figure 4.29), Dishes (Figure 4.6, 4.30) and Handled Jars (Figure 4.6, 4.32). Bases are usually thick and wheel made and flat in nature (Figure 4.31). Tin Glazed varieties are majorly 'table wares' used for serving and such other purposes, thus logically the shapes are dominated by everted rim bowls (Figure 4.12, 4.26 ,and 4.61) and the Turquoise Splashed sub-type also has similar bowl shapes with vertical sided non-contiguous ring base (Figure 4. 62, and 4.65). Lead Glazed wares are dominated again by open mouth vessels dominated by bowls with externally projecting rims sometimes rounded (Figure 4.65: 1-2). The base of the Lead glazed wares are mostly non-contiguous vertical sided ring bases (Figure 4.64, 4.65: 3).

The Turquoise Glazed Ware and Sasanian Glazed Ware functionally represent transport vessels as well as everyday use objects such as bowls, pots, and dishes/basins. Whereas, the Tin Glazed and Lead Glazed varieties were primarily table wares as discerned from their shapes which lack larger storage vessels. All the Glazed wares found in western India were novel for the users of these in the Indian sub-continent more specifically western India. This is because of the lack of 'Glazed Ware' production in the region of Western India in the time between 3rd to 10th century A.D. Thus, these would have had a value of their own as well.

4.6. Thin-Section Studies

The ceramics have been distinguished by their Petro-Fabric groups through textural analysis by observing the textural features; grain-size, grain-shape, frequency, and grain-size distribution character into consideration. Based on the optical properties of detritals; mineral phases and rocks were identified and non-mineral phases, such as, voids, grog, bio-clasts etc., were identified from its overall characters. Some of the thin-sections produced were rejected during the analysis due to multiple grain-fallout and other factors which hindered the process of

accurate fabric characterisation. A total of 140 samples were eventually analysed for the thin-section petrographic studies.

The samples were then placed under separate 'Petro-Fabric' Groups. The word 'Petro-Fabric' is stressed here to differentiate, between, the macroscopic observations which is labelled under Fabric, whereas Petro- Fabric being a characteristic description of a thin-section. Petro-Fabrics is a result of the fabric characterisation, which utilises descriptive criteria such as, mineralogical composition of the non-plastic inclusions, nature, colour, and birefringence of the matrix (plastic) portions, voids (and their nature), and textural features (shape, sphericity, size, frequency, sorting, orientation, size distribution character) (Krishnan and Shah 2005: 139). A detailed chart on the nature of Fabric Characterisation and its archaeological implications is given in (Krishnan and Shah 2005: Fig. 8.2, 148).

4.6.1. Petro-Fabric Groups

The Petro-Fabric groups from the samples undertaken yielded 12 main types, with Petro-Fabrics 4, and 8, with one sub-group division each namely, PF4a, and PF8a. This grouping has been done primarily on the basis of mineralogical composition of the non-plastic inclusions, and secondarily on the textural data, with features such as grog which are broken brick/pottery inclusions (rare) warranting a separate subgroup within the same Petro-Fabric Group.

Petro-Fabric Group 1

The PWWS Petro-Fabric Group has a non-pleochroic matrix (Figure 4.70) and is ferruginous in (Cross Polarised Light (XPL). The grains were angular to sub-angular and exhibited less sphericity. The frequency was 15-25%. The grain size distribution character was unimodal (Figure 4.99). Voids were mostly grain fallouts. None of the non- plastic inclusions in the sections had any preferred orientation and were well sorted. The minerals observed were quartz, plagioclase feldspar (fresh and altered), crypto-crystalline silica, clino-pyroxene and mica (biotite). The rock fraction was represented by basalt and shale (Figure 4.71, 4.98). The largest grain sizes were 350, 400, 420, and 450 microns.

The pottery sample falling in to this Petro Fabric Group 1 are all the PWWS variety of the Torpedo Jar numbering (see Appendix V). same as TORP.S in Priestman 2013: 496-497 which have a probable origin in southern Iraq).

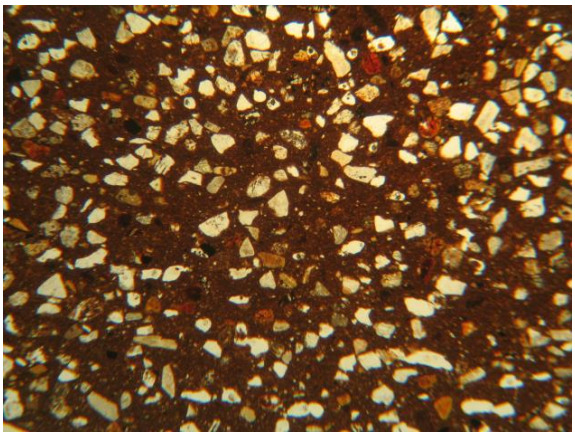


Figure 4.70: Representative sample of Torpedo Jar from Nagardhan viewed Plain Polarised Light (PPL) showing a non-pleochroic matrix with angular to sub angular grains. No preferred orientation is seen. Petro-Fabric Group 1. Field of view is 0.18mm^2.

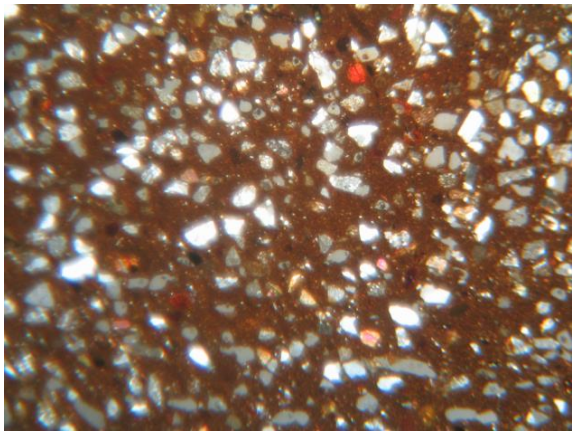


Figure 4.71: Representative sample of Torpedo Jar from Nagardhan viewed in (Cross Polarised Light (XPL) showing a ferruginous matrix with angular to sub angular grains of quartz, plagioclase feldspar, crypto-crystalline silica, mica (in red) and sandstone. Petro-Fabric Group 1. Field of view is 0.18mm^2

Petro-Fabric Group 2

Petro-Fabric Group 2 (similar to Tomber *et al.* 2020: 11, Fabric 8) had a non-pleochroic matrix and appeared calcareous in Cross Polarised Light (XPL) (Figure 4.73). The grains were angular to sub-angular with low spherecity. The frequency was 16-20%. The grain size distribution character was uni-modal (Figure 4.99). Voids were mostly grain fallouts. None of

the particles within the section had any specific orientation and were well sorted. The minerals observed were crypto-crystalline calcite, calcite, quartz, plagioclase feldspar (fresh+altered), crypto-crystalline silica and mica (Figure 4.72, 4.98). The largest grain sizes were 400-420 microns. Rock fragments were represented by sandstone particles. Bio-clasts were also found from this PF group. The samples form a part of this group are; Paliyad (P1, P2, P3), Kanmer (K1, K10), Vallabhipur (7, 4, 2, 13 ,10).

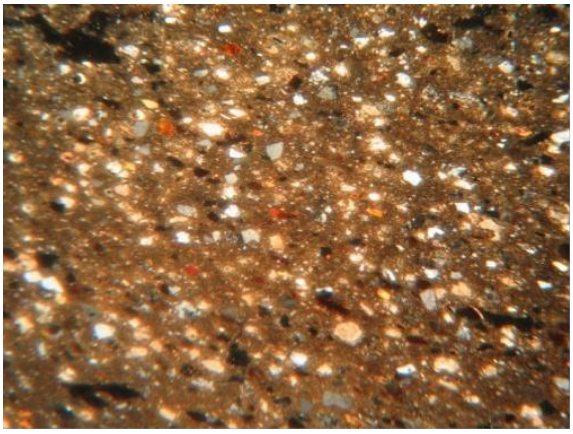


Figure 4.72: Photomicrograph of a Torpedo Jar from Paliyad 3 in Cross Polarised Light (XPL). The dominant minerals are Crypto-Crystalline Calcite and Quartz. Other minerals present are mica. Petro-Fabric Group 2. Field of view: 0.18 mm^2

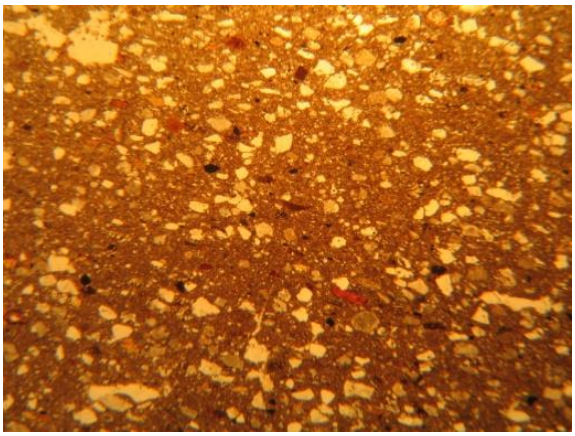


Figure 4.73: Photomicrograph of a Torpedo Jar from Paliyad 3 in Plain Polarised Light (PPL). Petro-Fabric Group 2 .Field of view: 0.18 mm^2

Petro-Fabric Group 3

It is non-pleochroic in Plain Polarised Light (PPL) (Figure 4.75) and has a Calcareous matrix with many haematite spots when viewed in the Cross Polarised Light (XPL) (Figure 4.74). The

grains are mostly angular to sub-angular and exhibit low-sphericity. It is well sorted. The frequency of grains is 12-16%. The largest grain size is 240, 220, 210, and 200 microns. The voids are mostly due to grain fallout. The dominant mineral is Quartz and Calcite (Figure 4.98). The ancillary inclusions are Plagioclase Feldspar, Biotite (Mica). The grain size distribution is unimodal (Figure 4.99) with no preferred orientation exhibited. Sasanian Glazed Wares from Kanmer (4)Vadnagar (1, 2, 3, 4) form a part of this group.

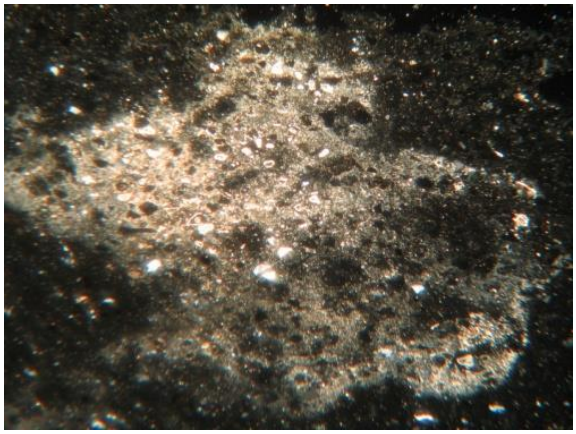


Figure 4.74: Photomicrograph of a Sasanian Glazed Ware in Cross Polarised Light (XPL) from Kanmer (4)– (5Y 7/2) Trench Y31, Layer 5, Lot No. 128. Petro-Fabric Group 3. Field of view: 0.18 mm^2

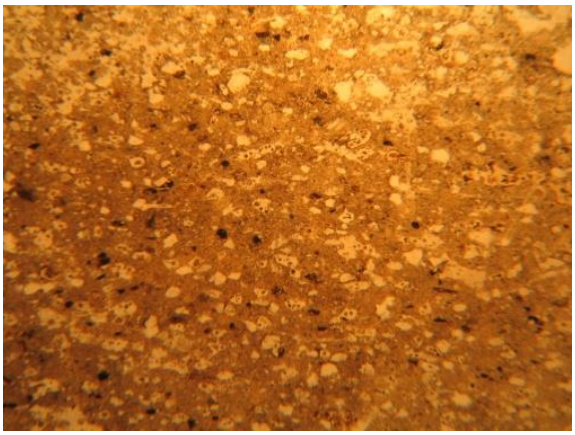


Figure 4.75: Photomicrograph of a Torpedo Jar from Kanmer in Plain Polarised Light (PPL). Petro-Fabric Group 3. Field of view: 0.18 mm^2

Petro Fabric Group 4

PFG 4 had a non-pleochroic matrix in Plain Polarised Light (PPL) (Figure 4.76) and low birefringence in Cross Polarised Light (XPL). The grains were angular to sub- angular in nature with low sphericity. The frequency was 18-20%. The grain size distribution is bimodal (Figure 4.101). Voids were mostly grain fallouts. They are moderately sorted. None of the particles within the section had any specific orientation. The mineralogy is dominated by crypto-crystalline silica, crypto-crystalline calcite, feldspar (plagioclase and altered), quartz and mica (biotite) (Figure 4.77, 4.100). The largest grains are 420, 500 microns. 6 samples from Iran fall into this group (nos. 2-7) including both Gritty Torpedo Jars and the Honeycomb Pithos Jars.

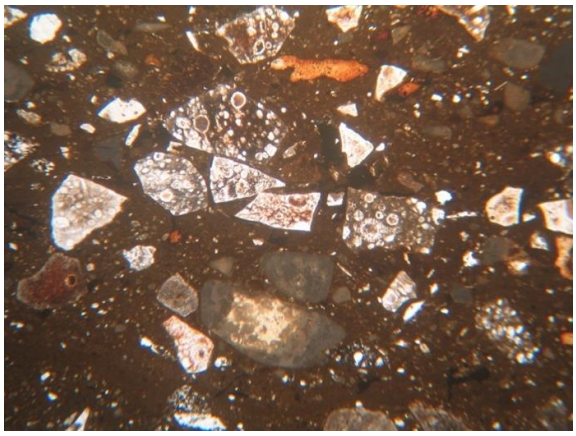


Figure 4.76: Photomicrograph of a Torpedo Jar sample 7 from Iran in Plain Polarised Light (PPL). Petro Fabric Group 4. Field of view: 0.18 mm^2

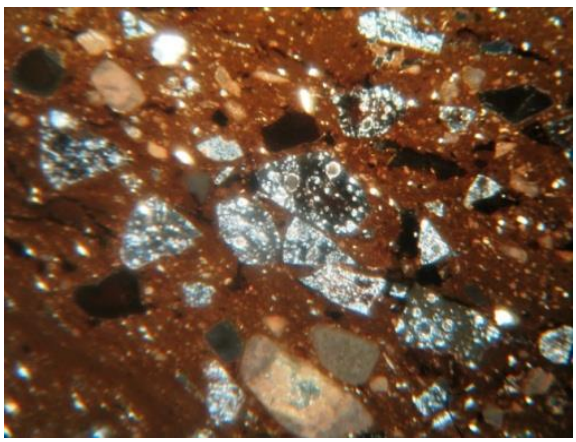


Figure 4.77: Photomicrograph of a Torpedo Jar sample 7 from Iran in Cross Polarised Light (XPL). The dominant minerals are Crypto-Crystalline silica (angular) and Crypto-Crystalline Calcite (secondary deposition) Petro Fabric Group 4. Field of view: 0.18 mm^2

Petro Fabric Group 4a had the similar non-pleochroic matrix in Plain Polarised Light (PPL) (Figure 4.78) with low birefriengence in Cross Polarised Light (XPL). The grains were angular to sub- angular in nature and exhibited low spherecity. The frequency was 10-16%. The grain size distribution is bimodal (Figure 4.101) with moderate sorting of inclusions. Voids were mostly grain fallouts. None of the particles within the section had any specific orientation. The mineralogy is dominated by crypto-crystalline silica, crypto-crystalline calcite, feldspar (plagioclase and altered), quartz and mica (biotite) (Figure 4.79, 4.100). The largest grains are in the range of 350- 420. Grog was also noted in this section (Figure 4.78). 2 samples from Iran fall into this group which includes 1 and 8 both Gritty Torpedo Jars.

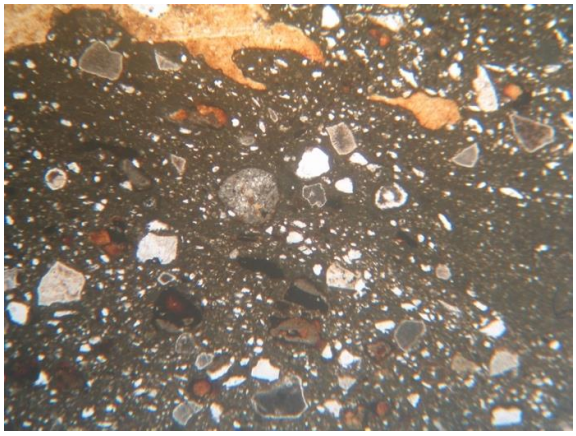


Figure 4.78: Photomicrograph of a Torpedo Jar Susiana 1 from Iran in Plain Polarised Light (PPL) from the site KS 139. Petro Fabric Group 4a. Field of view: 0.18 mm2

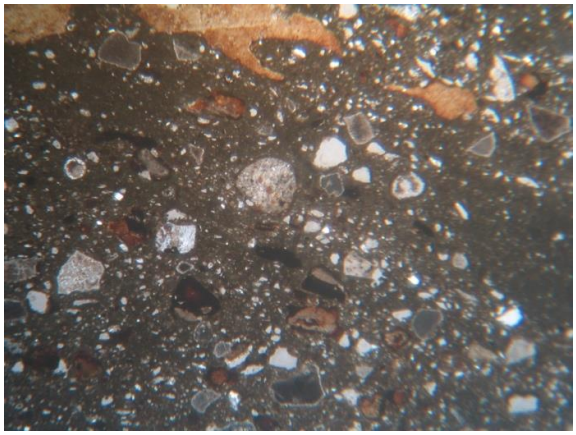


Figure 4.79: Photomicrograph of a Torpedo Jar Susiana 1 from Iran in Cross Polarised Light (XPL) from the site KS 139. Grog seen along with major minerals such as crypto-crystalline silica, feldspar, quartz, and mica. Petro Fabric Group 4. Field of view: 0.18 mm^2

Petro-Fabric Group 5

All the 10 samples representative of this petro-fabric group come from a single site (Chaul) and represent a single Ware (Grey Eggshell Ware). The samples numbers are 3, 9, 19, 20, 27, 30, 33, 37, and 38 (from the excavation) and sample 5 from the researcher's exploration. The matrix is non-pleochroic in Plain Polarised Light (PPL) and dark brown in Cross Polarised Light (XPL) (Figures 4.80 – 4.81) with no birefringence seen in Cross Polarised Light (XPL). The frequency is around 10 %. The grain size distribution is unimodal (Figure 4.101). The grains are angular to sub angular with low sphericity, and no orientation visible. Voids are mostly grain fallouts. The mineralogy is dominated by feldspar (plagioclase and microcline) and quartz, with ancillary inclusions including crypto-crystalline silica, and mica (biotite) (Figure 4.100). Size of inclusions in microns range from 200, 260, and 460. Grains are well sorted.

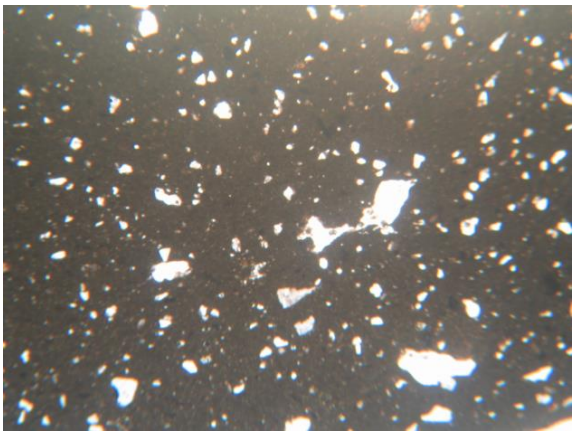


Figure 4.80: Photomicrograph of a GEGG (CHL EXP 5) in Plain Polarised Light (PPL). Petro-Fabric Group 5 .Field of view: 0.18 mm^2

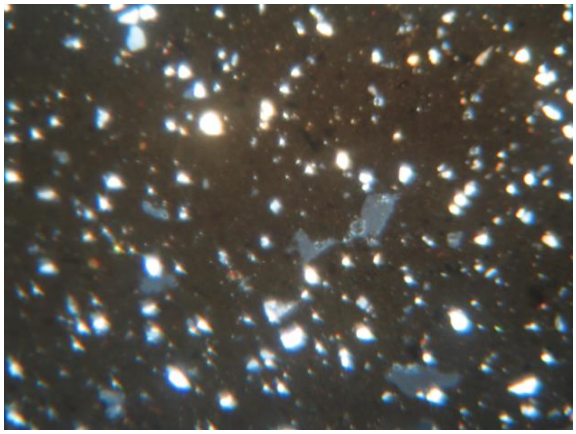


Figure 4.81: Photomicrograph of a GEGG (CHL EXP 5) in Cross Polarised Light (XPL). Petro-Fabric Group 5 . Field of view: 0.18 mm^2

Petro-Fabric Group 6

All the samples of this petro-fabric come from a single site (Chaul) and represented by WEGG (White Eggshell Ware), Buff (Plain and Incised). The samples are CHL - 4, 8, 13, 18, 22, 35, 39, and 42 (WEGG), Buff Plain and Incised Ware (28, 32, and 36) and Sasanian Glazed Ware (KMR 19). Matrix is Non-Pleochroic in Plain Polarised Light (PPL), dark brown in Cross Polarised Light (XPL)and very fine in nature with some haematite patches noticed (Figure 4.82). Frequency is 2-5 %. The grains are angular to sub-angular and no spherecity. Voids are rare. The inclusions are well sorted. Grain-size distribution is unimodal mostly ranging towards very fine sand with no preferred orientation (Figure 4.103). The mineralogy is dominated by quartz and cloudy feldspar (Figure 4.83, 4.102) and the largest grain size is around 200 microns but most grains are within the silt and very fine sand fractions.

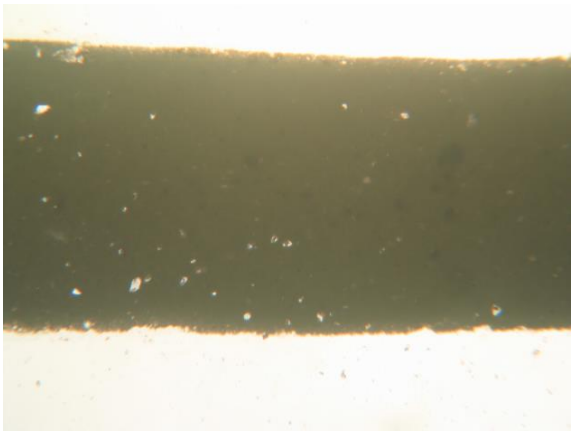


Figure 4.82: Photomicrograph of a WEGG (CHL 39) in Plain Polarised Light (PPL). Petro-Fabric Group 6. Field of view: 0.18 mm^2

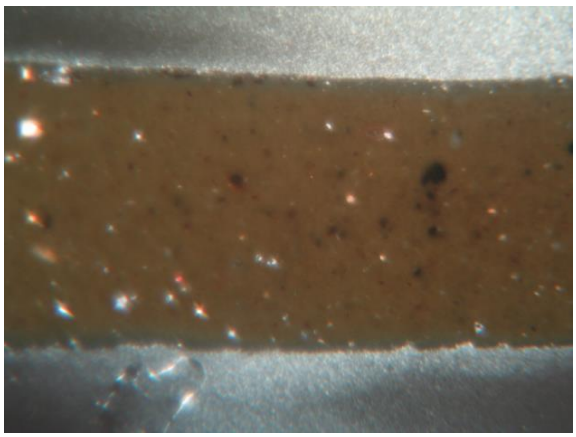


Figure 4.83: Photomicrograph of a WEGG (CHL 39) in Cross Polarised Light (XPL). Petro-Fabric Group 6. Field of view: 0.18 mm^2

Petro-Fabric Group 7

The matrix of petro fabric group 7 is Non-Pleochroic in Plain Polarised Light (PPL) (Figure 4.84) and dark brownish in Cross Polarised Light (XPL), and the matrix not as fine as PFG 6 and has lots of haematite patches. The voids are mostly grain fall outs. The frequency is about 10-11%. The grains are well sorted and lack any orientation. The grains are angular to sub angular and exhibit low sphericity. The mineralogy is dominated by plagioclase feldspar and quartz as ancillary inclusion with mica (biotite) (Figure 4.84, 4.102). The grain size distribution is bi modal in nature (Figure 4.103). The largest grain sizes are 200, 220, and 240 microns. Sample from Chaul; CHL 26 and CHL 31 form a part of this group.

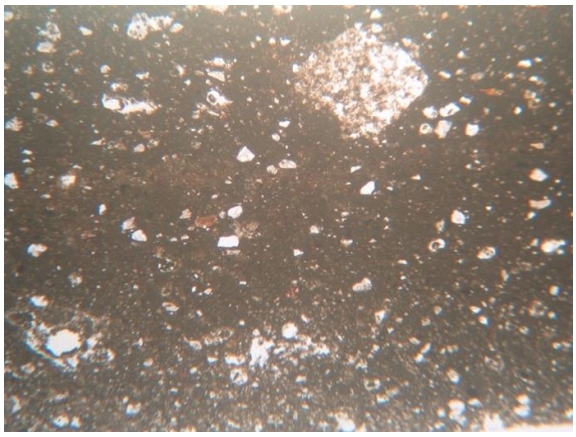


Figure 4.84: Photomicrograph of CHL 26 in Plain Polarised Light (PPL) with no pleochroism seen. Petro-Fabric Group 7. Field of view: 0.18 mm^2

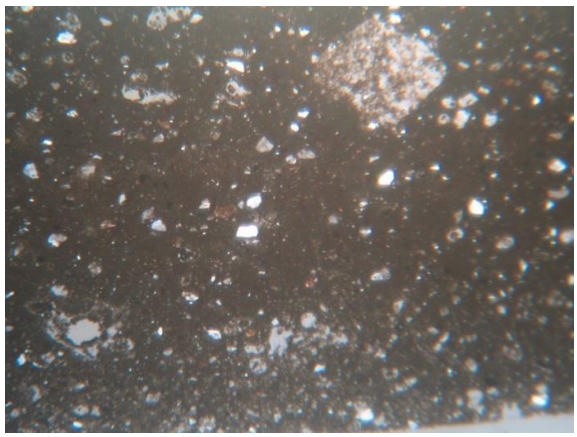


Figure 4.85: Photomicrograph of CHL 26 in Cross Polarised Light (XPL) with more of plagioclase feldspar and less of quartz. Petro-Fabric Group 7. Field of view: 0.18 mm^2

Petro-Fabric Group 8

The matrix is micaceous with no pleochroism in Plain Polarised Light (PPL) (Figure 4.88) but fairly birefringent in Cross Polarised Light (XPL). The non-plastic inclusions have no preferred orientation. The frequency is around 6-8%. Voids are due to grain fall outs. The grains are angular to sub-angular and are well sorted with low spherecity (Figure 4.86). The grain size distribution is unimodal (Figure 4.103). The largest grain is 300 microns, but most grains are around 30 to 80 microns (silt to very fine sand) in size. The dominant mineralogy was of plagioclase feldspar and mica and quartz was also found (Figure 4.10). The samples part of this group is S-LS 2 and S-LS3.

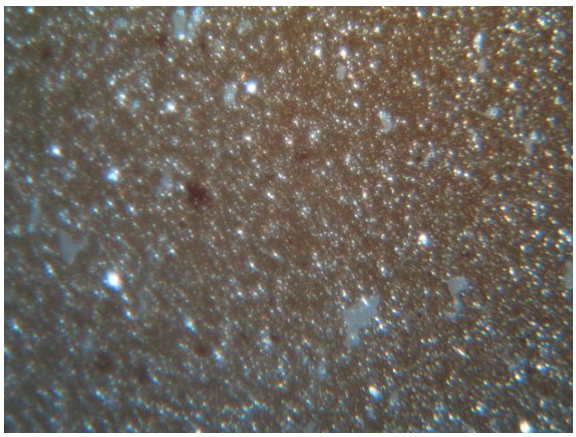


Figure 4.86: Photomicrograph of sample S-LS2 in Cross Polarised Light (XPL). Petro-Fabric Group 8. Field of view: 0.18 mm^2

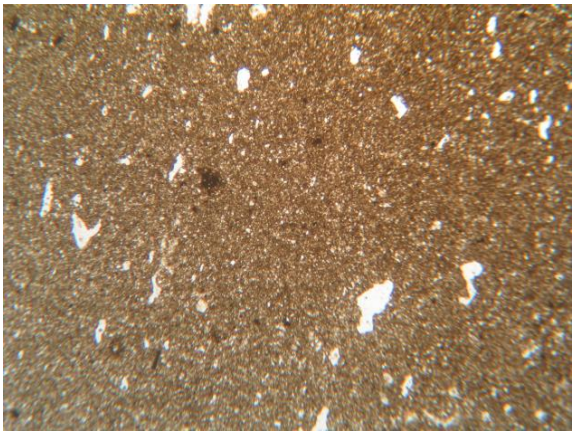


Figure 4.87: Photomicrograph of sample S-LS2 in Plain Polarised Light (PPL). Petro-Fabric Group 8. Field of view: 0.18 mm^2

Petro-Fabric Group 8a

The matrix is micaceous with no pleochroism in Plain Polarised Light (PPL) but fairly bi refringent in Cross Polarised Light (XPL) (Figure 4.88- 4.89). The non plastic inclusion has a parallel orientation. The frequency is around 5%. The angularity of grains is angular to sub-angular and no spherecity. The grains are well sorted. The voids are rare but mostly due to grain fallouts. Grain size distribution is unimodal (Figure 4.105) with the biggest grain being 140 microns. The mineralogy is dominated by mica and plagioclase feldspar with very few quartz (Figure 4.89, 4.104). Texturally the fabric is slightly different from the earlier petro-fabric 8. The samples part of this group are S-LS1 and S-LS4.

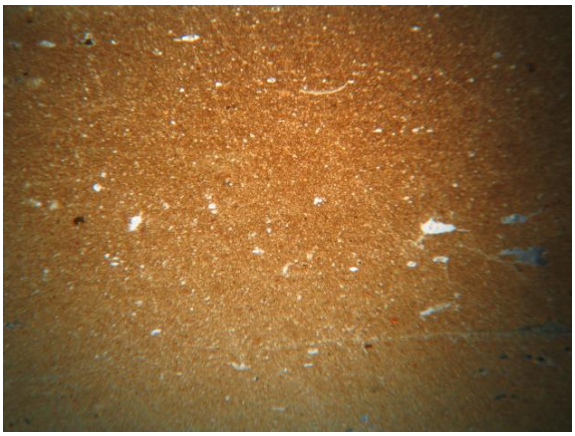


Figure 4.88: Photomicrograph of a Sgraffiato Ware S-LS4 in Plain Polarised Light (PPL). Petro-Fabric Group 8a. Field of view: 0.18 mm^2

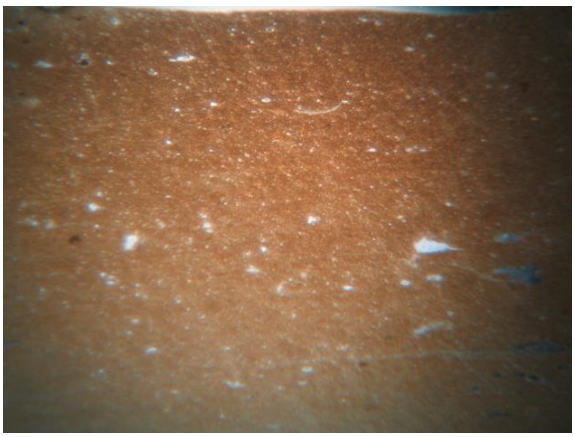


Figure 4.89: Photomicrograph of a Sgraffiato Ware S-LS4 in Cross Polarised Light (XPL). Petro-Fabric Group 8a. Field of view: 0.18 mm^2. Note the lack of Quartz compared to the earlier fabric.

Petro-Fabric 9

The matrix is mostly ferruginous sometimes greyish brown in Cross Polarised Light (XPL) and is non-pleochroic in Plain Polarised Light (PPL) (Figure 4.90). The angularity of the grains is angular to sub angular with less sphericity, with some sub rounded grains with medium spherecity also noticed. It is well sorted. Frequency of the grains vary from 5-8%. The largest grains being 770, 560, 490, and 350 microns. The grain size distribution is unimodal (Figure 4.105). The inclusions do not exhibit any preferred orientation. The voids are mostly grain fall outs. The dominant mineral is Quartz and other inclusions include feldspar (altered), plagioclase feldspar, microcline feldspar, mica (smaller in size 60 to 80 microns), chert (only from one sample) and haematite patches (Figure 4.91, 4.104). The samples in this petro-fabric group belong to two sites mostly, all glazed Wares, Sanjan (S TS 3, STGP 7, STGP 5, STGP 2, S TG1) and Chaul (CHL 3 TGP EXP).

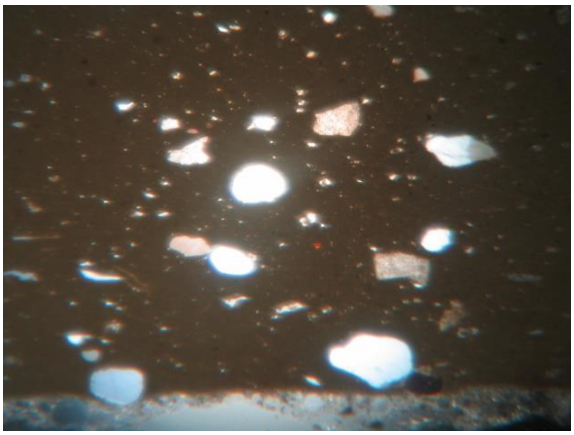


Figure 4.90: Photomicrograph of a Turquoise Splashed Tin Glazed Ware (sample no. S-TS3) from Sanjan in Plain Polarised Light (PPL) and bubbly glaze at the bottom. Petro-Fabric Group 9. Field of view: 0.18 mm2

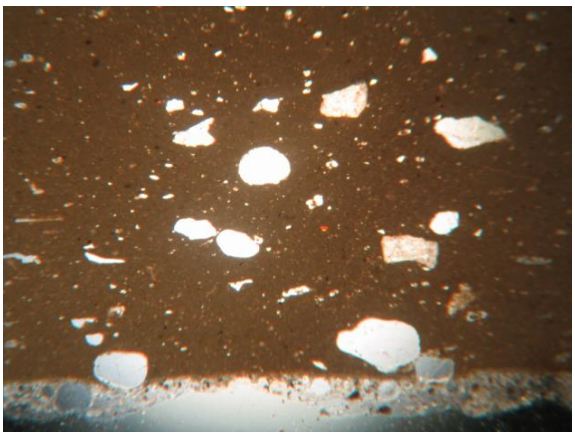


Figure 4.91: Photomicrograph of a Turquoise Splashed Tin Glazed Ware (sample no. S-TS3) from Sanjan in Cross Polarised Light (XPL) with sub rounded - rounded quartz inclusions. Petro-Fabric Group 9. Field of view: 0.18 mm2

Petro Fabric 10

The matrix is ferruginous and occasionally brown and clean in Cross Polarised Light (XPL) and non-pleochroic in Plain Polarised Light (PPL) (Figure 4.92). The frequency is from 4-8%. No preference of orientation is noticed. The grain size distribution is bi-modal (Figure 4.105). The angularity of the grains is angular to sub angular, and low-medium spherecity. The inclusions are moderately sorted. The largest grain sizes are 1050 microns (feldspar), 350 microns (quartz) and 200 microns (quartz). Voids are mostly result of grain fall outs. This petro-fabric is dominated by samples which have Quartz as well as Feldspar in a 50 percent 40 percent proportion. The minerals are dominated by quartz (50 percent) and feldspar (40 percent) mostly altered, poly crystalline quartz, crypto crystalline silica, mica lath, basalt (1 trychatic), biotite (Figure 4.93. 4.104). The samples also have haematite patches. This petro-fabric group is represented by Glazed Wares from three sites: Sanjan (S STG2, STGP 1), Chaul (CHL EXP 2TGP), and Kanmer (KMR 20).

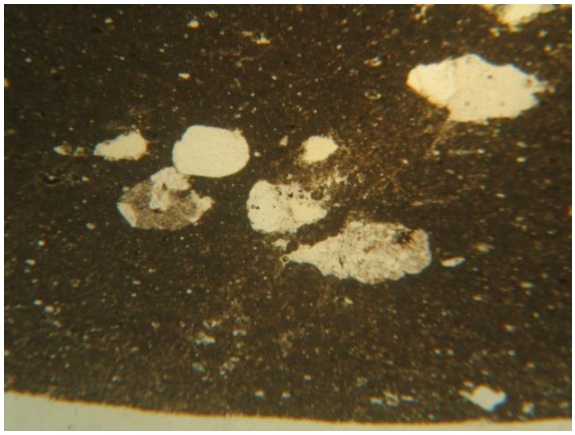


Figure 4.92: Photomicrograph of a Turquoise Glazed Ware (sample no. S-TGP 1) from Sanjan in Plain Polarised Light (PPL). Petro-Fabric Group 10. Field of view: 0.18 mm2

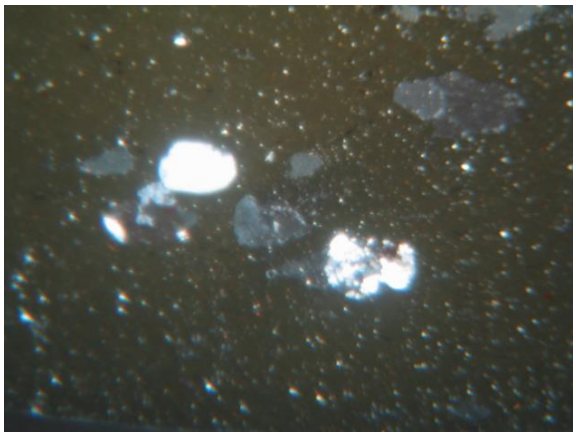


Figure 4.93: Photomicrograph of a Turquoise Glazed Ware (sample no. S-TGP 1) from Sanjan in Cross Polarised Light (XPL) with both sub rounded quartz, poly crystalline quartz and feldspar along with finer quartz. Petro-Fabric Group 10. Field of view: 0.18 mm2

Petro Fabric 11

The matrix is grey and greyish brown in Cross Polarised Light (XPL) and non pleochroic in Plain Polarised Light (PPL) (Figure 4.94). The frequency is around 4-6%. No preferred orientation is noticed. The angularity of the grains ranges is dominated by angular to sub angular grains with no spherecity and also some sub rounded grains with moderate spherecity. The grain size distribution is uni-modal (Figure 4.107). The largest grain sizes are 700 microns, 680 microns, 420 microns, 350 microns. The mineralogy is mostly dominated by feldspar, and then quartz, mica, (Figure 4.89, 4.106). Voids are rare. The grains vary from well to poor sorting. The dominant mineral here is feldspar (plagioclase, and altered). The other minerals include microcline feldspar, quartz, poly crystalline quartz, biotite, and the petro-fabric is also stained with haematite patches (Figure 4.95). The samples which belong to this petro-fabric group include glazed Wares from two sites; Chaul (CHL 6, CHL 24 TGW, CHL 2 TG, CHL EXP 4 TGP, CHL 45 SW), and Sanjan (S TS 4, STS 1, S TGP 8, and S TGP 4).

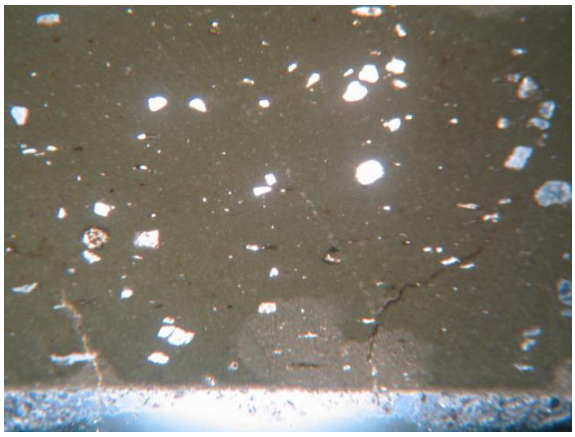


Figure 4.94: Photomicrograph of a Tin Glazed Ware from Chaul (CHL 24) in Plain Polarised Light (PPL). Petro-Fabric Group 11. Field of view: 0.18 mm^2

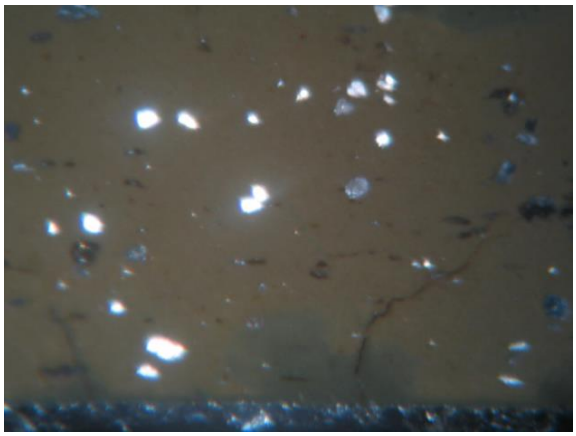


Figure 4.95: Photomicrograph of a Turquoise Glazed Ware from Chaul (CHL 24) in Cross Polarised Light (XPL) showing majority finer quartz and feldspar. Petro-Fabric Group 11. Field of view: 0.18 mm2

Petro Fabric 12

The sample is slightly birefringent in Cross Polarised Light (XPL) and pleochroic in Plain Polarised Light (PPL) (Figures 4.96 – 4.97). The grains are angular to sub angular with low spherecity. The voids are due to the grain fall outs. The grain size distribution is unimodal in nature (Figure 4.107). Further, the grains are well sorted in nature. It has a parallel orientation and has lots of smaller quartz as dominant mineral and micaceous matrix (Figures 4.96-4.97). The dominant mineral is fine quartz ranging from 80 to 100 microns with plagioclase feldspar and mica (Figure 4.106) as ancillary inclusions. Largest grains are 500, 400, 490, and 310 microns. The frequency is 13%. Only, one sample, from Sanjan STGP 3 forms a part of this group.

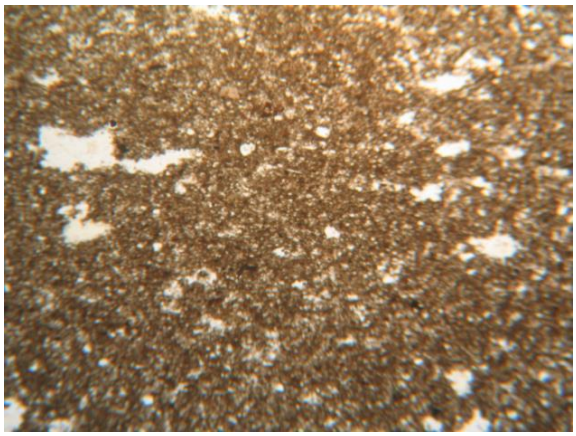


Figure 4.96: Photomicrograph of a Turquoise Glazed Ware (sample no. S-TGP 3) from Sanjan in Plain Polarised Light (PPL). Petro-Fabric Group 12. Field of view: 0.18 mm2

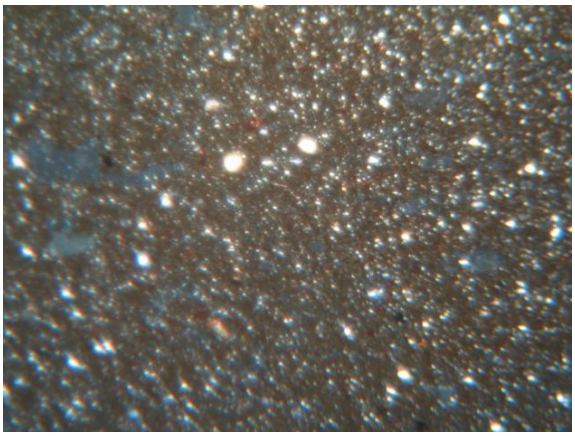


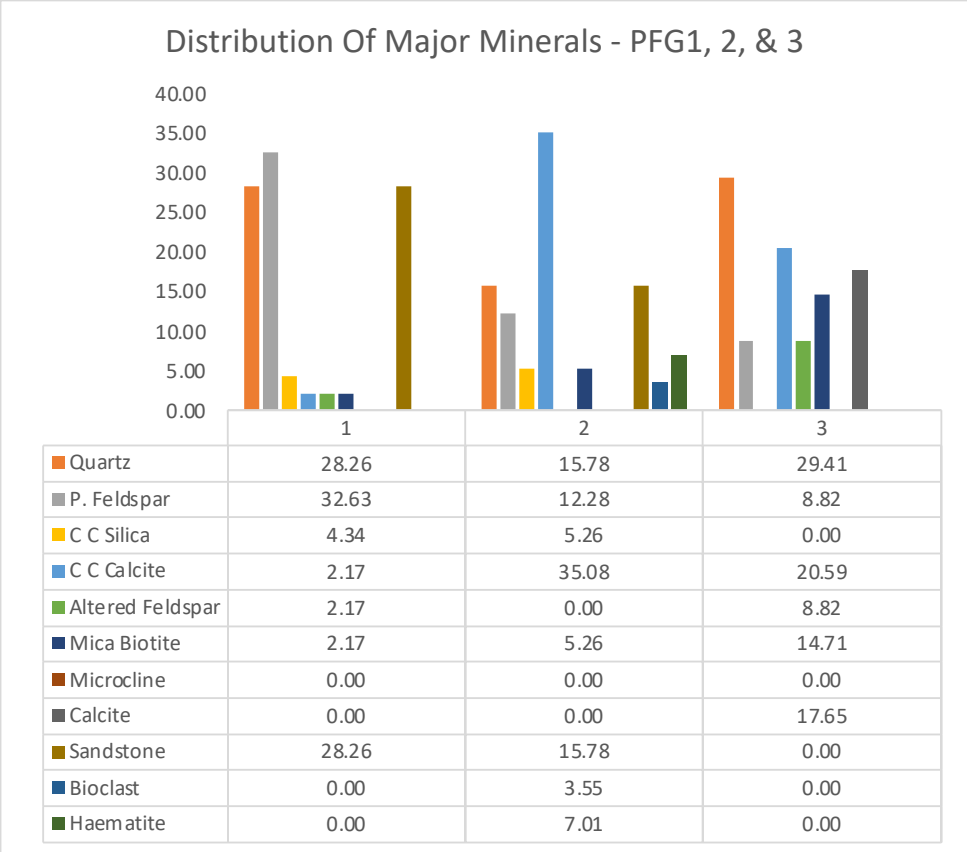
Figure 4.97: Photomicrograph of a Turquoise Glazed Ware (sample no. S-TGP 3) from Sanjan in Cross Polarised Light (XPL) with a micaceous matrix and highly fine and well sorted quartz petro-fabric. Petro-Fabric Group 12. Field of view: 0.18 mm2

The following are the assigned nomenclature of the Petro-Fabric Groups;
PFG 1 – Quartz with basaltic fractions, PFG 2 – Quartz with Calcite, PFG 3 – Quartz, PFG 4 – Crypto-crystalline silica dominant, PFG 4a similar to 4 but with Grog, PFG 5 – Feldspar-Quartz dominant, PFG 6 – Quartz-Altered Feldspar with very fine sand inclusions, PFG 7 – Feldspar dominant, PFG 8 – Feldspar dominant with Quartz, PFG 8a – Mica-Feldspar with trace quartz, PFG 9 – Quartz-Feldspar with medium coarse sand sub-rounded inclusions with smaller angular inclusions, PFG 10 – Quartz (50%) Feldspar (40%) dominant with crypto crystalline silica and basalt as rock fraction, PFG 11 – Feldspar dominant and PFG 12 – Quartz (fine sand) + feldspar. Quartz and Feldspar are inherently present in most sections but other minerals (calcite, mica), rock fractions (basalt, shale), and textural variation (frequency in particular) is utilised for differentiating and classifying them into separate groups as discussed further in 4.6.2.

Mineralogy of the non-plastic inclusions was identified along with the recording of their optical properties, to determine the geological sources of the non-plastic inclusions as seen Petro-Fabric Groups (Figures 4.98, 4.100, 4.102, 4.104, 4.106). The PF groups can be divided into 4; (i) Crypto-Crystalline silica dominant (PFG 4 and 4a), (ii) Quartz dominant (PFG 1, 2, and 3), (iii) Quartz-Feldspar dominant (PFG 9, 10, 11, and 12), and (iv) Feldspar dominant (PFG 5, 6, 7, 8, and 8a).

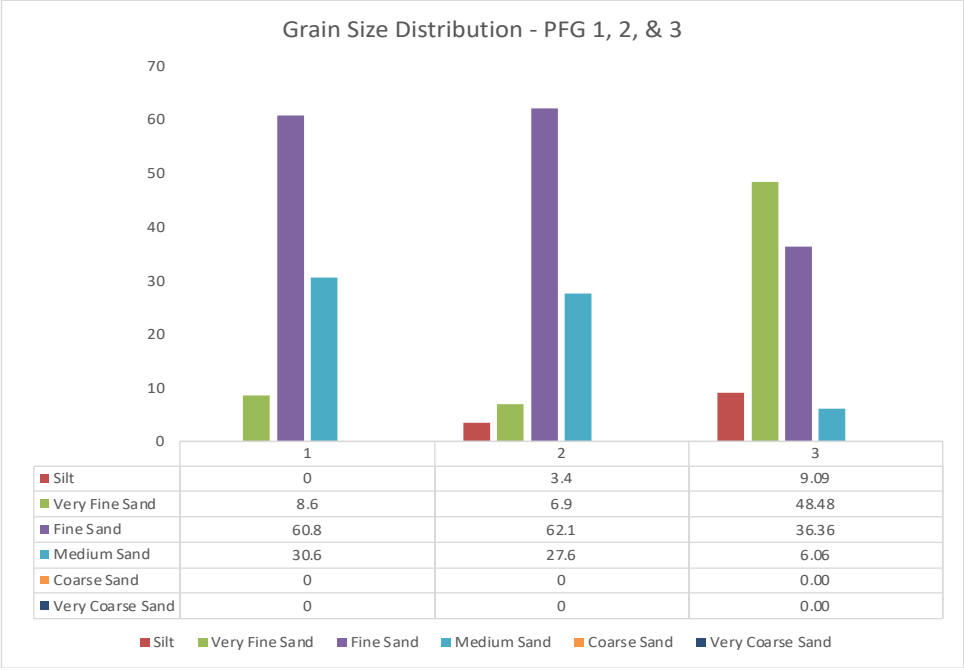
4.6.2. Textural Data – Semi-quantitative

After the Petro-Fabric Groups were defined, representative samples were point counted as described in detail in (section 3.2.4.3. Thin-section Analysis of Pottery**)**. Point-counting helped in generating semi-quantitative results of the major minerals and other non-plastic inclusions within the sampled ceramic thin-sections. Further, it also helped in understanding the textural distribution of the Petro-Fabric Groups. Texturally, there are three groups namely (i) PF groups 4 and 4a, (ii) PF Groups 5, 6, 7, 8, 8a, 10, and 12, and (iii) 1, 2, 3, and 11 and PF group 9 as an anomaly. The Values of the textural data were calculated in terms of percentage totalling 1 (=100 percent). XL Stat software, Visualising Data was utilised for generating the Ternary Diagram (Figure 4.108).



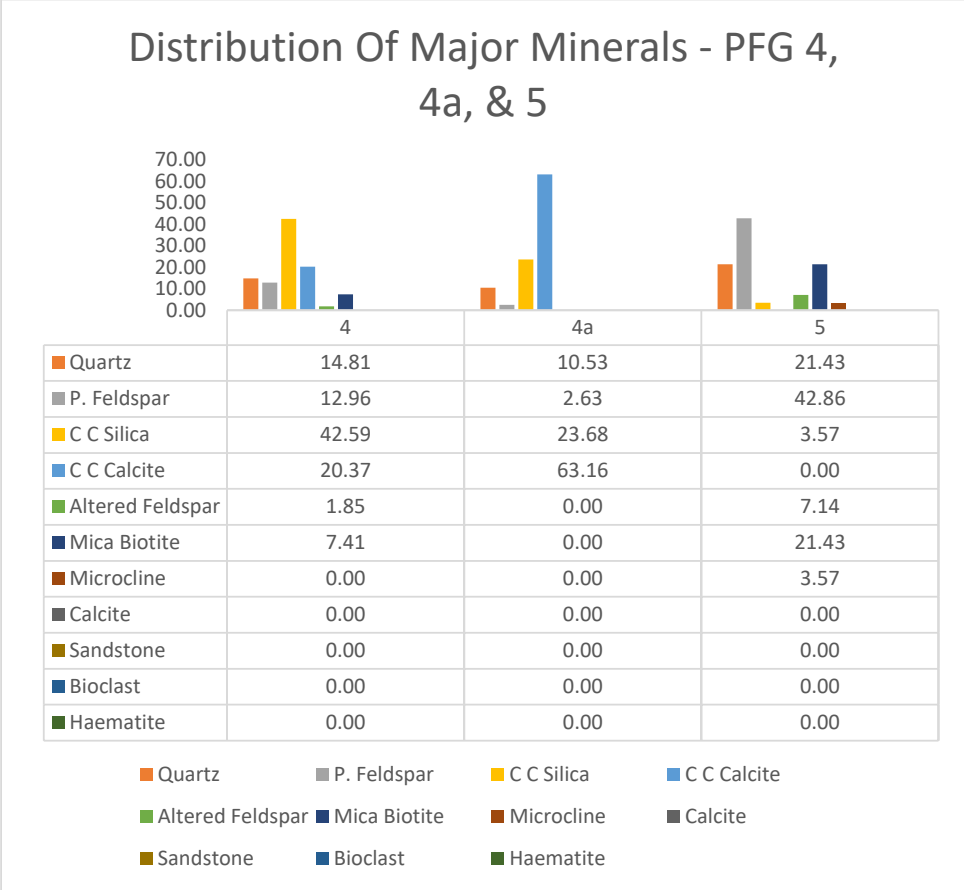
	1	2	3
Quartz	28.26	15.78	29.41
P. Feldspar	32.63	12.28	8.82
C C Silica	4.34	5.26	0.00
C C Calcite	2.17	35.08	20.59
Altered Feldspar	2.17	0.00	8.82
Mica Biotite	2.17	5.26	14.71
Microcline	0.00	0.00	0.00
Calcite	0.00	0.00	17.65
Sandstone	28.26	15.78	0.00
Bioclast	0.00	3.55	0.00
Haematite	0.00	7.01	0.00

Figure 4.98: Distribution Chart of Major and other Non-Plastic inclusions in Petro-Fabric Groups 1, 2 and 3



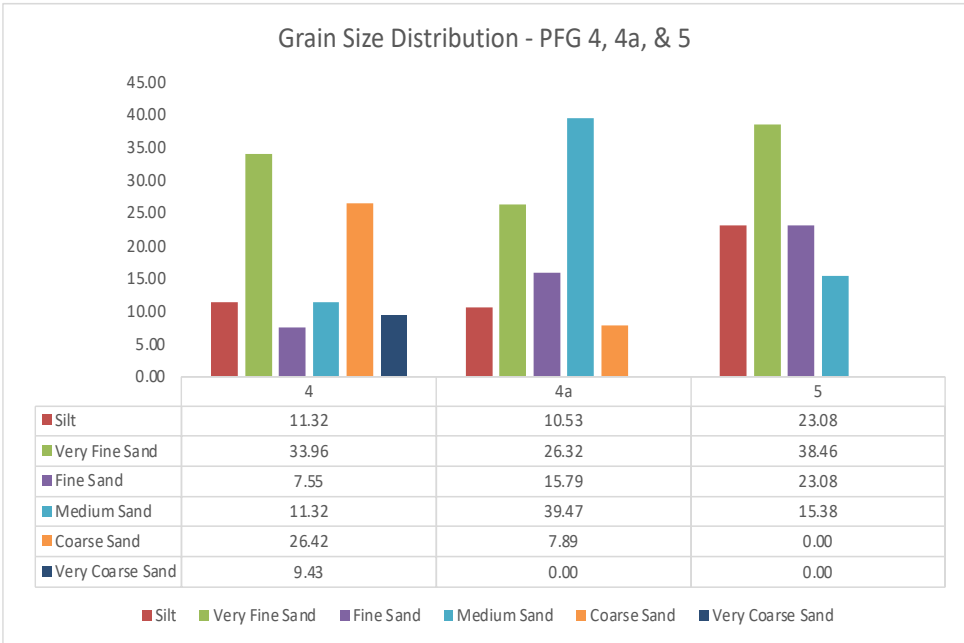
	1	2	3
Silt	0	3.4	9.09
Very Fine Sand	8.6	6.9	48.48
Fine Sand	60.8	62.1	36.36
Medium Sand	30.6	27.6	6.06
Coarse Sand	0	0	0.00
Very Coarse Sand	0	0	0.00

Figure 4.99: Grain Size Distribution of Petro-Fabric Groups 1, 2 and 3



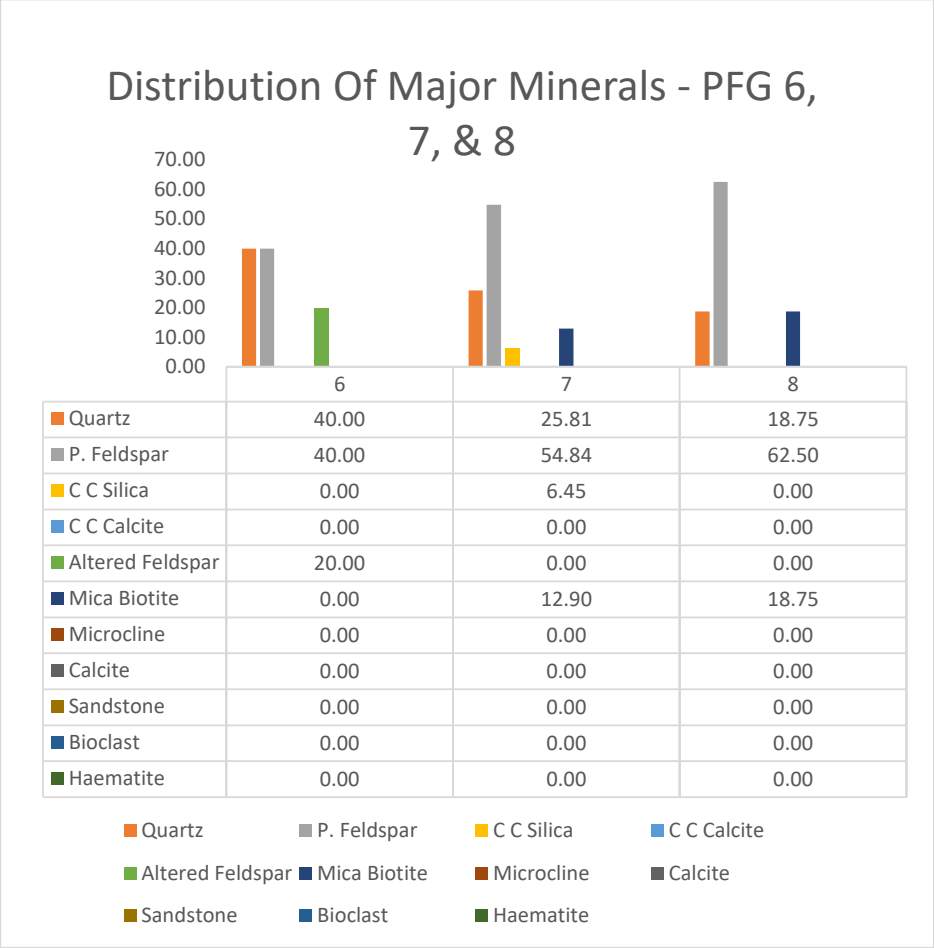
	4	4a	5
Quartz	14.81	10.53	21.43
P. Feldspar	12.96	2.63	42.86
C C Silica	42.59	23.68	3.57
C C Calcite	20.37	63.16	0.00
Altered Feldspar	1.85	0.00	7.14
Mica Biotite	7.41	0.00	21.43
Microcline	0.00	0.00	3.57
Calcite	0.00	0.00	0.00
Sandstone	0.00	0.00	0.00
Bioclast	0.00	0.00	0.00
Haematite	0.00	0.00	0.00

Figure 4.100: Distribution Chart of Major Minerals and other Non-Plastic inclusions in Petro-Fabric Groups 4, 4a, and 5



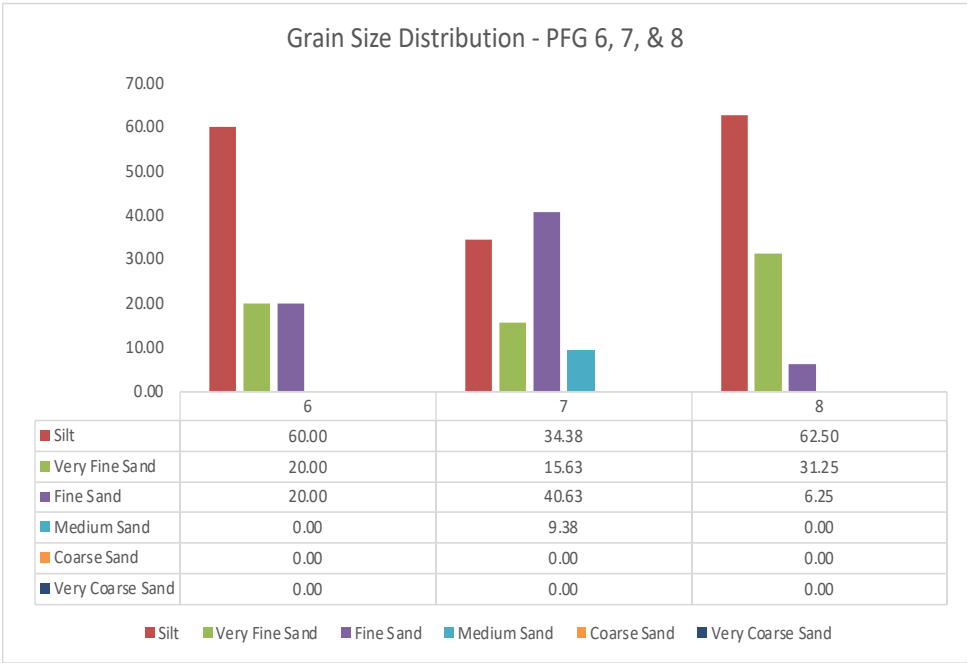
	4	4a	5
Silt	11.32	10.53	23.08
Very Fine Sand	33.96	26.32	38.46
Fine Sand	7.55	15.79	23.08
Medium Sand	11.32	39.47	15.38
Coarse Sand	26.42	7.89	0.00
Very Coarse Sand	9.43	0.00	0.00

Figure 4.101: Grain Size Distribution of Petro-Fabric Groups 4, 4a, and 5



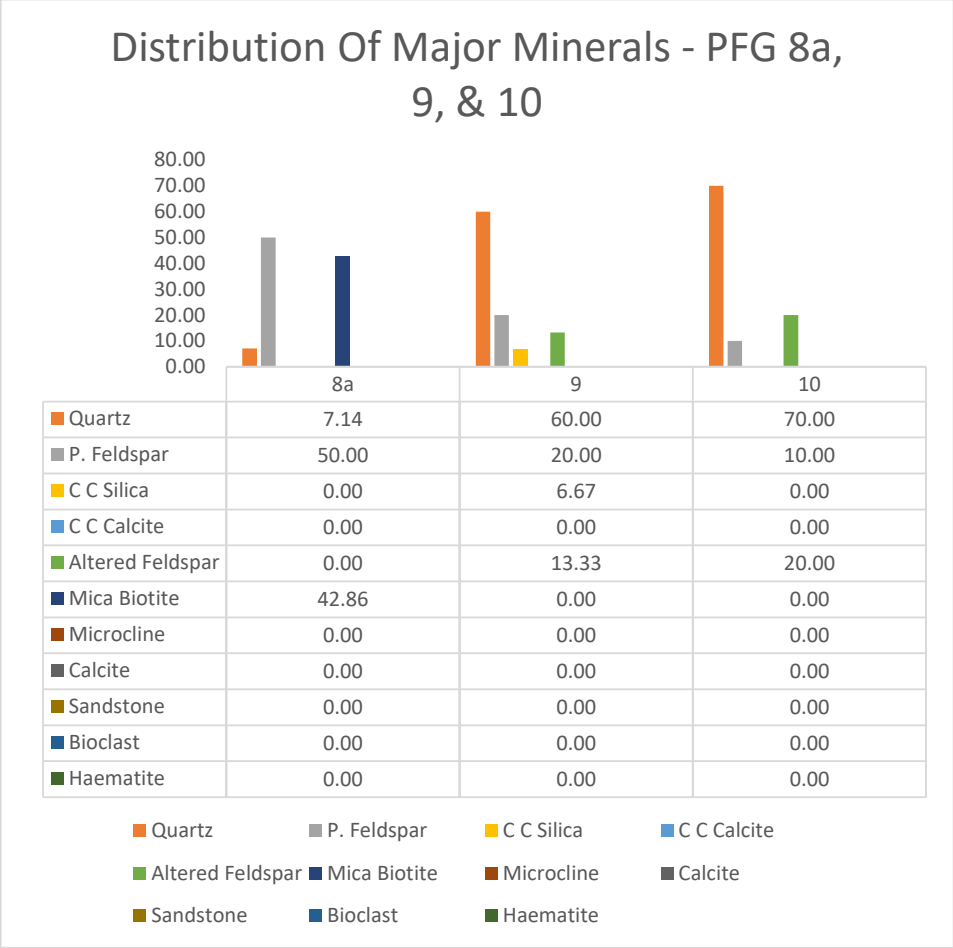
	6	7	8
Quartz	40.00	25.81	18.75
P. Feldspar	40.00	54.84	62.50
C C Silica	0.00	6.45	0.00
C C Calcite	0.00	0.00	0.00
Altered Feldspar	20.00	0.00	0.00
Mica Biotite	0.00	12.90	18.75
Microcline	0.00	0.00	0.00
Calcite	0.00	0.00	0.00
Sandstone	0.00	0.00	0.00
Bioclast	0.00	0.00	0.00
Haematite	0.00	0.00	0.00

Figure 4.102: Distribution Chart of Major Minerals and other Non-Plastic inclusions in Petro-Fabric Groups 6, 7, and 8



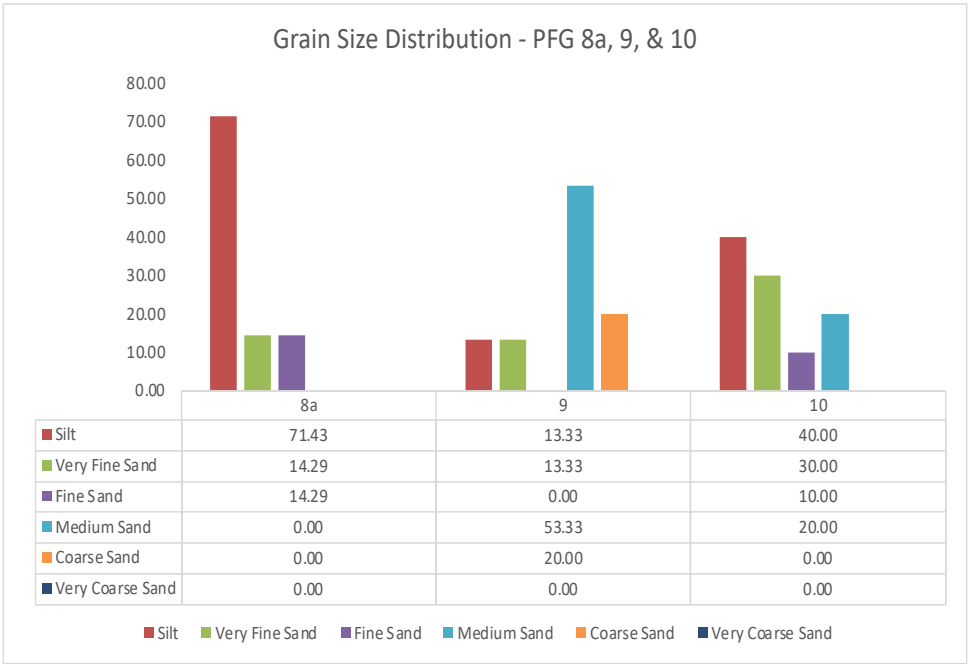
	6	7	8
Silt	60.00	34.38	62.50
Very Fine Sand	20.00	15.63	31.25
Fine Sand	20.00	40.63	6.25
Medium Sand	0.00	9.38	0.00
Coarse Sand	0.00	0.00	0.00
Very Coarse Sand	0.00	0.00	0.00

Figure 4.103: Grain Size Distribution of Petro-Fabric Groups 6, 7, and 8



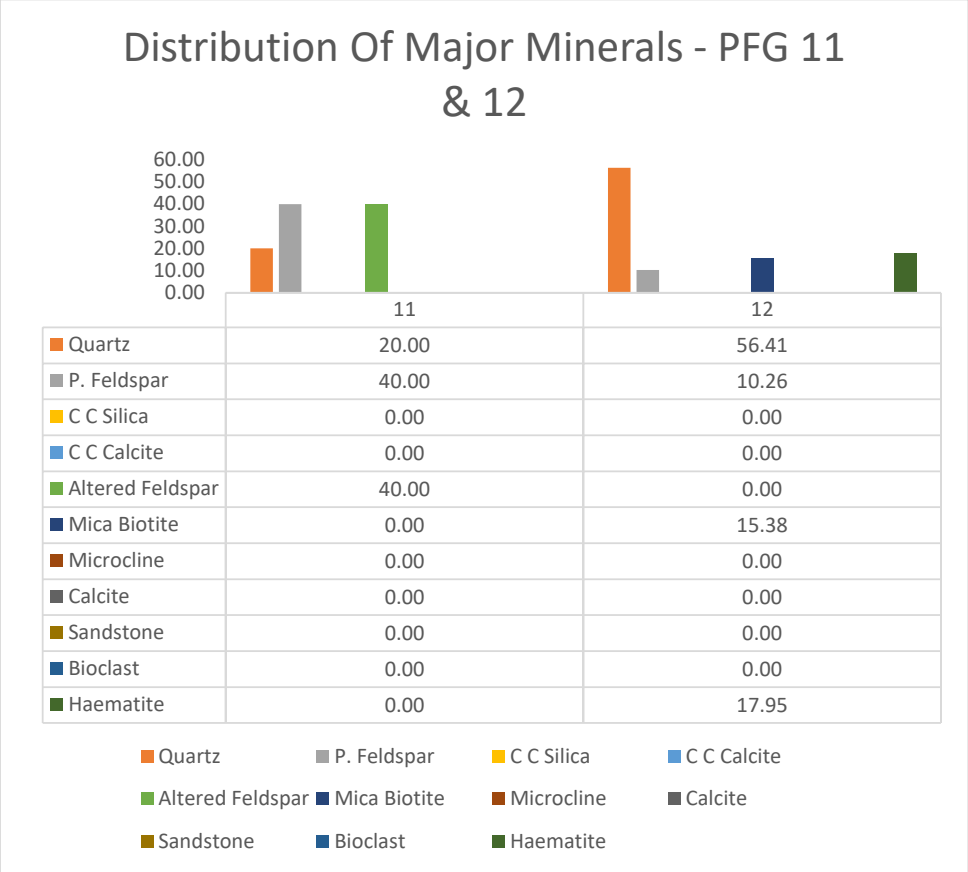
	8a	9	10
Quartz	7.14	60.00	70.00
P. Feldspar	50.00	20.00	10.00
C C Silica	0.00	6.67	0.00
C C Calcite	0.00	0.00	0.00
Altered Feldspar	0.00	13.33	20.00
Mica Biotite	42.86	0.00	0.00
Microcline	0.00	0.00	0.00
Calcite	0.00	0.00	0.00
Sandstone	0.00	0.00	0.00
Bioclast	0.00	0.00	0.00
Haematite	0.00	0.00	0.00

Figure 4.104: Distribution Chart of Major Minerals and other Non-Plastic inclusions in Petro-Fabric Groups 6, 7, and 8



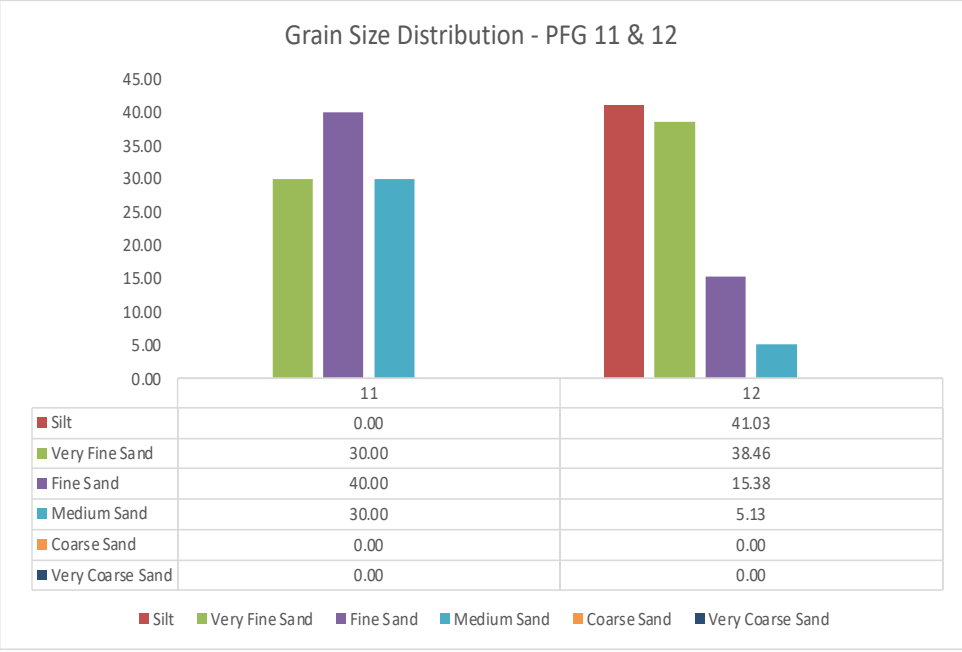
	8a	9	10
Silt	71.43	13.33	40.00
Very Fine Sand	14.29	13.33	30.00
Fine Sand	14.29	0.00	10.00
Medium Sand	0.00	53.33	20.00
Coarse Sand	0.00	20.00	0.00
Very Coarse Sand	0.00	0.00	0.00

Figure 4.105: Grain Size Distribution of Petro-Fabric Groups 8a, 9, and 10



	11	12
Quartz	20.00	56.41
P. Feldspar	40.00	10.26
C C Silica	0.00	0.00
C C Calcite	0.00	0.00
Altered Feldspar	40.00	0.00
Mica Biotite	0.00	15.38
Microcline	0.00	0.00
Calcite	0.00	0.00
Sandstone	0.00	0.00
Bioclast	0.00	0.00
Haematite	0.00	17.95

Figure 4.106: Distribution Chart of Major Minerals and other Non-Plastic inclusions in Petro-Fabric Groups 11, and 12



	11	12
Silt	0.00	41.03
Very Fine Sand	30.00	38.46
Fine Sand	40.00	15.38
Medium Sand	30.00	5.13
Coarse Sand	0.00	0.00
Very Coarse Sand	0.00	0.00

Figure 4.107: Grain Size Distribution of Petro-Fabric Groups 11, and 12

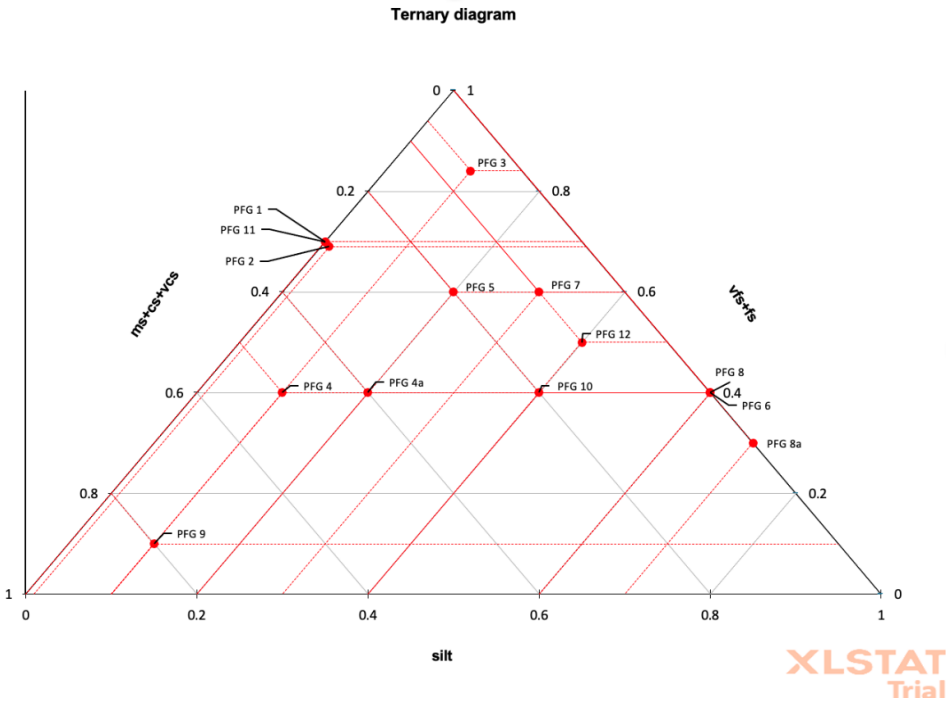


Figure 4.108: Ternary Diagram Textural Data of Petro Fabric Groups as derived from the Point Counting