

# ABIEL II

New Research on the Arabian Peninsula

## ARABIA AND ITS NEIGHBOURS

ESSAYS ON PREHISTORICAL AND  
HISTORICAL DEVELOPMENTS

Edited by  
C.S. Phillips  
D.T. Potts  
S. Searight

# Dilmun pottery in Mesopotamia and Magan from the end of the 3rd and beginning of the 2nd Millennium B.C.

*Sophie Méry, Carl Phillips and Yves Calvet*

Sumerian and Akkadian economic texts attest to the importance of contacts between Dilmun and other areas of the Gulf, and textual information increases as Dilmun progressively becomes more and more involved in commercial exchanges, until it reaches the status of indispensable intermediary. Long distance trade is also indicated by archaeological finds which include shells, ivories, carnelian and lapis-lazuli beads and chlorite vessel. Contact between Dilmun and Magan is likewise illustrated by ceramics. Omani funerary vessels from the end of the Umm an-Nar Period were deposited in Bahraini tumuli, and other vessels were discovered in the settlement of Qala'at al-Bahrain (Fig. 1) and the Barbar Temples (for example see Larsen, 1983: fig. 43 h, fig. 47 b, c, e, f, i, l, q, and perhaps p, s and t; Bibby, 1986: fig. 29; Lowe, 1986: fig. 9; Mortensen, 1986: 181; Nayeem, 1992: fig. 6 a-c and e-f p. 310 & 312; Højlund and Andersen, 1994: figs. 288-291, figs. 293-309, figs. 498-508, figs. 541-543). Petrographic analyses of thin-sections demonstrate that these ceramics were manufactured in Oman (Méry 1991, 117-118). Ceramics of the same type were recovered from numerous sites in the Eastern Province of Saudi Arabia and from the island of Tarut (for example see Bibby, 1973: fig. 33 b; Masry, 1974: Pl. XLIII no.2 & 3; Piesinger 1983: fig. 50 V28, fig. 55 V25, fig. 77 no. 96, fig. 146 no. 40 & 41; Burkholder 1984: fig. 17). There is also archaeological evidence that relations between Dilmun and Magan continue after the Umm an-Nar period: Wadi Suq pottery, or vessels of Wadi Suq style, are associated with Barbar Temple II (Mortensen, 1986: 181), with the Ali tumuli (Frifelt, 1986: 133, fig. 33), with those of Hamala North (During Caspers, 1980: Pl. V), Hamad town (catalogue of the Bahrain National Museum: 33 top), and with the tumuli of Dhahran (Zarins, 1989: fig. 13 no. 14, fig. 14 no.1-6, 8, 10), as well as with the settlement of Qala'at al-Bahrain (Højlund and Andersen, 1994: figs. 222-224, 684, 695).

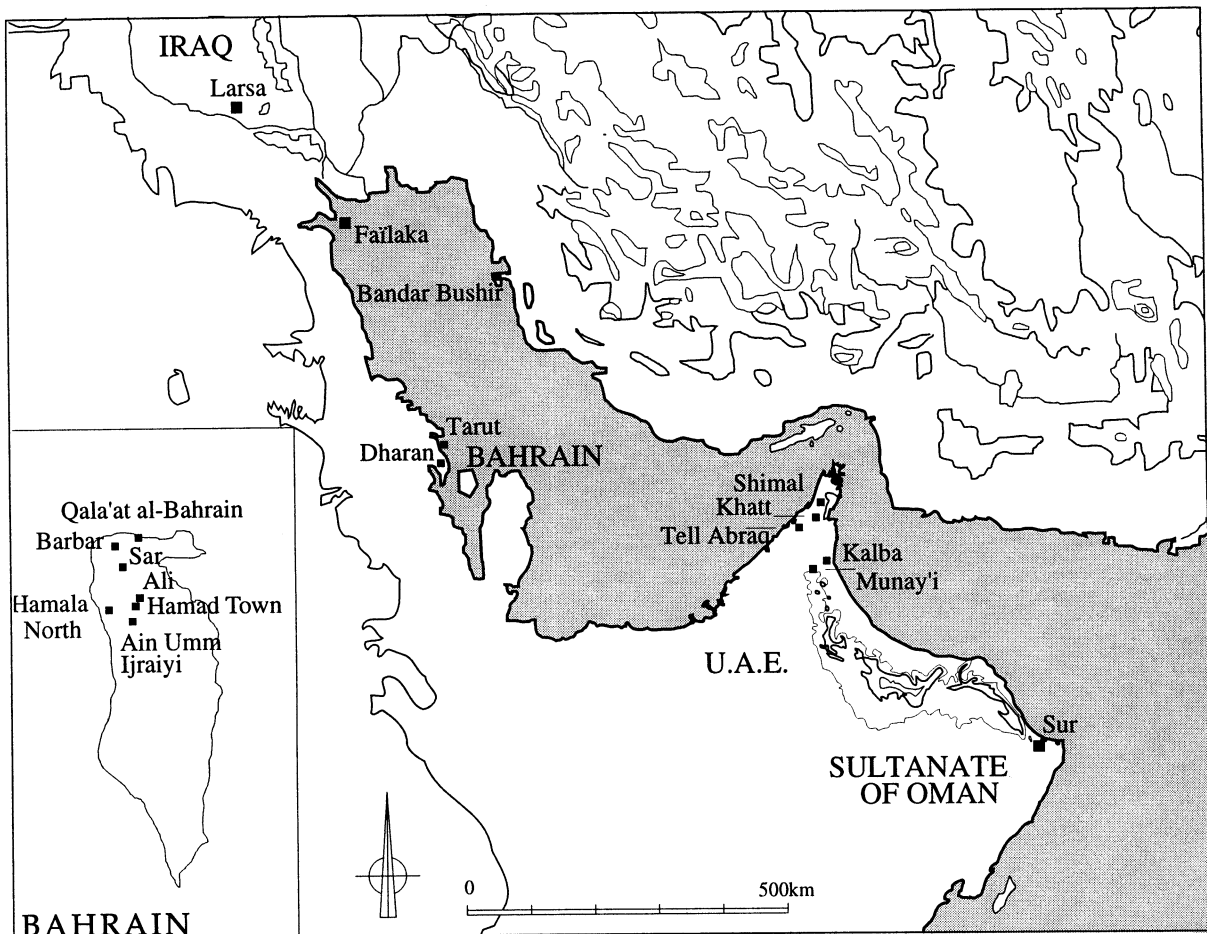


Fig. 1.  
Map of main sites  
quoted in text.  
Drawing: H. David  
& S. Méry.

Likewise, pottery of Barbar style is found in archaeological contexts beyond the boundaries of Dilmun. A few examples have been discovered in South Mesopotamia and in Iran (1), and others have been found in the Oman Peninsula, mainly in the northern part of the United Arab Emirates, and in the Sultanate of Oman. Petrographical characterization of one such vessel from Shimal (Emirate of Ras al-Khaimah, U.A.E.), and comparisons with samples of Bahrain ceramics confirm that their origin is Dilmun. Two further samples of pottery of Barbar style were analysed, one from Shimal and another from Larsa in southern Mesopotamia. Although these do not match exactly the Bahrain samples in petrographical composition, one can nevertheless consider them as manufactured in Dilmun.

### *Dilmun jars in Mesopotamia*

In 1987 and 1989, excavations in a residential quarter at Larsa uncovered several large houses of the Old Babylonian period dating to the 18th century B.C., of which two were extensively excavated (Calvet, 1994, n.d.). All of these were large isolated residences covering several hundred square metres. A burial vault of baked bricks and tiled floors was found beneath the floor of one of the larger rooms in each of the two excavated houses. These vaults, which were probably built together with the house, consist of a series of reclin-

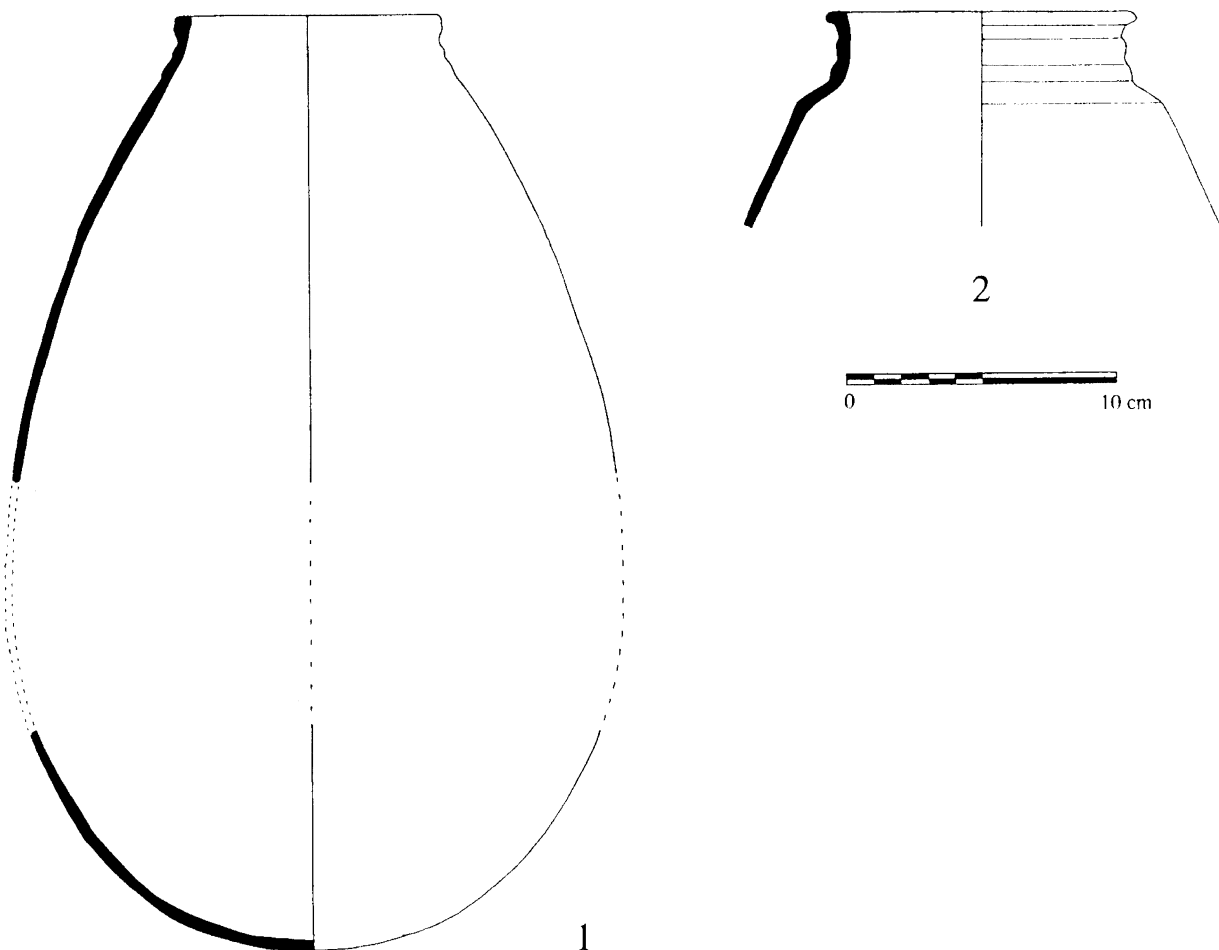
ing arches, their opening blocked by stacked baked bricks. Funerary deposits were found in the vault and before the door. A few discarded bones, several pots and a few more valuable items (in one of the vaults) had survived ancient plundering.

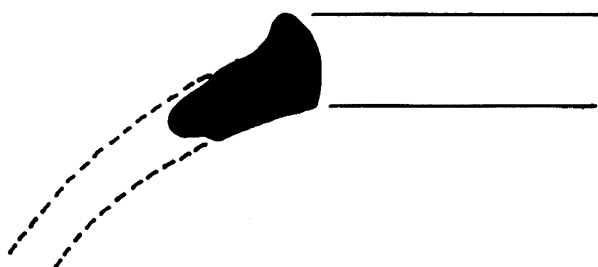
Most of the pots from the Larsa vaults were locally manufactured. However, two jars (n.25.569 and 25.570) from beneath the floor of room 3 of Building B27 display clear stylistic links with pottery from the Gulf. They belong to the series of Barbar funerary vessels of which hundreds have been discovered in the Bahrain tumuli. Ancient plunderers had stamped on them, and since Barbar pottery is often very brittle, and includes large thin-walled vessels, complete restoration was impossible to achieve.

Potsherd no.25.569 (Fig. 2.2) belongs to the upper half of a jar with a short ridged neck, carinated shoulder and rounded slightly flaring rim. This sherd recalls a very common type of Dilmun funerary vessel (for example see Bibby, 1954: fig. 4; 1966: fig. 10; During Caspers, 1980: Pl. XIV; Ibrahim, 1982: fig. 34 no.7; Nayeem, 1992: fig. 12d p. 321).

Vessel no.25.270 (Fig. 2 no.1) is a bag-shaped jar with a very short

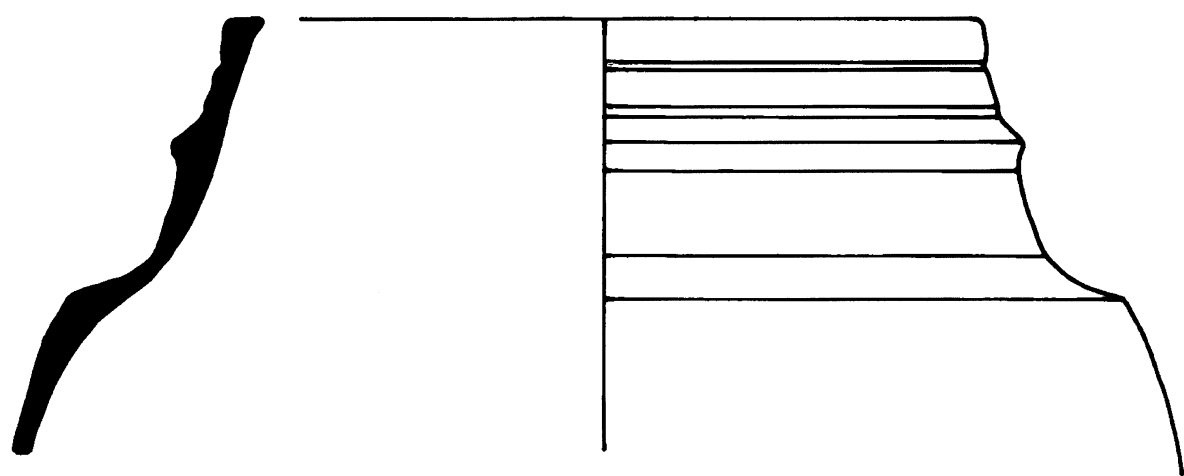
Fig. 2.  
Funerary Dilmun jars from an  
Old-Babylonian burial-vault  
at Larsa. 1: no. 25.570 (sample  
for thin-section analysis). 2:  
no.25.569.  
Drawings by J.-M. Chofflet &  
V. Bernard.



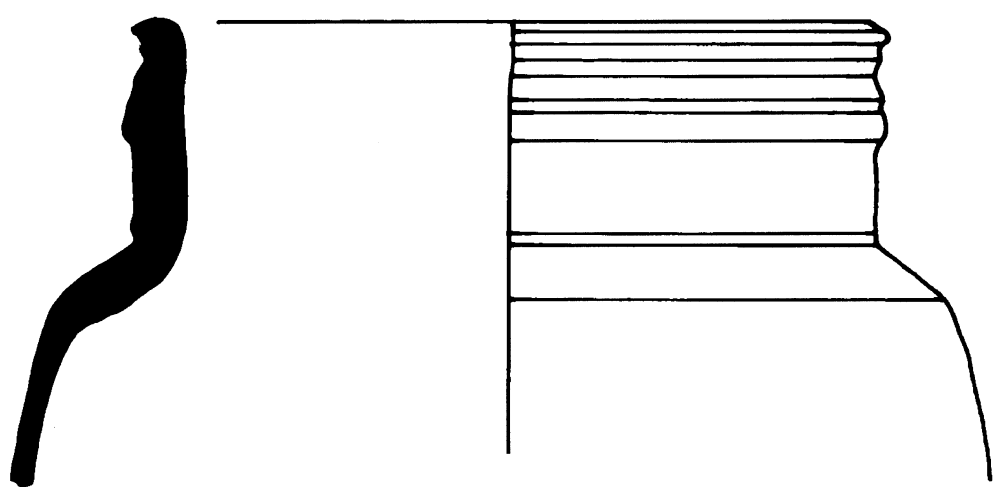


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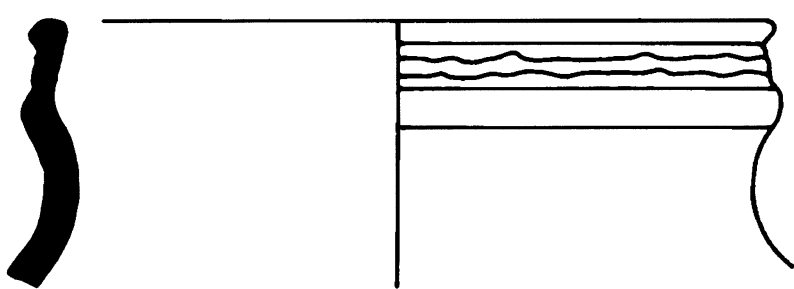
Fig. 3.  
 1: fragment of 'chain-ridged ware' from an Early Wadi Suq level from settlement SX-SY at Shimal (sherd E109 329/26). Drawing by H. David. 2: rim of funerary Dilmun jar from Sur. 3: rim of funerary Dilmun jar from Munayi. 4 : rim of funerary Dilmun jar from Kalba site K5. Drawings by C. Phillips. Scale = 1:1



2



3



4

neck and a rim whose section is triangular. The jar recalls vessels found in Bahrain at Saar (Ibrahim, 1982: fig. 33 no.5, fig. 35 no.9), Qala'at al-Bahrain (Højlund and Andersen, 1994: fig. 219) and a site located near Ain Umm Ijrai (During Caspers, 1980: Pl. IX). It is also known from Failaka, but in this case the macroscopic aspect of the paste indicates that we are perhaps dealing with an import from Mesopotamia (Højlund, 1987: p. 101 figs. 439-440, p.106).

The pieces from Larsa are not the only funerary jars of this type which were discovered in Mesopotamia. At Tell ed-Der (de Meyer, 1978: Pl. 23 no.9) they are described as '...[un type] peu courant, avec une lèvre striée irrégulièrement, mais avec une panse soigneusement lissée' (*Ibid.*: 121). We do not know whether these jars were imported from Dilmun, or whether they were locally manufactured copies, since the colour of the paste is a very pale brown, contrasting with the deep red colour of the jars found in Bahrain.

### *Barbar pottery in Magan at the end of the Umm an-Nar Period and at the outset of the Wadi Suq Period*

In the past ten years potsherds of Barbar style have been found at several sites in the northern United Arab Emirates: Shimal and Tell Abraq on the coast of the Persian Gulf, Kalba on the coast of the Sea of Oman, and at Khatt and Munayi in the interior. None has been found in the U.A.E. south of Munayi, albeit two fragments from a funerary jar were discovered in a survey of the Sur area in the Sultanate of Oman. On the east side of the road which leads in to Sur there is a prominent ridge along the top of which is a number of cairns. These cairns have previously been recorded by Beatrice de Cardi as part of her survey in the Sharqiyah of Oman (Doe, 1977: 47, site 33). The cairns appear to have been about three metres in diameter, now collapsed, and surface finds are scarce and usually undiagnostic. However, to the east of this ridge there is a lower terrace on which two or three similar cairns are located and it is from the collapsed debris of one of these cairns that the fragments of a Dilmun funerary jar were located (Fig. 3.2). In addition to the Dilmun jar there were fragments of a second vessel, the form of which could not be reconstructed, made of an undiagnostic, brown fabric.

Several rims from Dilmun funerary jars belong to late Umm an-Nar contexts. One was found on the surface of an Umm an-Nar tomb at Khatt (Kh. 155b) (de Cardi, Kennet & Stocks, 1994: 46, fig. 6.3). At Munayi, a tomb has yielded a number of sherds which constituted the remains of a Dilmun funerary jar (Fig. 3.3). The tomb has all the typical characteristics of an Umm an-Nar tomb. It was nine metres in diameter with little more than the foundations of the tomb

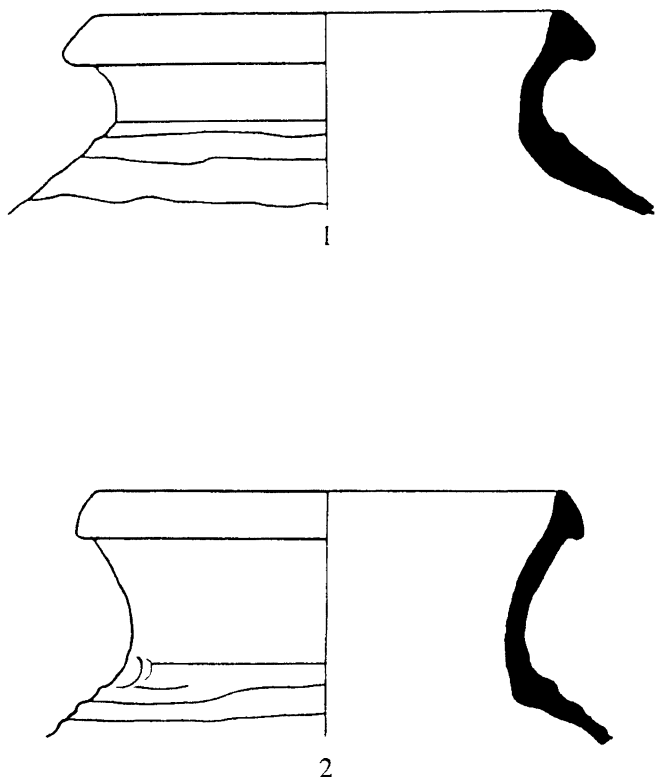


Fig. 4. (above)  
Three potsherds from Bahrain, for thin section-analysis. 1: no.517.UD, Barbar Temple IIB (A706). 2: potsherd no.520.AOZ, Qala'at al-Bahrain (A707). 3: no.517.AOG, Barbar Temple I (A705).  
Drawings by Forhistorisk Museum Moesgård.

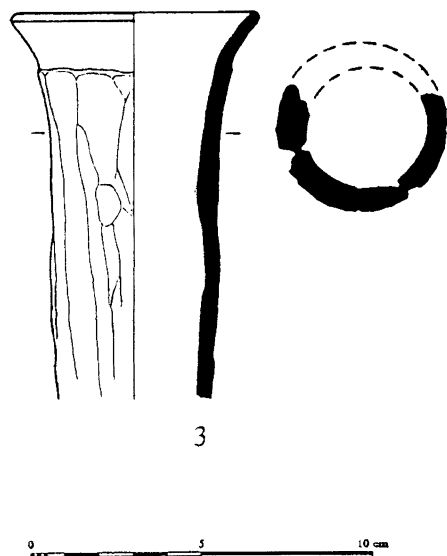
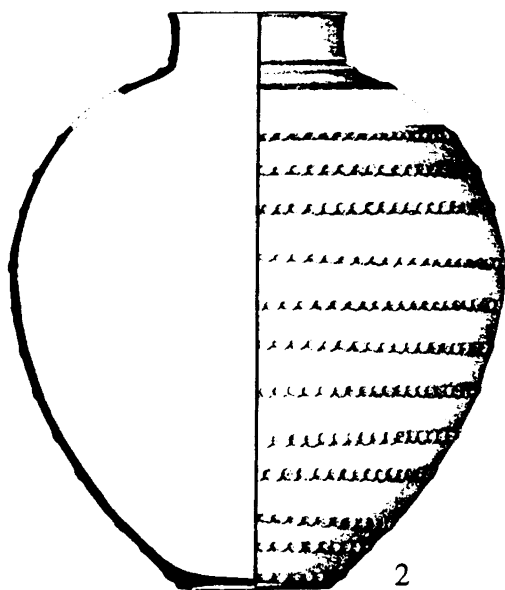
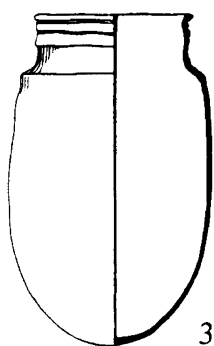
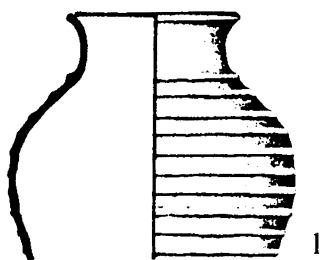


Fig. 5. (below)  
Main types of Dilmun pottery found beyond the area of Dilmun civilization. 1: decorated domestic ware ('red-ridged ware' type) (after Højlund and Andersen, 1994: fig. 103). 2: decorated domestic ware ('chain-ridged ware') (*Ibid.* 1994: fig. 104). 3: funerary jar (after Ibrahim, 1982: fig. 33 no.2).



0 10 cm

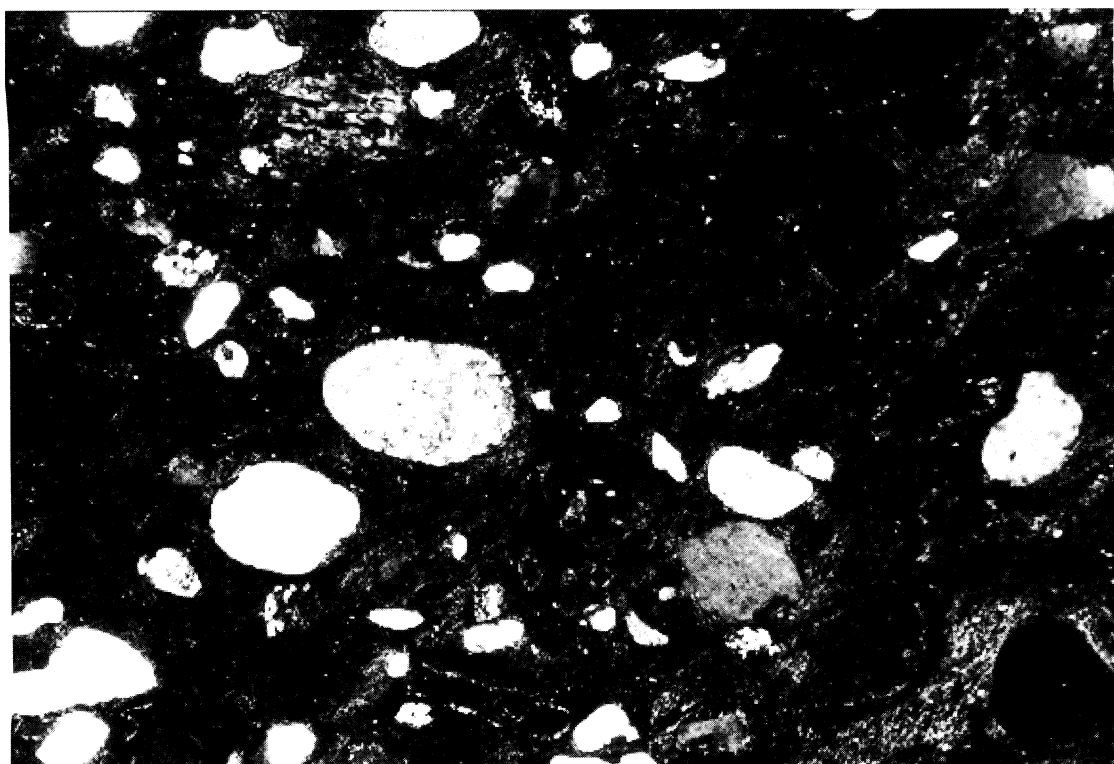
remaining. There was evidence to suggest that its floor was originally paved but all of the paving had been removed except for one remaining slab. Nevertheless a considerable amount of typical Umm an-Nar pottery and soft stone vessels of the *série récente* was recovered. In addition, there was one sherd of an imported Mesopotamian vessel, of the same type as recovered from tomb N at Hili (al-Haddu, 1989: pl. 9) and at Tell Abraq (Potts, 1990: 94, fig. 115.1) and one sherd of incised grey ware, most likely imported from south east Iran or south western Pakistan.

Dilmun pottery has also been found associated with other contexts from the end of the Umm an-Nar Period. For instance in the settlement of Tell Abraq a potsherd of 'City I chain-ridged ware' (finger-tip impressions on ridges) (Potts, 1991: 29, figs. 16 and 17) and potsherds of 'red-ridged ware' (plain ridges) were found in association with levels of the end of the 3rd millennium (Potts, 1990: 25, fig. 12 no. 12). A rim from a Dilmun pot whose shape is uncertain (see below) was discovered at Shimal in an Umm an-Nar tomb (Fig. 3, Franke-Vogt, 1991: 194 footnote 2) where it was associated with Fine Red Omani Ware and Grey Painted and Incised Iranian wares (Sahm, 1988).

Dilmun pottery is obviously more abundant in the early Wadi Suq levels (beginnings of the 2nd millennium) of some settlements. Several potsherds of 'red-ridged ware' and one sherd of 'chain-ridged ware' (Fig. 3 no.1) were found in association with the levels of Phase 1 of the SX-SY settlement at Shimal (Franke-Vogt, 1991: 194 footnote 2). More than 300 potsherds of 'red-ridged ware' were found in the early 2nd millennium levels at Tell Abraq (Potts, 1990: 61-65, fig. 71 no.1, 4 and 5, fig. 72, fig. 75, fig. 76.5 and 6, fig. 87.6; 1991: 72-74, figs. 96 and 97; 1993: 123). Two Barbar funerary jars were also discovered there (Potts, 1990: 63-64, fig. 77 and 78.9).

A fragment from a Dilmun funerary jar has also been found at Kalba (Site K5). On the inland side of the date gardens at Kalba the remains of two large cairns were located on the approach towards the Wadi Ham. One of the cairns (Site K2) was well preserved and after excavation was seen to have a diameter of nine metres. There was a single internal dividing wall and the walls of the structure were so thick as to form two narrow burial chambers with a shared entrance on the west side of the tomb. Apart from its circular form the tomb does not show the typical features of an Umm an-Nar tomb. That this might have been an early precursor of the Umm an-Nar type tomb is suggested by the presence of an imported vessel of ED II type. However, the remaining bulk of the pottery was of typical Umm an-Nar type which suggests the continued use of this tomb throughout the third millennium. Also recovered, from the outside wall of the tomb, as if they had been purposely placed there, was a beaker of typical Wadi Suq type and a fragmentary soft stone vessel, again of

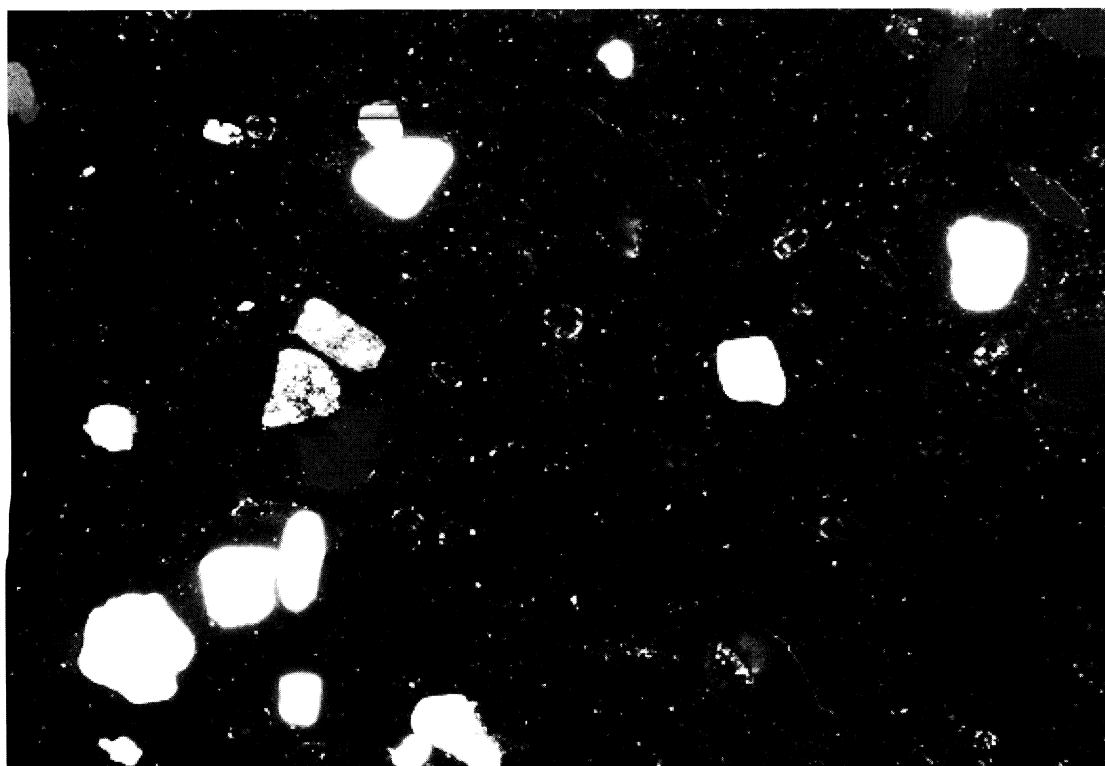




Pl. 1: Thin-sections shown in polarized light, enlargement 40.

1: A715, (above) decorated domestic ware ('chain-ridged ware') from Qala'at al-Bahrain (Bahrain).

2: A1037, (below) funerary jar from Larsa (Iraq).



Wadi Suq type. Near to this tomb was a second tomb of similar construction (Site K5) but a large portion of this tomb had been removed by an adjacent wadi, leaving only a small section of the outer wall of the tomb. Again, as if purposely placed there, from the outside wall, the remains of two Wadi Suq type beakers were recovered and a single sherd of a Dilmun jar (Fig 3.4). Located within the northern end of the gardens at Kalba is a further site which is currently excavated by the British expedition. The earliest phases of this site (Site K4) appear to be part of a tower type structure comparable with that of Hili 8 and Tell Abraq. Pottery of Umm an-Nar and Wadi Suq types is abundant, alongside sherds of Mesopotamian and Indus Valley import. Many of the contexts excavated so far are mixed and, as already stated, excavation is still in progress. However, sherds of Barbar ware are present, including one sherd which is clearly Barbar 'red-ridged ware'.

Several potsherds of 'red-ridged ware' were also found at Khatt in the area of the undated platforms Kh.118a, Kh.118b and Kh.119a (de Cardi, Kennet and Stocks, 1994: 44-46, fig. 6.1-2).

### *Petrographic composition of reference samples*

Six Barbar potsherds were used as reference samples; all originate from sites located on the island of Bahrain: Qala'at al Bahrain (3 sherds), Barbar Temples I and II (2 sherds), a tumulus of Saar (1 sherd). This restricted sampling is by no means representative of the large macroscopical diversity of Barbar pottery.

— A705 (Fig. 4.3): Barbar Temple I, potsherd no.517.AOG, conical beaker, Type B26, *ibid.*: 85.

— A706 (Fig. 4.1): Barbar Temple IIB, potsherd no.517.UD, triangular rim of 'red-ridged ware', Type B3, *ibid.*: 76-78.

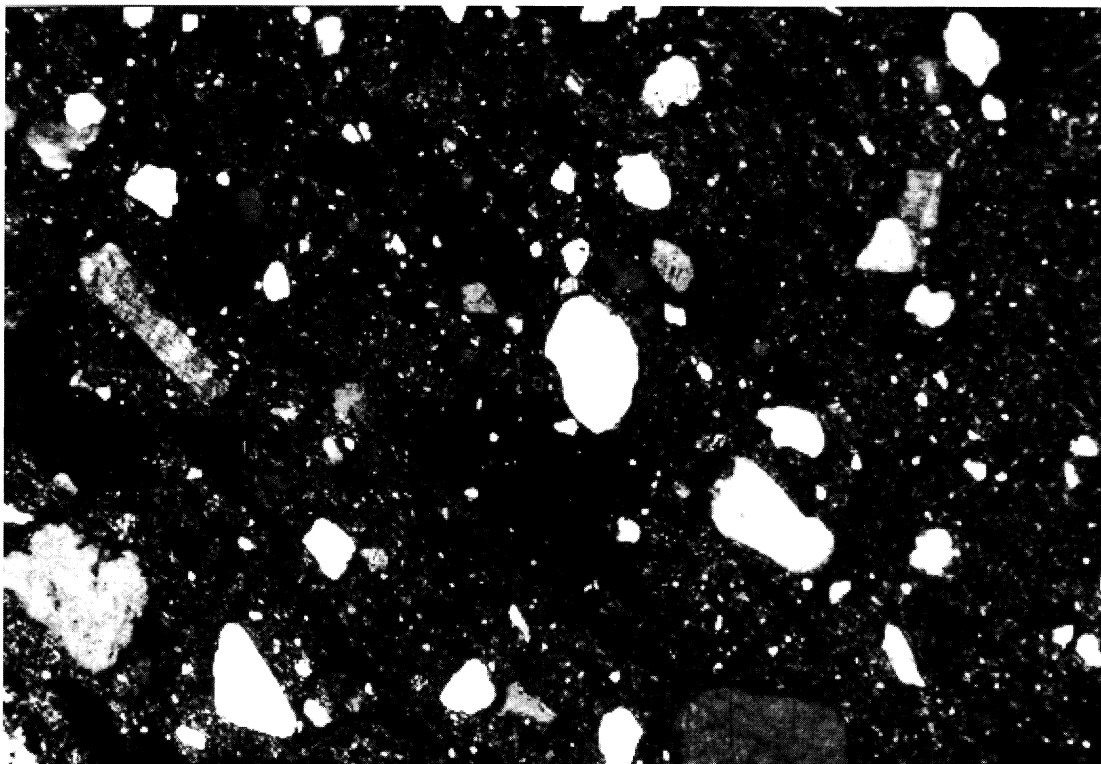
— A707 (Fig. 4.2): Qala'at al Bahrain, potsherd no.520.AOZ, triangular rim of 'red-ridged ware', Type B3, Højlund and Andersen 1994: fig. 109.

— A714: Qala'at al Bahrain, potsherd no.520.API.1, body sherd of 'chain-ridged ware', Type B55, *ibid.*

— A715 : Qala'at al Bahrain, potsherd no.520.API.2, body sherd of 'chain-ridged ware', Type B55, *ibid.*

— A719: tumulus of Saar, jar no. 513.B, body sherd from a funerary jar.

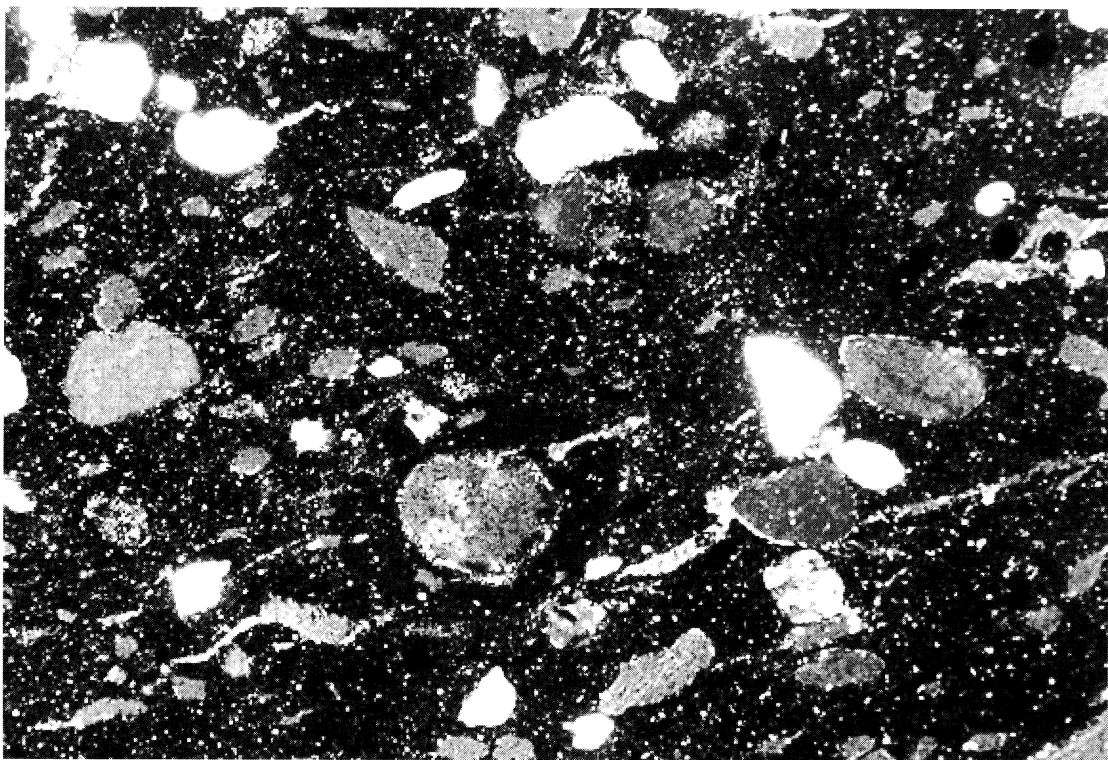
All the samples which we analysed are of a deep red colour (ref. *Code Cailleux*: M37). Potsherds A707, A714 and A715 display a whitish outer face. A706, A707 and A714 have a grey core. All the samples are macroscopically similar, save the fragment from the funerary jar (A719) of very fine paste where visible mineral inclusions are very scarce. Other samples have more or less numerous grey



Pl. 1: (continued)  
Thin-sections shown in polarized light, enlargement 40.

3: A1153, (above) body sherd of Dilmun pot from Shimal (U.A.E.).

4: A933, (below) decorated domestic ware ('chain-ridged ware') from Shimal (U.A.E.).



translucent rounded inclusions. Porosity is high. Vacuoles are edged with a very characteristic white and opaque halo.

In the thin-sections, five of the samples are characterized by a coarse temper fraction (up to 700  $\mu\text{m}$ ) composed of uncalibrated quartz feldspathic sand. The sand itself is mainly made up of quartz mixed with plagioclases, orthoclases, perthites, rocks of micro-crystalline quartz and a few epidotes and amphiboles. Grains are subrounded to rounded, sphericity is generally high. This sand was perhaps added to the clay deliberately.

Albeit a homogeneous group, this lot of samples displays differences in granulometry, in the amounts of the temper fraction, and in the aspect of the matrix:

— A705. Phylliteous matrix with cordate (thin sinuous and elongated vacuoles) and reticulate structure (phyllites set at right angles around the grains). The fine fraction is lower than 50  $\mu\text{m}$  and loosely scattered. The coarse fraction, reaching up to 700  $\mu\text{m}$ , is very abundant as it covers 30 to 35% of the surface of the thin-section (2). Numerous rounded micrite grains. Remains of carbonates in the shape of thin micritic halos on the edge of vacuoles, and remains of micro-organisms very much damaged by dissolution.

— A706. Argillaceous subisotropic matrix. Very abundant fine fraction composed of splinters of quartz and mica. The coarse fraction, reaching up to 600  $\mu\text{m}$ , is loosely scattered and covers 15 to 20% of the surface of the thin-section.

— A 707. Argillaceous subisotropic matrix with cordate structure. The fine fraction composed of quartz and mica is quite abundant. There is a fair amount of coarse fraction as well (up to 1.1 mm) which covers 20 to 25% of the surface. Remains of carbonates in the shape of thin micritic halos on the edge of vacuoles.

— A714. Phylliteous matrix with cordate structure. Large amounts of fine (quartz) and coarse fraction (up to 1.1 mm, 25 to 30% of the surface).

— A715. Phylliteous matrix with cordate structure. Loosely scattered fine fraction and abundant uncalibrated coarse fraction (up to 700  $\mu\text{m}$ , 25 to 30% of the surface). Remains of carbonates in the shape of thin micritic halos on the edge of vacuoles.

The one fragment from a funerary jar (A719) shows a very different composition: the temper fraction is very scant (less than 5% of the surface) and its size is very small (quartz grains smaller than 150  $\mu\text{m}$ ) except for argillite grains which reach up to 1.5 mm. The argillaceous and subisotropic matrix shows a compact structure instead of the cordate structure which is so typical of the remaining samples.

## *Comparison with samples from Larsa and Shimal*

Thin-section analyses were carried out on one of the Larsa jars (sample A1037: no. 25.270, Fig. 2.1) and on two sherds from the United Arab Emirates (A933 and A1153). Sample A933 belongs to the late Umm an-Nar tomb from Shimal North (unnumbered sherd). This is a neck fragment whose profile and thickness indicate that we are not dealing with funerary ware; otherwise we are unable to specify which type of vessel it belongs to. Sample A1153 (Fig. 3) comes from an early 2nd millennium level (phase 1) from settlement SX at Shimal (sherd E109 329/26). This is a rim fragment from a jar of the 'hole-mouth jar' type, decorated with fingertip impressions, a motif which is seldom found at Qala'at al-Bahrain (Højlund and Andersen, 1994: 81 type B17).

A1037 from Larsa is 4 mm thick. Its macroscopical characterization includes an evenly red paste (ref. *Code Cailleux*: M37) and small grey often translucent mineral inclusions. The paste is porous and the vacuoles display the characteristic white halo which has been described for the Bahrain samples. A933 from Shimal is 8 mm thick. Its colour is the same as the Larsa sample but the grey inclusions are more numerous and either translucent or opaque. The pores and their white halo can be easily discerned on the thin-section. On sample A1153 from Shimal mineral inclusions and pores display the same characteristics as those of A933, but here the colour of the sherd is dark grey (ref. *Code Cailleux*: S51) except for the surface which is red (*id.*: M37).

As seen from the thin-sections, the paste composition of the two UAE samples is related to those of the Qala'at al-Bahrain samples, and clearly not related to other types of ceramics which were analysed so far (these include several hundred pots from Oman, Mesopotamia, Iran, Indus: (Blackman et al., 1989; Méry, 1991, n.d.; Méry and Schneider, 1996; Méry and Blackman, n.d.). A few points deserve to be mentioned:

— In thin-section, A1153 (Shimal, settlement SX) is identical to A705 (Barbar Temple I) except for a larger amount of temper and the presence of micritic grains in A705.

— A933 (Shimal, Umm an-Nar tomb) has an argillaceous cordate matrix and comprises mica particles in the fraction below 10  $\mu\text{m}$ . The coarse temper fraction is loosely scattered (15 to 20% of the surface of the thin-section) and does not exceed 500  $\mu\text{m}$ . This fraction includes subrounded quartz particles mixed with quartz rock fragments, plagioclases, orthoclases, perthites, epidotes. The sample also includes carbonate remains in the shape of thin micritic halos on the edge of vacuoles. Its composition is thus very close albeit not exactly similar to the microfacies of our reference samples from Bahrain.

Similarly, the Larsa sample (A1037) is less characteristic than A1153. Its matrix is argillaceous, subisotropic, and the fine fraction includes minute quartz and mica particles. The coarse fraction (up to 500  $\mu\text{m}$ ) is rare (5% of the surface of the thin-section); more than anything, it includes quartz mixed with a few plagioclases, perthites, and microcrystalline quartz rocks. This kind of microfacies is not found in our reference samples. However, its composition is close to A933 (Shimal, Umm an-Nar tomb) even though it contains few mineral inclusions and displays no micritic halos on the edge of vacuoles.

The petrographical thin-section analysis of the sherd from the Shimal settlement confirms that Dilmun vessels were circulated to Magan. However, we need the results of an X-ray fluorescence chemical analysis (3). to confirm that both the Larsa jar and the potsherd from the Umm an-Nar tomb at Shimal came from Dilmun. It would also be useful to compare these sherds with samples from geographical regions other than Bahrain, as for instance with Failaka.

## Conclusion

Recent archaeological discoveries show that both Barbar funerary jars and domestic wares were circulated beyond the territory of Dilmun from the last centuries of the 3rd millennium. These domestic wares display two types of decoration: the 'chain-ridged' and the 'red-ridged ware'. At Qala'at al-Bahrain, the first group includes types B55A and B55B as defined by F. Højlund (Højlund and Andersen, 1994: 91-92, figs. 104, 188, 410, 439-440, 473-474, 524-526). Type B55A is found in periods Ia, Ib and IIa; Type B55B is found in periods Ib, IIa and IIb (*Ibid.*: fig. 389). The decoration of the 'red-ridged ware' (Type B59, *Ibid.*: 92, figs. 103, 111, 190-191) appears at Qala'at al-Bahrain in Period Ib. Both these types of decoration were used on vessels of identical shape, which were themselves made of the same materials (pers. comm. F. Højlund). Little by little one type replaces the other, as demonstrated by F. Højlund at Qala'at al-Bahrain. In the Oman Peninsula, both types are found at the end of the Umm an-Nar period (at Tell Abraq), whereas at the outset of the Wadi Suq period, when Dilmun pottery becomes much more abundant, there are only a few occurrences of the 'chain-ridged ware' decoration (Shimal).

One distinctive characteristic of Bronze Age Oman is the recurring presence of foreign pottery. At a time when pottery was not yet mass-produced, imported wares were very valuable. For example, Jamdat Nasr/ED pottery is a current feature in early 3rd millennium Omani graves of the Hafit period, whereas Iranian and Indus ceramics are quite numerous in tombs of the Umm an-Nar period. However, we cannot be sure that these pots were considered as funerary items in those regions. In the case of Dilmun, the situation is different. The

fact that Barbar funerary vessels were found in Mesopotamian and Omani graves could imply that they were imported from Dilmun precisely for that purpose.

When circulated, the pots were not necessarily empty. A text from Mari mentions a dispatching of oil from Shamshi-Addu of Assyria to the ruler of Dilmun. The oil was transported in vessels named *kisikkûm* (Groneberg, 1992: 77), a word referring to a funerary ritual. According to J.J. Glassner (n.d.), this ritual may have been common to both royal courts and, together with Amorite onomastics, may be an indication that there was some kind of cultural unity spreading from North Syria to the northern part of the Gulf area in the early second millennium. This is only a hypothesis which needs to be confirmed by new archaeological data from Bronze Age excavations in the northern Gulf area.

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<sup>1</sup> Jars with 'red-ridged ware' decoration were found at Bandar-Bushir (Pézard 1914: 21, Pl. III no.3 and 4, Pl. VI no.5) as well as Iranian potteries (*Ibid.*: Pl. VI no.1, 3) whose shape is close to the vessels usually found in late 3rd millennium Umm an-Nar tombs. Fragments of chlorite vessels of the *série tardive* (*Ibid.*: Pl. VIII no.2, 4, 5) manufactured in the Oman peninsula in the Wadi Suq Period were also found at Bandar-Bushir.

<sup>2</sup> Comparison Chart for Estimating Percentage Composition, *Journal of Sedimentary Petrography*, vol. 25 no.3, 1955. Estimation made with enlargement 40.

<sup>3</sup> In progress at the Arbeitsgruppe Archäometrie, Institut für Anorganische und Analytische Chemie, Freie Universität Berlin.

### *Bibliography*

al-Haddu, M.M., 1989. Excavations in Tomb N at Hili. *Archaeology in the United Arab Emirates* V: 55-70.

Bibby, T.G. 1954. Five among Bahrain's hundred thousands gravemounds. *KUML*: 132-141.

Bibby, T.G. 1966. Arabian Gulf Archaeology. *KUML*: 90-95.

Bibby, T.G. 1973. *Preliminary Survey in East Arabia*, 1968. Jutland Archaeological Society, Copenhagen.

Bibby, T.G. 1986. The origins of the Dilmun civilization. In Shaikha H.A., al-Khalifa and Rice M. (ed.), *Bahrain through the Ages*, KPI, London: 108-115.

- Blackman, M.J., Méry, S., Wright, R.P. 1989. Production and Exchange of Ceramics on the Oman Peninsula from the Perspective of Hili. *Journal of Field Archaeology* 16 (1): 61-77.
- Burkholder, G. 1984. *An Arabian Collection: Artifacts from the Eastern Province*. GB Publications, Boulder City, Nevada.
- Calvet, Y., 1994. Les grandes résidences paléo-babyloniennes de Larsa. *Cinquante-deux réflexions sur le Proche-Orient ancien offertes en hommage à Léon de Meyer*, Mesopotamian History and environment, Occasional Publications, vol. 2, Peeters: 215-228.
- Calvet, n.d. The Dilmun Culture as its border with Mesopotamia. In Cleuziou S., Tosi M., Zarins Y. (ed.), *Arabia Antiqua* 3, Serie Orientale Roma, IsMEO, Rome.
- de Cardi, B., Kennet, D., Stocks, R. 1994. Five thousand years of settlement at Khatt, UAE. *PSAS* 24: 35-95.
- de Meyer, L. (ed.) 1978. *Tell ed Der II. Progress Report*. Editions Peeters, Leuven.
- Doe, B. 1977. Gazetter of Sites in Oman, 1976. *JOS* 3 (1): 35-58.
- During-Caspers, E.C.L. 1980. *The Bahrain Tumuli, an illustrated catalogue of two important collections*. Nederlands Historisch-Archaeologisch Instituut te Istanbul, XLVII, Leiden.
- Franke-Vogt, U. 1991. The settlement of Central Shimal. In Schipmann K., Herling A., Salles J.-F (ed.), *Gölf- Archäologie. Mesopotamian, Iran, Kuwait, Bahrain. Vereinigte Arabische Emirate und Oman*, Internationale Archäologie 6, Verlag Marie Leidorf: 179-204.
- Frifelt, K. 1986. Burial mounds near Ali excavated by the Danish Expedition. In Shaikha, H.A, al-Khalifa H., Rice M. (ed.), *Bahrain through the Ages, the Archaeology*, K.P.I., London: 125-134.
- Glassner, J.-J. n.d. Dilmun et Magan, peuplement et organisation politique. Le point de vue de l'assyriologue. In Cleuziou S., Tosi M., Zarins Y. (ed.), *Arabia Antiqua* 3, Serie Orientale Roma, IsMEO, Rome.
- Golding, M. 1974. Evidence for Pre-Seleucid Occupation of Eastern Arabia. *PSAS* 4: 19-32.
- Groneberg, B. 1992. Le Golfe arabo-persique vu depuis Mari. *Florilegium marianum, Mémoires de N.A.B.U., SEPOA*, Paris 1992 : 69-80.
- Højlund, F. 1987. Failaka / Dilmun, The Second Millennium Settlements, volume 2 : *The Bronze Age Pottery*. Jutland Archaeological Society Publications XVII:2, Moesgaard, Aarhus.
- Højlund, F., Andersen, H. H. 1994. *Qala'at al-Bahrain, volume 1. The Northern City wall and the Islamic Fortress*. Jutland Archaeological Society Publications XXX:1., Moesgaard, Aarhus.
- Ibrahim, M. 1982. *Excavations of the Arab expedition at Saar El-Jisr*. Ministry of information, Bahrain.



- Larsen, C.E. 1983. *Life and Land Use on the Bahrain Islands : the Geoarcheology of an Ancient Society*. Prehistoric Archaeology and Ecology Series, The University of Chicago Press, Chicago.
- Lowe, A. 1986. Bronze Age burial mounds on Bahrain. *Iraq* XLVIII: 73-84.
- Masry, A.H. 1974. *Prehistory in North Eastern Arabia, the problem of interregional interaction*. Field Research Projects, Miami.
- Méry, S. 1991. Emergence et développement de la production céramique dans la péninsule d'Oman à l'Age du Bronze. Thèse de Nouveau Doctorat, Université de Paris I-Panthéon/Sorbonne. [unpublished].
- Méry, S., Blackman, M.J., n.d. Black-Jars of Meluhha : production and diffusion of an Indus pottery ware during the second half of the 3rd millennium BC. *Harappan Studies* 3.
- Méry, S., Schneider, G. 1996. Mesopotamian Wares in Eastern Arabia from 5th to 2nd Millennium BC : a contribution of archaeometry to the reconstruction of economical history. *PSAS* 26: 80-96.
- Mortensen, P. 1986. The Barbar Temple: its chronology and foreign relations reconsidered. In Sheikhha al-Khalifa H., Rice M. (ed.), *Bahrain through the Ages, the Archaeology*, K.P.I., Londres: 178-185.
- Mughal, R. 1983. *The Dilmun burial complex at Saar. The 1980-82 excavations in Bahrain*, Directorate of Archaeology and Museums, Ministry of Information, Bahrain.
- Nayeem M.A., 1992. *Bahrain Prehistory and Protohistory of the Arabian Peninsula*, volume 2. Hyderabad Publishers, Hyderabad.
- Piesinger, C.M. 1983. *Legacy of Dilmun : the Roots of Ancient Maritime Trade in Eastern Coastal Arabia in the 4th/3rd millennium BC*. University of Microfilms, Ann Arbor, Michigan.
- Potts, D.T. 1990. *A prehistoric mound in the Emirate of Umm al-Qaiwain: Excavations at Tell Abraq in 1989*. Munksgaard, Copenhagen.
- Potts, D.T. 1991. *Further excavations at Tell Abraq, the 1990 season*. Munksgaard, Copenhagen.
- Potts, D.T. 1993. Four seasons of excavation at Tell Abraq (1989-1993). *Proceedings of the Seminar for Arabian Studies* 23: 117-126.
- Sahm, N. 1988. Preliminary report of the excavation of the Umm an-Nar tomb in Shimal North. In Kästner J.M., Sahm N., Velde C. (eds.) : *Excavations of the German Archaeological Mission to Ra's al-Khaimah, Report of the 4th Season 1988*, Seminar für Vorderasiatische Archäologie, Göttingen.
- Srivastava, K.M. 1991. *Madinat Hamad, burial mounds, 1984-85*. Bahrain National Museum.
- Zarins, J. 1989. Eastern Saudi Arabia and External Relations. Selected ceramic, steatite and textual evidence : 3500-1900 BC. In Frifelt K., Sørensen P. (ed.) : *South Asian Archaeology 1985*, Scandinavian Institute of Asian Studies, Occasional papers No. 4, Curzon Press, Londres: 74-103.