

Kiln sites of the fourteenth–twentieth-century Julfar ware pottery industry in Ras al-Khaimah, UAE

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Summary

This paper presents a summary of the results of a study of four kiln sites of Julfar ware, a coarse ware that was produced in the Shimal area of Ras al-Khaimah (UAE) close to the historical site of Julfar between the fourteenth and twentieth centuries. The paper presents and analyses surface assemblages of pottery that were collected from each of the kiln sites. The kiln sites are described and an outline of the typology that was developed to catalogue the ceramic assemblage is presented. A seriation of the assemblage demonstrates a relative chronology of the four sites that can be linked to an absolute chronology using external data. Using the range of types at each kiln site as a proxy for the intensity of production suggests a peak of production in the fifteenth to sixteenth century contemporary with the main phase of occupation at historic Julfar, and contemporary with the widest distribution of Julfar ware around the western Indian Ocean. Analysis of the coefficient of variation of rim diameters from the most common types from three of the sites suggests related changes in the organization of production.

Keywords: medieval, Islamic, pottery kiln, Julfar, Ras al-Khaimah

Introduction

Julfar ware is a coarse earthenware that is known to have been manufactured from around the twelfth to the mid-twentieth century at a number of kiln sites in the Shimal area of northern Ras al-Khaimah in the United Arab Emirates (UAE). It is the most abundant ceramic class in almost all archaeological contexts in Ras al-Khaimah and surrounding areas from the fourteenth to the mid-twentieth century, and several manufacturing sites each consisting of numerous kilns have been located (Dostal 1983: 140 map 3; Stocks 1996: 155–157; Kennet 1994: 190; 2004: 53). In addition to its importance as the most common local earthenware, Julfar ware is known for its wide distribution across the Gulf and the western Indian Ocean. Despite its importance to both the economic history and the archaeological chronology of the region, however, the kiln sites and the associated remains of production have not been studied in detail.

In the autumn of 2011 a research project was initiated by Ron Hawker, Derek Kennet, and Jeff Szuchman to conduct a preliminary study of these kilns and their pottery. The project was generously funded by Zayed

University Research Incentive Fund and was supported by collaboration with the Department of Antiquities and Museums of Ras al-Khaimah. As this is the first attempt to study the kilns in detail, the principal aims of the research focused on providing a basis for future studies, namely: to conduct a quantified surface pickup of pottery from the kiln sites; to catalogue the collected material; to create a typology of the pottery taking into consideration previous work; to quantify and seriate this data in order to present a relative chronology of the kilns and the pottery, and to conduct preliminary analyses that would give an insight into the industry's development. The project results were analysed as part of an MA dissertation by Gen Mitsuishi at the Department of Archaeology, University of Durham (Mitsuishi 2012). This paper sets out the preliminary results of the project. A more detailed report is planned for the future.

Location

The emirate of Ras al-Khaimah is located at the lower end of the Arabian Gulf, occupying the northern corner of the UAE (Fig. 1). The mountains known as the Ru'us al-Jibal

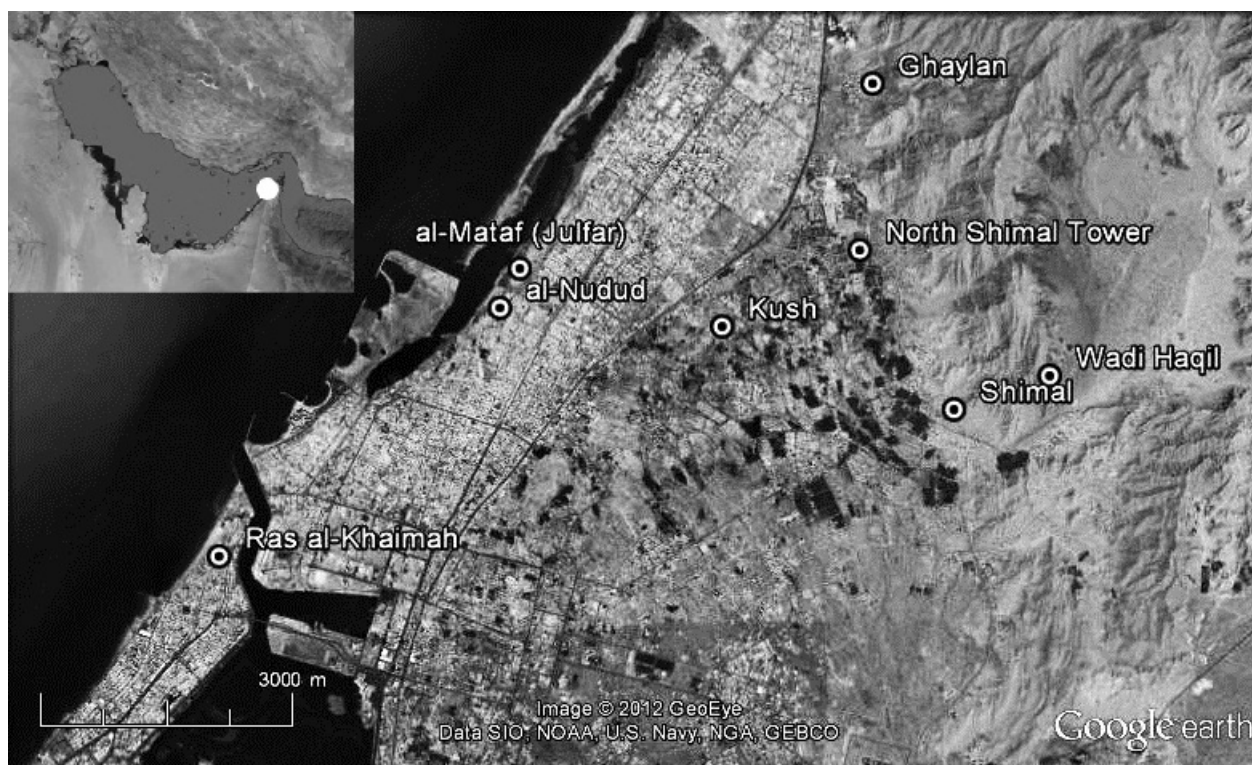


FIGURE 1. *A satellite image showing the location of the four kiln sites.*

run north to south parallel to the coastline, dominating the geography of northern Ras al-Khaimah. To the west of the mountain range, along the coast, lies a semi-fertile coastal plain known as the Sir and Jiri plains. To the west of this is located the modern city of Ras al-Khaimah. Approximately 6 km north of the city lie the sites of al-Mataf and al-Nudud, together identified as the historical site of 'Julfar'. A series of excavations has been carried out at this site since 1973, which have revealed its status as the largest urban centre in the area from the fourteenth to the sixteenth centuries (Ṭaha 1975; Hansman 1985; King 1990; 1991; 1992; Sasaki & Sasaki 1992; Sasaki T 1993; Kennet 2003; Morley, Carter & Velde 2011). The Julfar ware kilns are located to the east of Julfar, along the foot of the mountain range, roughly 8 to 10 km north-east of the modern city of Ras al-Khaimah. Between the kilns and the site of Julfar lies Kush, an archaeological tell dating from the Sasanian period to the thirteenth century, where the earliest examples of Julfar ware have been found (Kennet 1997; 2004: 53).

Regional history

The area of Ras al-Khaimah where the Julfar ware kilns are situated has had a close relationship with maritime trade throughout history because of its strategic location close to the Straits of Hormuz. Excavations at Julfar have shown that the site developed from a small coastal fishing village in the fourteenth century to a large urban centre by the fifteenth century, with a dense network of houses and streets (Kennet 2003: 118–119). As the urban centre of al-Mataf grew, rural activity in the hinterland also increased dramatically, probably due to the area's role as a supplier of agricultural products to the growing population of Hormuz (Kennet 2002: 161). Evidence shows that proximity to Hormuz greatly affected the area during the fourteenth to sixteenth centuries, when trade through Hormuz boomed in response to the prosperity of contemporary Iranian cities (2002: 161). This seems to have led to a transformation in the socio-economic structures of the region including the Julfar ware ceramic industry, as will be discussed later in this paper.

Al-Mataf was abandoned by the late sixteenth century (Kennet 2003: 117) and it is likely that the population then shifted to Ras al-Khaimah town, which succeeded al-Mataf as the main urban centre and port of the area (Hansman 1985: 10). Much less is known archaeologically about the period post-dating the abandonment of al-Mataf, as there is no excavated sequence for this time (Kennet 2004: 21). It is known, however, that the level of rural activity remained high even after the abandonment of Julfar (Kennet 2002: 161).

Julfar ware

Julfar ware is a handmade or slow-wheel-made unglazed, coarse earthenware with a dark orange or grey body and a rough, hackly fracture. It has a soft fabric that contains frequent distinctive red, white, and/or black platelets of approximately 2 to 4 mm in size. The body can be plain or decorated with rust-red or purple paint sometimes on top of a whitewash or thin paint. The majority of the forms are cooking pots, while a certain amount of bowls, jugs, and storage jars were also manufactured.

This ware was first reported by de Cardi during her 1968 survey of Northern Trucial States (de Cardi & Doe 1971: 269), and later studied in more detail based on the material from the excavations at al-Mataf and in Ras al-Khaimah town by Hansman (1985: 60–66). The most comprehensive study on Julfar ware to date is the work by Kennet (2004: 53–56), which has produced a systematic classification of Julfar ware and has shown the transition of forms through the Kush and al-Mataf sequences as well as setting out a possible sequenced typology for the post-al-Mataf period based on surface collections.

Kiln production sites have been reported from a number of locations in the Shimal area of Ras al-Khaimah by both Dostal (1983: 140 map 3) and Stocks (1996: 155–157). In some cases it was possible to relocate these sites, in others they have disappeared. In many cases it is not very clear from these two publications what the evidence for pottery production was. Apart from the four sites covered in the present paper, other sites mentioned in these publications either consist of relatively small-scale production of a single kiln, or the evidence for pottery production is not clear on the ground. For these reasons these sites are not included in the present study, although a fuller analysis of pottery production in this area would need to include them.

Julfar ware has been reported from a wide area across the western Indian Ocean from sites which include Kilwa, Tanzania (Chittick 1974: 331), the Eastern Province of

Saudi Arabia (Potts *et al.* 1978: pls 17, 250, 251), Bahrain (Larsen 1983: 292; Frifelt 2001: 93–95), Yemen (Kennet 2004: 53), the southern coast of Iran (Priestman 2005: 226–229), and Al-Ain in the UAE (Power & Sheehan 2012: 295, fig. 4).

Methodology

During the present study four previously known kiln sites, Ghaylan (Stocks 1996: site 141), Shimal (Dostal 1983: ‘Sharqe’; Stocks 1996: site 22), North Shimal Tower, and Wadi Haqil (Dostal 1983: ‘Hadjer’; Stocks 1996: sites 49–61) were visited and explored. The presence of abundant wasters from Ghaylan, Shimal, and Wadi Haqil had been confirmed during a preliminary visit in October 2011. The North Shimal Tower (NST) site was visited based on the information supplied by Christian Velde.

Timed pottery pickups were conducted at each site. The pickup was carried out by walking across each area for ten to fifteen minutes. Due to time restrictions, the pickups were limited to diagnostic sherds (i.e. rims, spouts, handles, decorated sherds) although wasters were also collected. Sherds that were clearly not Julfar ware were not collected.

It must be noted that the numbers of collected sherds differ greatly between sites. While a total of 1095 sherds were collected from Ghaylan, only 204 sherds were collected from Wadi Haqil, mainly due to the lack of material remaining on the surface. This means that some of the results of the analyses must be treated with caution. At Shimal and at Wadi Haqil, where the location of individual kilns was identifiable, sherds were collected separately from each kiln to allow possible differences to be investigated.

The sherds were then classified into a typology, primarily based on rim and handle forms. Fabric was on the whole not used in defining the typology since no coherent distinctions were noted that could be reliably made using a X10 magnification hand lens. Differences in style and decoration were recorded and categorized independently from the typology because some rim and handle forms cross-cut styles and decoration. Lids were left uncategorized in this study because they demonstrated a wide variety of forms and defining any reliable type was not possible at this stage. A total of 139 rim sherds (9.6% of the whole assemblage) were left unclassified after defining the typology.

All sherds were then recorded in a database that included data on provenance, type, style, and decoration, and rim diameter in the case of rim sherds from Ghaylan,

Shimal, and Wadi Haqil. Selected sherds were drawn and photographed. The assemblages were quantified by counting individual sherds.

Kiln Sites

Ghaylan (GLN) UTM 40 R 402350/2859400

The kiln site of Ghaylan is situated approximately 9.5 km north-east of the modern city of Ras al-Khaimah (Fig. 1). It is the northernmost kiln site of the known Julfar ware kilns. The site measures 160 m north-east to south-west and 200 m north-west to south-east, and abundant sherds and wasters are found across all parts of the site. The kilns were located just behind the modern village of Ghaylan. Four areas of concentrated pottery scatters have been identified at the site (Fig. 2). Three areas (GLN-1, 2, 3) are located on the steep, rocky slopes above and immediately behind the village, while the largest (GLN-4) is located at the foot of the slope and consists of a large flat mound of kiln debris, possibly as much as 2 m deep in some places, covering an area of almost 1 ha, on top of which a number of modern structures have been built.

The exact location of the kilns and how many kilns were in use at this site is not clear. Only one kiln at GLN-1 is visible on the surface although wasters were found in abundance in all areas.

North Shimal Tower (NST) UTM 40 R 402300/2857550

The site of NST is situated 8.5 km north-east of the modern city of Ras al-Khaimah (see Fig. 1). An area of sporadic

scatters of pottery sherds, measuring 100 m north to south and 120 m east to west, spreads just north of a late Islamic tower. While other kiln sites are located very close to the mountains, NST is located on the flat plain a little more than 0.5 km away from the foot of the mountain. The site is more eroded than the other sites, and no kiln structures are visible on the surface. In addition, the pottery scatter is much less dense compared to Ghaylan and Shimal. Roughly 10% of the sherds collected at this site were made up of wasters, however, suggesting the certain existence of kilns in this area.

Shimal (SHI) UTM 40 R 403400/2855600

The site of Shimal is situated at the foot of the mountain range, 9 km north-east of the modern city of Ras al-Khaimah. The kiln field is located on the plain right at the foot of the hills, measuring 140 m north-east to south-west and 105 m north-west to south-east. The locations of individual kilns are recognizable, as each kiln forms a small 'doughnut mound' with a hollow centre. In some cases, the stone structure of the kiln can also be recognized. There were approximately twenty kilns in the area, of which eleven were studied.

Wadi Haqil (WHQ) UTM 40 R 404500/2855900

The site of Wadi Haqil is situated at the foot of the mountain range, just to the north of the entrance to the round valley of Wadi Haqil (see Fig. 1). It is 10 km north-east of the modern city of Ras al-Khaimah. It has two groups of kilns, one large group in the north and a smaller group in the south, approximately 200 m away from each other. The

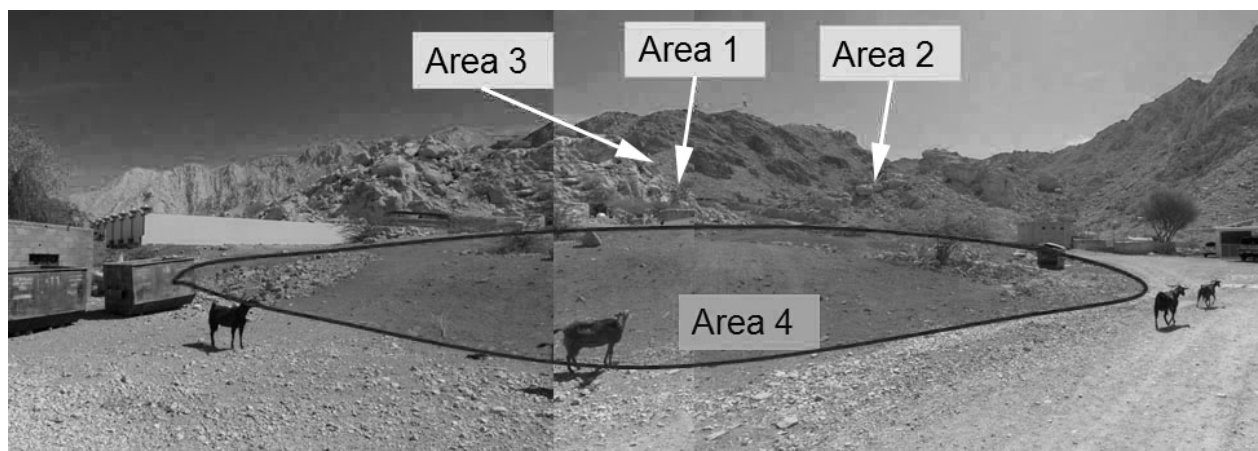


FIGURE 2. A panoramic view of Ghaylan looking westwards, showing the four kiln areas at the site.

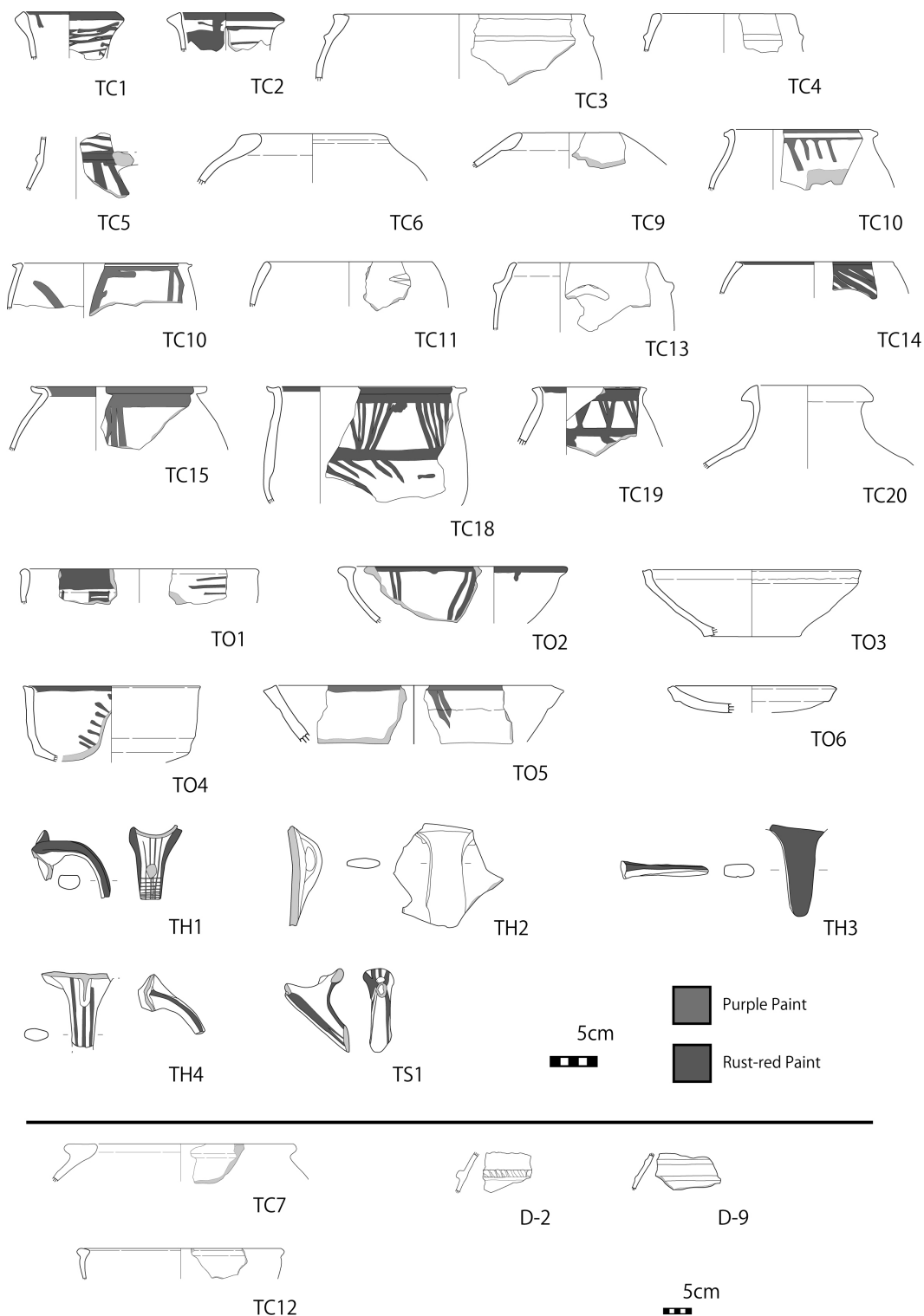


FIGURE 3. Typical examples of the key pottery and decoration types defined during the study.

Styles with painted decoration	
S-1	This style has a whitewashed surface on which decoration is painted with rust-red paint. The surface colour beneath the whitewash is mostly dark orange, although a grey surface is occasionally noted.
S-5	This style has decoration in rust-red paint on a dark orange surface. The surface is not whitewashed and the decoration is painted directly on the plain surface.
S-7	This style has decoration painted in purple on a dark grey surface. There is no whitewash on the surface.
Styles without painted decoration	
S-2	This style has a whitewashed surface but no painted decoration.
S-3	This style has no painted decoration and no whitewash. The surface colour is dark orange.
S-4	This style has no painted decoration and no whitewash. The surface colour is grey.

FIGURE 4. *Julfar ware pottery styles.*

larger group measures approximately 120 m from north-east to south-west and 60 m from north-west to south-east. The smaller group is approximately 70 m from north-east to south-west and 35 m from north-west to south-east. The kilns at Wadi Haqil are the best preserved of the four sites, and in a number of cases the entire structure and layout of the kilns is still visible. Approximately twenty kilns were recorded, eight of which were studied. Pottery manufacture is recorded to have continued at this site until 1969 (Hansman 1985: 64).

Typology

The key types of Julfar ware defined by the study are illustrated in Figure 3.

Style

In addition to the typology based on rim form, all sherds were classified into six different style classifications, based on differences in surface colour, surface treatment, and the colours used for the painted decoration. This was done because many forms cross-cut different styles. The six styles can be divided into two groups depending on the presence or absence of painted decoration as shown in Figure 4.

Types

Altogether twenty-nine rim and handle types were defined. Single examples are shown in Figure 3 and a brief description is given in Figure 5.

Decoration

Due to time limitations, decoration was not fully categorized during this study, but two distinctive decorations were identified and are described in Figure 6.

Analysis

Dating and chronology

In order to understand the chronological order of the sites, a seriation was attempted based on the occurrence of types at the four sites. The result yielded a clear sequence with some overlaps (Fig. 7), suggesting that there is a chronological progression between sites and — with some overlap — that the main centre of production moved from one site to another during the course of the industry's development.

The assemblages of GLN-1, 2, and 3 are very similar to each other, suggesting that the three areas were more or less contemporary. Clear overlaps are seen between these three areas and GLN-4, while GLN-4 also has types overlapping with Shimal and NST. The assemblages of NST and Shimal also overlap with Wadi Haqil. In contrast, very few overlaps are observed between the assemblage from GLN-1, 2, 3 and Shimal, and no types overlap between GLN-1, 2, 3 and Wadi Haqil. Considering that the kilns of Wadi Haqil continued manufacturing until the 1960s (Hansman 1985: 64), the relative chronology of the sites can thus be set in the following order: 1) GLN-1, 2, and 3; 2) GLN-4; 3) Shimal and NST; 4) Wadi Haqil.

Lacking any excavated sequence, the absolute dating or the length of time during which the kiln areas operated is not clear. Nevertheless, the above sequence can be linked to external dating evidence, which confirms that it is broadly correct.

First, parallels of the most common types at Ghaylan, such as TC1 and TC4, are abundantly found at Julfar (de Cardi & Doe 1971; Hansman 1985; Kennet 2004; Saunders, forthcoming), suggesting a rough date for Ghaylan contemporary with the main occupation of Julfar. Furthermore, cooking pots with everted, notched rims designed to hold lids, as well as the lids themselves

Closed vessels	
TC1	Small, narrow-necked jar or jug with clubbed rim and painted horizontal linear decoration. All sherds of this type are in style S-1. It is similar to TC2 but can be distinguished by its smaller diameter and smaller clubbed rim. The similarity of sherds of this type to the rim of the bridge-spouted jugs found at other sites (Hansman 1985: fig. 17/b; Frifelt 2001: 94) suggests that some sherds of this type are from bridge-spouted jugs, together with TC5, TS1, and TH1.
TC2	A jar with a clubbed triangular rim. It is similar to TC1 but has a larger diameter and a bigger rim. Rim sherds with a similar form but without painted decoration are classified as TC20. All sherds are in style S-1. Some sherds also have decoration painted on the interior.
TC3	Cooking pot with a clubbed rim and a continuous horizontal ridge 2–3 cm below the rim. It is similar to TC4 but can be distinguished by its clubbed rim. Most sherds are in style S-2. Some sherds bear small lugs at opposite points on the ridge.
TC4	Cooking pot with a continuous horizontal ridge 2–3 cm below the rim. Most sherds are in style S-2. Some sherds bear small lugs at opposite points on the ridge. TC4 is classified as CP1.2 in Kennet's typology (2004).
TC5	Body sherd with an angular ridge. It is likely to be part of a long-necked jug. All sherds of this type have style S-1.
TC6	Storage jar with a thickened rim. It is similar to TC7 but smaller, and the rim is not as wide as TC7. It is mostly in style S-2.
TC7	Storage jar with a flat, wide thickened rim. The rim is wider and generally larger than TC6. It has no decoration. It varies widely in size, ranging from 12 to 38 cm in rim diameter.
TC9	Hole-mouth jar with rim thickened in the inside. It has no decoration and the surface is grey or dark orange. This type is only found at GLN-4.
TC10	Cooking pot with an everted, slightly troughed rim, designed most probably to hold a lid. Of the cooking pots with everted and troughed rims, sherds that could not be classified into any further subdivision (TC14, TC15, TC18, and TC19) were all included in TC10, hence there is a wide variation in the form of this type, which needs further refinement of typology in the future. The majority of the sherds have style S-7, although some sherds do not have any decoration. It is a subdivision of Kennet's CP4.1 (2004).
TC11	Cooking pot with a slightly in-turned rim. The rim end stretches straight and is not everted. It has a triangular lug 2–3 cm below the rim. It does not have painted decoration. It is classified as CP1.1 in Kennet's typology (2004).
TC12	Large cooking pot with a heavy clubbed rim. The rim top is mostly flat. The wall of the body stands up almost vertically. Most sherds have a whitewashed surface. This type only appears in the material collected at GLN-4 and NST.
TC13	Cooking pot with an incurved rim formed by a deliberate and very evident bending of the wall just below the rim. Many sherds of this type have a triangular lug similar to TC11. This type was classified as CP5.1 in Kennet's typology (2004: 56). The majority of the sherds are in style S-4, although there are some examples of style S-2 and S-3.
TC14	Cooking pot with a slightly troughed rim, possibly designed to hold a lid. Some have the top of its rim slightly everted. Most of the sherds are in style S-7.
TC15	Cooking pot with an everted and slightly troughed rim. It is a subdivision of Kennet's CP4.1, and it can be distinguished from other types by its sharply everted rim form. The majority of the sherds are in style S-7.
TC18	Ovoid-shaped cooking pot with an out-curved rim with a slight trough to hold a lid. This type has a distinctive triangular shape of rim that can be found only at Wadi Haqil. The majority of the sherds are in S-1 or S-5.
TC19	Cooking pot with an out-curved rim. The rim top mostly does not have a trough. Almost all sherds are in S-1.
TC20	Clubbed rim sherd with triangular rim. It is similar to TC2 but it is slightly larger and has no decoration. This type is only found at GLN-1.
Open vessels	
TO1	Curve-sided bowl with vertical thickened rim. The majority of the sherds are in S-1. While the decoration on the exterior is quite consistent, the decoration on the interior varies widely.
TO2	Curve-sided shallow bowl with a flanged rim. Most of the sherds are in S-1. The decoration is painted mainly on the interior and the decoration pattern varies widely.
TO3	A bowl with an unsmoothed exterior and painted interior. It has a flat base and the rim has a shallow trough to hold a lid. The exterior of the bowl is roughly potted and no attempts of smoothing can be seen below a slight carination around the neck.
TO4	Bowl with a vertical wall and a slightly everted rim. The exterior surface is left unsmoothed and undecorated. Simple linear decoration is painted on the interior.
TO5	Large bowl with a straight thick wall and a slightly troughed rim.
TO6	Shallow bowl with a folded rim. It has a smoothed interior but the exterior is left unsmoothed. Most of the sherds have no decoration.
Handles	
TH1	Painted handle with a small knob on the top surface. It has a flattened oval section. All sherds are in style S-1.
TH2	Short and wide handle with a thin oval section. All sherds are in S-2.
TH3	Straight flat handle with a flattened oval section.
TH4	Handle with a raised midrib on the upper end of the handle. Most of the sherds are in S-1.
Spouts	
TS1	Spout supported by a flattened bridge stretching from the neck of a jug. A small knob is attached on the bridge. All sherds are in S-1.

FIGURE 5. *Julfar ware pottery types.*

D-2	Horizontal cordon decoration pinched out by hand from a belt of clay attached around the body. The decoration might be linked with a specific type, although only one example remains with the rim, and therefore the link is unclear. The sherds are mostly in style S-4.
D-9	A plain horizontal belt of clay attached around the body. Occasionally, two belts run parallel to each other. The sherds are mostly in style S-3.

FIGURE 6. *Julfar ware pottery decoration.*

	TC20	TC5	TH2	TC3	TC4	TC2	TH4	D-2	TC1	TS1	TH1	TC2	TC1	TC6	TC7	TC11	TC9	TC12	D-9	TC13	TC15	TC14	TC3	TH3	TC10	TC6	TC4	TC5	TC18	TC19	Others	Total	
GLN-1	9	2		53	112	3	2	14	15	20	11			10	4																16	271	
GLN-2		1	2	23	65	4	1	10	7	10	5	3		3	11	1															19	165	
GLN-3				14	34			4	1	1		1	3																		11	69	
GLN-4				4	28	1	2	9	49	28	39	21	2	22	15	21	4	16	5	4		2	1		7						81	361	
NST-Gen														2	3		1			2			3	1	86						28	126	
SHI-Gen																1				7		1	1	14							5	29	
SHI-Z6																				21	7	15	2	7							29	81	
SHI-T2															1					27	3	6	10								13	60	
SHI-Z11																				19	1		5	6							25	56	
SHI-Z1																				11	1	2	2	6							14	36	
SHI-Z2								2												21		4	6	2							20	55	
SHI-T6																1				9	1	8	1	5							6	31	
SHI-T5																				2	1		3	2							9	17	
SHI-Z10																		1		1	1	2	2	2	13	1					10	33	
SHI-T3																				2			4	33							11	51	
SHI-T4								1									1			5				10							3	20	
SHI-T1																						2	4	2	22						14	44	
SHI-Z5																				1	1	5		31							28	66	
WHQ-Gen																									8	1	3		2	1	8	23	
WHQ-T1																									1			2	1		7	11	
WHQ-T2																							2	5				4			16	27	
WHQ-T3																						1		3				1			4	9	
WHQ-T4																											3	2	2		9	16	
WHQ-T5																						1		3	1						7	12	
WHQ-T6																								3			1				1	5	
WHQ-T7																								11				3			13	27	
WHQ-Z1																								2							1	12	15
WHQ-Z3																									1	13	1	1	3	3	8	30	
WHQ-Z5																									3		1		1		23	29	
Total	9	3	2	94	239	8	5	40	72	59	55	25	5	37	35	25	4	17	7	130	18	42	37	12	306	4	3	9	15	8	450	1775	

FIGURE 7. *A seriation of the surface assemblages, classified by type, from the four kiln sites.*

(e.g. TC10, TC11, TC14, TC15, TC18, TC19), which are known to be completely absent from the assemblages at Julfar (Kennet 2004: 54), are similarly absent at GLN-1, 2, and 3 and are found only in a relatively small quantity at GLN-4. Meanwhile, sherds with such rims and lids appear abundantly at other sites. Hence the shift of production from Ghaylan kilns to Shimal and NST is likely to have occurred after the abandonment of Julfar in the late sixteenth century.

Second, another set of evidence is provided by the recently reported late Islamic ceramic sequence at Al-Ain (Power & Sheehan 2012: 294, fig. 3). At Al-Ain, TC4 was found in the sixteenth- to early seventeenth-century assemblage, TC13 was found in the late seventeenth- to eighteenth-century assemblage, and TC10 was found in the late nineteenth- to twentieth-century assemblage. This corresponds well with the relative chronology suggested by the seriation of the kiln sites. Some uncertainty remains,

however, as there is a gap between the occurrence of TC13 and TC10 in the sequence from al-Ain, while TC10 and TC13 both occur at Shimal in abundance.

Changes in production

A preliminary analysis of the occurrences of types at each of the four sites shows clear differences and suggests changes in the nature of production through the industry's history.

The production of two types, TC3 and TC4, were the main output at GLN-1, 2, and 3, together accounting for more than 60% of the whole assemblage. The proportion of TC3 and TC4, however, fell sharply at GLN-4 to 1.28% and 8.95% respectively. Instead, many new types appear and the range of variety widens considerably at GLN-4. Notably, TC1, which is the most common type at GLN-4, accounts for only a little more than 15% of the

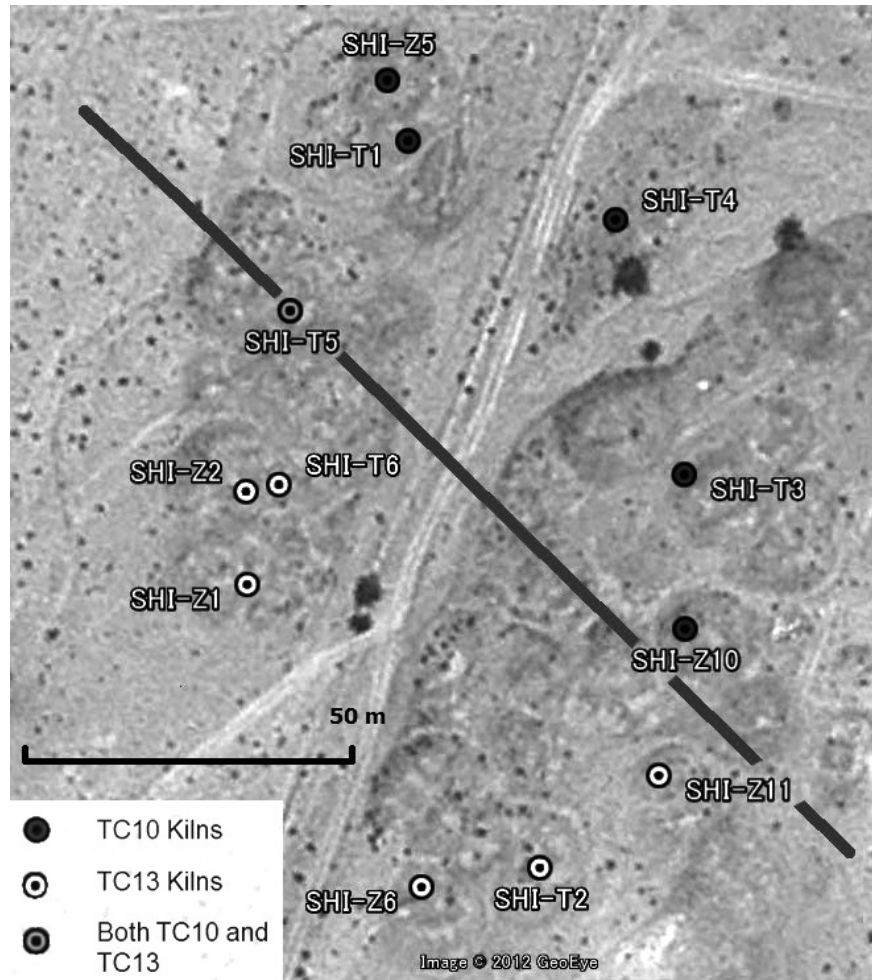


FIGURE 8. A satellite image of the Shimal kiln site showing the distribution of kilns with assemblages dominated by TC10 and TC13 (north is to the top of the picture).

whole assemblage, illustrating that the diversity of types at GLN-4 was much greater. Although no data exists on the scale of production at present, the wider variety of types produced at GLN-4 seems to suggest an expansion of production during this stage.

There is a significant change in production again at Shimal and NST, where the production seems to have been narrowed down to certain limited types. TC13 and TC10 are the two most common types at Shimal, together accounting for more than 60% of the whole assemblage. Similarly, at NST TC10 accounts for almost 70% of the assemblage. While remembering that TC10 is something of a ‘catch-all’ type (see above), a sharp contrast can

nonetheless be observed in the diversity of types between GLN-4 and Shimal/NST. The decline in variation at Shimal and NST might be taken to indicate a reduced output and a more narrowly focused market compared to GLN-4.

The production becomes a little more varied again at Wadi Haqil and a number of new types appear during this stage. Wadi Haqil shows a relatively high proportion of unique sherds that were not designated a type. This is primarily due to the lack of sufficient surface material at Wadi Haqil, although it might also represent a wider variety of production at Wadi Haqil.

Shimal North and Shimal South

The comparison of the occurrence of types at the individual kilns at Shimal suggests that the kilns at Shimal can be divided into two groups, each of which is focused on a single type.

While the proportion of TC10 supersedes that of TC13 considerably at kilns Z5, T1, T4, T3, and Z10, the proportion of TC13 supersedes that of TC10 at kilns T6, Z2, Z1, Z11, T2, and Z6. Plotting the locations of these kilns on the map, it is clear that these differences in production are linked to geographical location within the kiln field. The kilns that focused production on TC13 are concentrated in the south and the kilns that focused production on TC10 are concentrated in the north (Fig. 8).

This difference between the two groups may represent a chronological order or it may represent a difference in the organization of the kiln field. The late Islamic ceramic sequence at Al-Ain has shown that TC13 predates the occurrence of TC10 (Power & Sheehan 2012: 294), which may imply an earlier date for the southern kilns producing TC13 compared to the kilns producing

mostly TC10. Questions remain, however, as there is a contradiction between the coexistence of TC13 and TC10 at almost all kilns at Shimal, and a gap of roughly half a century between the two types in the Al-Ain sequence. At this stage, therefore, no final interpretation can be made of the difference between the two kiln groups at Shimal.

It is interesting that significant similarities can be identified between the production pattern of the northern kilns of Shimal and NST. The similarity seems to suggest a stronger link between the northern kilns of Shimal and NST than between the northern and southern kiln groups at Shimal.

Analysis of rim diameter

A comparison of the degree of variability of rim diameters was also conducted in the hope of gaining some preliminary insight into the organization of production at each site. For this purpose, the coefficient of variation (C.V.) on rim diameters, an index used to show compositional homogeneity in a group (Blackman, Stein & Vandiver 1993: 68), was calculated for the most common types at each kiln. C.V. can be calculated by

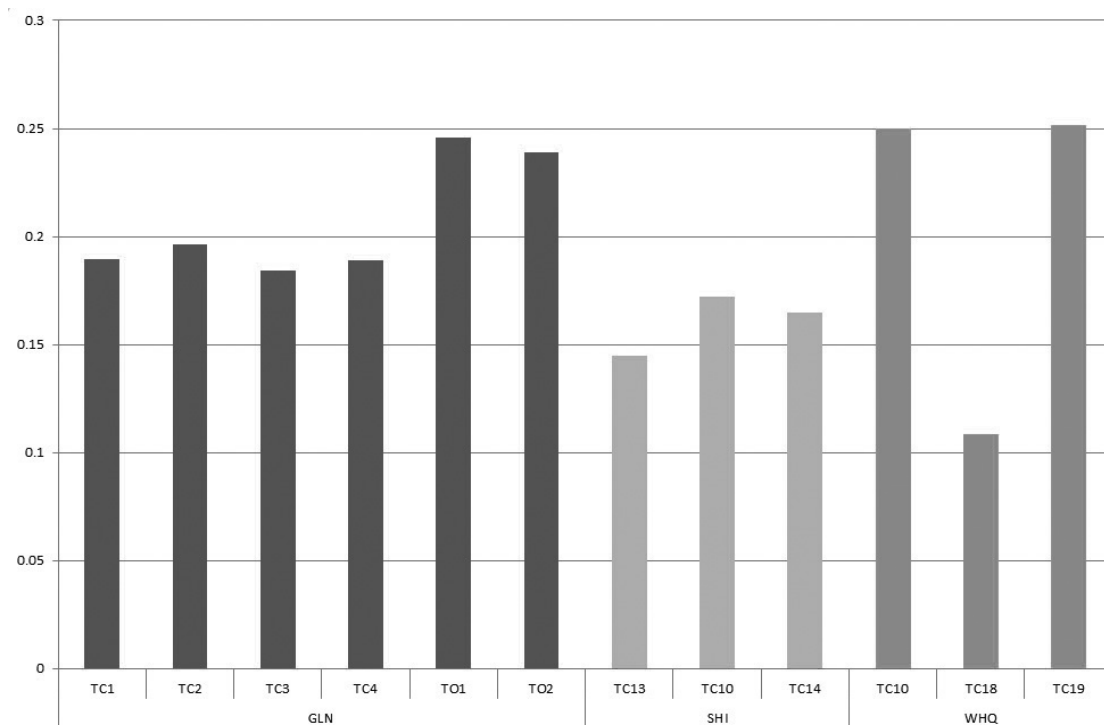


FIGURE 9. A graph showing the coefficient of variation (C.V.) of rim diameters based on the most common types from three of the kiln sites.

dividing the sample standard deviation by its mean. C.V. is a value that lacks any meaningful unit, but can be used to compare values across different types. Ideally, multiple measurements should be made on different parts of the body and the values cross-checked. Due to time limitations, however, only the rim diameter was measured and used for this analysis. Similarly, due to lack of time NST was not included in this analysis.

The results (Fig. 9) show that C.V. value is comparatively low at Shimal, indicating higher levels of homogeneity within this site, while the values are generally higher at Ghaylan. Comparatively low C.V. value at Shimal might imply higher levels of standardization and more centralized organization of production at this site, although it can also be merely a result of less ‘cumulative blurring’ of multiple production events (Blackman, Stein & Vandiver 1993: 74), meaning a shorter duration of manufacturing. Inconsistency in the results at Wadi Haqil may be due to the low number of sherds collected. The marked rise in C.V. value of TC10 from Shimal to Wadi Haqil, however, might suggest that the production was more varied at Wadi Haqil than at Shimal.

Discussion

The precise scale of production at the kilns remains unclear. As has been mentioned above, the wide variety of products at GLN-4 might suggest that it marks the peak production and a time during which the widest and most varied market was being serviced. At Ghaylan, twenty-three types of pottery were defined while only seven to eleven types were defined at the other three sites. This is not surprising, considering the proximity of Ghaylan kilns to the site of Julfar, which was a rapidly developing, wealthy trading town during this period. The period when Julfar was at its peak was a time of great expansion of interregional trade in the Gulf (Williamson 1973: 54). A rapid increase in the level of activity has been suggested, not only at Julfar, but also in its hinterland as well as other parts of the Gulf littoral (Williamson 1973: 57; Kennet 2002: 161). This was a response to the expansion of trade in the Gulf stimulated perhaps by the prosperity of Hormuz, and it has been suggested that Julfar and its hinterland were among the Hormuzi possession that provided natural resources to the island (Kennet 2002: 161; 2003: 122). The supposed peak of production at Ghaylan seems to fit well with this broader economic expansion of the region.

Julfar was largely abandoned by the late sixteenth century (Kennet 2003: 117) and the trading centre on the

coast moved to Ras al-Khaimah (Hansman 1985: 10). This change seems to have greatly influenced the industry of Julfar ware as well, as many drastic changes occurred between the products of Ghaylan and Shimal/NST. The biggest change is the significant drop in the diversity of types. In contrast to the wide variety of types found at GLN-4, close to 70% of the assemblage at NST are of a single type, TC10. Similarly at Shimal, more than 60% of the assemblage at the northern kilns of Shimal was TC10 and more than 40% of the assemblage at the southern kilns of Shimal was TC13. This shows clearly that the variety of production was significantly narrowed down and suggests that the kilns of Shimal and NST focused their production on a much narrower market.

In parallel to this concentration of products at Shimal and at NST, simplification of products also seems to have occurred at these sites. Comparison of the occurrence of styles between sites shows that while more than 28% of the vessels at GLN-4 were in style S-1, almost no vessels with style S-1 occur at Shimal and at NST. S-1 is a style that is comparatively complex, requiring both the whitewash and the painted decoration. An almost complete lack of this style at Shimal and at NST seems to suggest a simplification of the manufacturing process at these kilns. This simplification can also be attested in the decoration patterns of other painted vessels. For example, no vessels with elaborate decoration comparable to that of TO2 at Ghaylan or TC18 at Wadi Haqil can be found at Shimal. Both TC10 and TC13, which together make up the majority of the production at Shimal and NST, bear very limited decoration, or in many cases do not have any painted decorations at all. Furthermore, the analysis of the rim diameters also points to a decline in the variability of the products and an increased standardization at Shimal. Altogether, the evidence seems to suggest a shift from a diversified production at Ghaylan to a concentrated, simplified, and more standardized production at Shimal and at NST.

This change from Ghaylan to Shimal/NST seems to represent the industry’s attempt to respond and to adapt to the new environment, characterized by the abandonment of Julfar and the shift to Ras al-Khaimah. Very little is known about what was happening in the region during this period, as no excavated sequence exists for the post-al-Mataf period. It has been suggested, however, that a shift of orientation of the economy from the coast to the interior of the Oman peninsula occurred during this period (Kennet 2001: 107–108). It seems likely that the changes suggested in the pottery production are related to wider-scale economic changes that were occurring at the time.

Although studies of the parallels outside Ras al-Khaimah are as yet very limited, available examples show a general trend that types linked with Ghaylan have a much wider distribution than types linked to Shimal and NST. Only four types linked with Shimal and NST were found at three locations overseas, while a total of ten types linked with Ghaylan were found at five different overseas locations, including Kilwa on the eastern coast of Africa. This seems to show that the industry lost its overseas market — or at least part of its overseas market — as Julfar lost its prosperity. The simplification and centralization of production at Shimal and NST might also, therefore, be interpreted as a reflection of the demands of a smaller and more focused market.

Some important changes can also be observed at Wadi Haqil. There is an increase in the diversity of the vessels compared to Shimal and NST. Vessels with more elaborate decoration, such as TC18 and TC19, appeared during this period. The production of vessels with style S-1 also seems to have revived. Moreover, a parallel of TC18 at Bahrain (Frifelt 2001: 95) suggests the restoration of an overseas market to a certain extent. These changes may be related to the emergence of the modern city of Ras al-Khaimah as a trading centre and a place where Wadi Haqil pottery was sold (Lancaster & Lancaster 2011: 108, 280, 414, 442).

Throughout the history of the industry, the production at Ghaylan seems to be the most important period for the development of the industry, while the later kilns seem to owe much to the legacy of the production at GLN-4. It was at Ghaylan that cooking pots with everted rims were first introduced as well as the production of lids. It was also during this period that style S-7, which became the

most dominant style in the later kilns at Shimal and at Wadi Haqil, was first introduced. GLN-4 reflects a period of great innovation in the development of this industry, and it seems likely that it was the proximity to the prosperous Julfar and the 'pull' of the vigorous demand from the market overseas, that stimulated this innovation.

The Julfar ware industry, however, survived the changes that put an end to the prosperity of Julfar. Although the exact processes behind these alterations are as yet unclear, it is certain that the industry continued its production until the mid-twentieth century, flexibly altering its production and adapting to new economic environments. Conversely, it was this flexibility and its ability to adapt its products to new demands that enabled the industry to thrive for such a long period of time. The Julfar ware industry thus provides an interesting study of the relationship between a local industry and the broader vicissitudes of the region's economy.

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