

# Etched (carnelian) beads from northeast and southeast Arabia

Etched beads from northeast and southeast Arabia are usually not cited in connection with east-west trade, because they remain unknown to most scholars. There is ample evidence, however, from sites on the Arabian shores of the Persian Gulf that the region participated in active trade during several periods. Etched beads are one of the commodities testifying to the existence of maritime links. A high percentage of the etched beads found belong to the Early Bronze Age and the Pré-islamique récent (PIR)-period, although other periods are also represented.

**Keywords:** beads, etched, carnelian, Persian Gulf, Arabia, international trade

**An De Waele  
and Ernie Haerinck**  
Ghent University, Belgium

Ghent University, Belgium  
Department of Near Eastern Art  
and Archaeology  
St. Pietersplein 6  
B-9000 Ghent, Belgium  
e-mail: an.dewaele@ugent.be;  
ernie.haerinck@ugent.be

## Introduction

Etched, mostly carnelian, beads found in northeast and southeast Arabia are rarely, if at all, cited in studies of the movements of commodities in the ancient Near East. Archaeology started only a couple of decades ago in eastern Arabia and the documentation from that area is not well known to scholars studying other regions. However, textual and archaeological evidence clearly indicate that goods from different countries reached the Arabian shores of the Persian Gulf in all periods. Throughout history the Persian Gulf has been one of the major arteries through which exotic goods were transported between different civilisations. Northeast and southeast Arabia were often involved in these transactions and participated in the traffic, and goods from different regions often ended up in the communities of the Persian Gulf and were incorporated into their material culture. Ceramics, seals, glass, ivory objects and coins, amongst others, all testify to such relations.

In the Persian Gulf region, etched carnelian beads, which are thought to have been mainly produced in India, have thus far been found for the most part in tombs of varying date in Bahrain, the UAE and Oman. Thus far, some seventy etched beads have been discovered. Although the majority

of the beads found belong to the Early Bronze Age (late third millennium BCE) and the PIR-period (third century BCE-third century AD), etched or bleached beads are also attested during the Late Bronze Age, the Iron Age and the Sasanian/Early Islamic era.

Beads were important for more than just adornment. Particularly in the past, they had symbolic meanings and functioned in a system of non-verbal communication. They functioned in the social, political, religious, magical or medicinal sphere, depending on the particular sort of stone and/or design of a bead (1).

As to the typology and chronology of etched beads in general there are three major studies at hand by H.C. Beck (2), E.C.L. During Caspers (3) and particularly by J. Reade (4). However, these were published decades ago and included almost no beads from northeast or southeast Arabia. Most of the finds from these regions were only found in the 1980s and 1990s.

Since the archaeology of the Arabian shores of the Persian Gulf is a recent phenomenon, not all excavations have yet been reported in full. More beads may have been found, but they have remained unpublished. In some cases, illustrations are lacking or are not of the best quality. In others there may be

little published information on the shape, design, colour or context of the bead. Finally, the identification of a bead as 'carnelian' may in some cases be suspect, since agate and other chalcedonies could have been etched as well.

### **Carnelian**

A member of the chalcedonic quartz family, carnelian was one of the most popular and widespread semi-precious stones in the ancient Near East and India. With its attractive, deep red colour and brilliancy, carnelian became one of the most valuable stones after lapis lazuli (5), chiefly in the manufacture of jewellery and seals. Most of the important carnelian sources are located in India. On the Deccan Plateau, for example, numerous nodules are found on the river banks (6) while Ratanpur in the Rajpipla State was a famous extraction site as well (7). In Iran, carnelian is both present near Shahr-i Sokhta in the Helmand Basin and on the Bushehr peninsula. According to D. Whitehouse, these two sites were not major sources but they were not without significance (8). On the Arabian Peninsula, thick and easily accessible veins of carnelian are located near al-Ghail (c. 40 km south of Ras al-Khaimah, UAE) (9). Good quality sources are known in the mountains of Yemen (10) and further sources have been identified in western Saudi Arabia (11). Elsewhere in Asia, carnelian can be found in southwestern Afghanistan, southern Uzbekistan, Azerbaijan, etc. (12).

### **The history of etched carnelian beads**

The oldest etched carnelian beads have been found in India (13) and Mesopotamia (Early Dynastic III period, middle of the third millennium BCE) (14). Most scholars agree that the technique of etching originated in India (15) where the raw material was readily available. Actual workshops for producing etched carnelian beads have been excavated at Chanhu-Daro and Lothal (16). Initially, both nodules and (un)decorated beads were traded to Mesopotamia by land and sea routes (17). The land routes were those also mostly used by the lapis lazuli traders: a northern route via Damghan, Hamadan and the Diyala region; a southern way via Shahr-i Sokhta, the Lut desert, Shahdad, Fars

and Khuzistan (18). However, the etched beads found in northeast and southeast Arabia most likely illustrate a southern maritime route via the Persian Gulf.

Later on, the manufacturing method could have been adopted by the inhabitants of Mesopotamia (19). This is suggested by the fact that some (mostly simple) types have only been found in Mesopotamia and not in India (20). Thus, Mesopotamian production cannot be excluded as a possibility. Moreover, in view of the potential value of etched carnelian beads and the uncertainties of long-distance trade, the imitation of such beads in Mesopotamia — possibly even by Indian craftsmen — should come as no surprise, even if firm proof is as yet lacking (21). The trade in beads, the adoption of special types of beads (as regards technique/style) and the movement of beadmakers are in any case difficult phenomena to confirm and reconstruct (22).

When the Indus Valley civilization came to an end in the second quarter of the second millennium BCE, the production of etched carnelian beads seems to have almost ceased along with the trade to Mesopotamia. However, a major phase of production began about the middle of the first millennium BCE. At Taxila in Pakistan, at least forty-one etched beads dated between 500 BCE and the second century AD were excavated (23). In Mesopotamia, they would have become popular around the same time (Achaemenid period) (24). For the later periods we have textual evidence. Greek and Latin writers inform us about Indian chalcedonies traded during the first century AD (25). In the *Periplus Maris Erythraei* we read about the export of agate from Barygaza (modern Broach, India) (26). The medieval Muslim communities also mastered the technique of etching carnelian beads. Even today there are craftsmen, for example in Iran, producing carnelian objects etched with Koranic verses.

From a chronological point of view, etched beads are commonly classified into three groups: Group A—pre-2000 BCE; Group B—300 BCE-AD 200; and Group C—AD 600-1000. Each of these groups is characterized by different designs (27). Depending on the period, etched beads were widespread in the western regions of Asia from Syria/Jordan to Turkey, Mesopotamia and Iran, the Caucasus and Central Asia, and in the east from India to China and Thailand (28).

### Three types of etched carnelian beads

H.C. Beck was the first to make a detailed study of etched carnelian beads. On the basis of the manufacturing technique used, he defined two main groups (29): 1) naturally coloured carnelian beads etched with a white pattern; and 2) completely white etched carnelian beads decorated with a black design. Forty years later, E.C.L. During Caspers (30) and J. Reade (31) distinguished a third type: a black pattern on a naturally coloured carnelian bead. Of these varieties, the white-on-red type was the most common, the black-on-white type was uncommon while the black-on-red type was extremely rare (32).

### Methods of manufacture

On the basis of experimental and ethnographical research, H.C. Beck (33) and E. Mackay (34) described the manufacturing techniques of both the white-on-red and the black-on-white types. Beads of the first type are decorated by drawing a pattern on the carnelian with a solution of alkali (generally soda). By heating the bead, the alkali enters the stone, etching a permanent white design. In the case of the black-on-white type, the bead was entirely whitened by this technique, after which the black design was drawn with a metallic solution (copper, cobalt and manganese would have traced the best lines). Finally, the bead was heated and in this way the pattern was etched on the carnelian (35). The quality of the etched decoration depended on the individual stone and the firing temperature (36).

The fabrication of the carnelian beads themselves is well described by E. Mackay (37), M. Tosi (38), P. Francis, Jr. (39) and M.-L. Inizan (40). After the extraction of the raw material, the pebbles were roasted to intensify their red colour through oxidation (41) as well as to soften their cortex to facilitate the flaking off of blades from the core (42). In a next step, these blades were reduced to smaller pieces. Subsequently, through precise and careful chipping, rough beads were formed. During this stage, grinding of the carnelian on the surface of coarse metamorphic rocks was done as well. The next step was the most complex one: the beads were bored from both ends and the drill-holes had to meet in the middle. Sometimes, e.g. at Chanhudaro, the drilling was done before the final shaping of the bead,

probably because of the risk of breaking the bead. Finally, the beads were polished and reheated to bring back their original shine (43).

Unfortunately, distinguishing workshops on the basis of the manufacturing methods used has not been possible (44). However, efforts have been made to source the different carnelians used in antiquity using non-destructive compositional analysis, such as PIXE/PIGME (45).

### The Early Bronze Age (Fig. 1)

On Bahrain (Table 1) at least fourteen etched beads are known from excavations, mainly in graves. In the UAE (Table 2) they occur in circular, above-ground tombs of Umm an-Nar type or in subterranean, rectangular refuse tombs in their immediate vicinity. Some twenty-eight beads have been recovered in graves at coastal (Umm an-Nar, Al Sufouh, Mowaihat, Tell Abraq and Shimal) and inland sites (Hili and Hili North). These tombs date mainly to the late third millennium BCE. Thus far no etched beads of the Early Bronze Age have been reported from Oman.

The types which have been discovered in this period in the Persian Gulf are also known in the Indus Valley and on major sites in southern Mesopotamia (Eshnunna, Kish, Nippur, Ur) and Iran (Shah Tepe, Susa, Tepe Hissar).

#### *Northeastern Arabia*

1. *Medinat Hamad/Hamad Town (Bahrain)* (Bahrain National Museum, Manama)

Tumulus 420: two beads of the white-on-red type. One oval bead etched with two sets of touching triple concentric circles (related to Reade's types D7/D8) (Fig. 2.1a). Another oval bead shows three circle segments inscribed in an oval (related to Reade's types D10/D11) (Fig. 2.1b) (46).

Other beads from Medinat Hamad: at least eleven beads of the white-on-red type. Six are lentoid with a band around the edge or 'eye pattern' (Reade's type D1) (Fig. 2.1c). Five others are elongated elliptical lentoids etched with tangent circles/figures-of-eight or 'spectacles' (Reade's type D5/D6) (Fig. 2.1d) (47).

2. *Sar el-Jisr (Bahrain)* (Bahrain National Museum, Manama)

One bead (Fig. 2.2) from grave S-267.3, probably of the white-on-red type. It is an oval lentoid bead

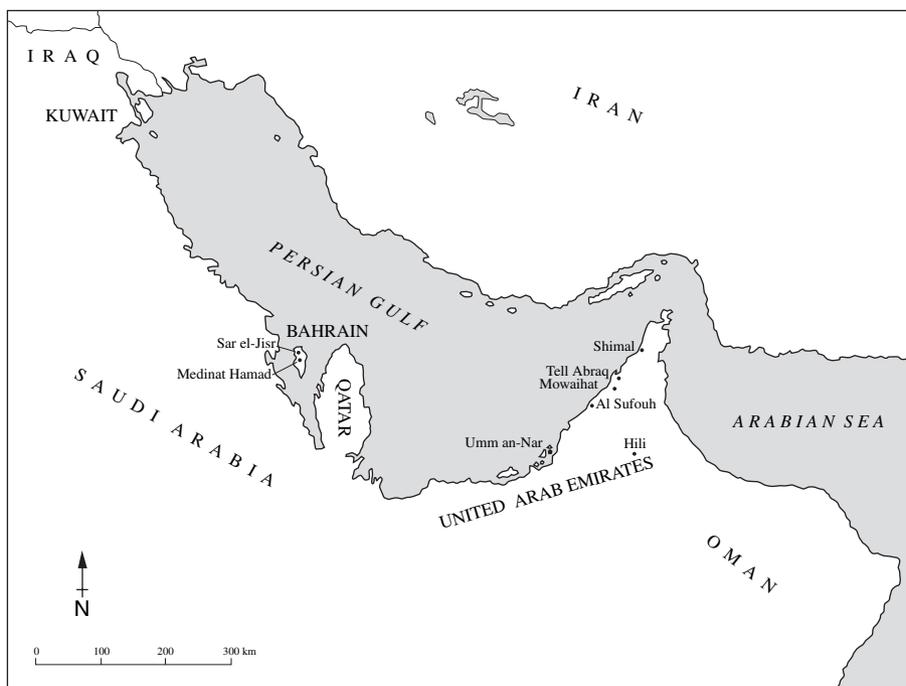


Fig. 1. Sites where etched beads from the Early Bronze Age have been found (map by Erik Smekens).

Table 1.

Reade's type	Technique	Site (number of beads)
D1	white-on-red	Medinat Hamad (6) Sar el-Jisr (1)
D5/D6 related to D7/D8	white-on-red	Medinat Hamad (5)
related to D10/D11	white-on-red	Medinat Hamad, tumulus 420 (1)
	white-on-red	Medinat Hamad, tumulus 420 (1)

decorated with a band around the edge ('eye pattern'; Reade's type D1) (48).

*Southeastern Arabia*

1. *Umm an-Nar Island (Abu Dhabi)*

Cairn II: a white-on-red barrel-shaped bead (Fig. 2.3) with four encircling lines (Reade's type B1) (49).

2. *Al Sufouh (Dubai)* (Dubai Archaeological Museum).

Tomb I: six beads in chamber 2; Tomb II: three beads. Only bead AS 232 is of the white-on-red type; the eight others are of the black-on-white type (Fig. 2.4). Eight show three concentric circles, the outermost forming a sort of oval frame (repeated

Table 2.

Reade's type	Technique	Site (number of beads)
B1	white-on-red	Umm an-Nar (1)
B3	white-on-red	Al Sufouh (1) Mowaihat (1) Hili tomb N (2)
	black-on-white	Al Sufouh (8)
	?	Hili North tomb B (5)
B8?	?	Hili tomb B (1)
related to C3	white-on-red	Hili tomb N (1)
related to D7/D8	red-on-white	Tell Abraç (1)
D8	white-on-red	Hili North tomb A (1)
related to D10	white-on-red	Hili tomb N (1)
D10	white-on-red	Mowaihat (1)
	black-on-white	Hili North tomb A (1)
E1/E2	black-on-red	Shimal (1)
E2	white-on-red	Hili tomb N (1)
?	?	Shimal (1)

'eye design'; Reade's type B3). The ninth one has only two concentric circles (50).

3. *Mowaihat (Ajman)* (Ajman Archaeological Museum).

Tomb B: two beads of the white-on-red type. One has a pattern consisting of three concentric circles (repeated 'eye design'; Reade's type B3) (Fig. 2.5a).

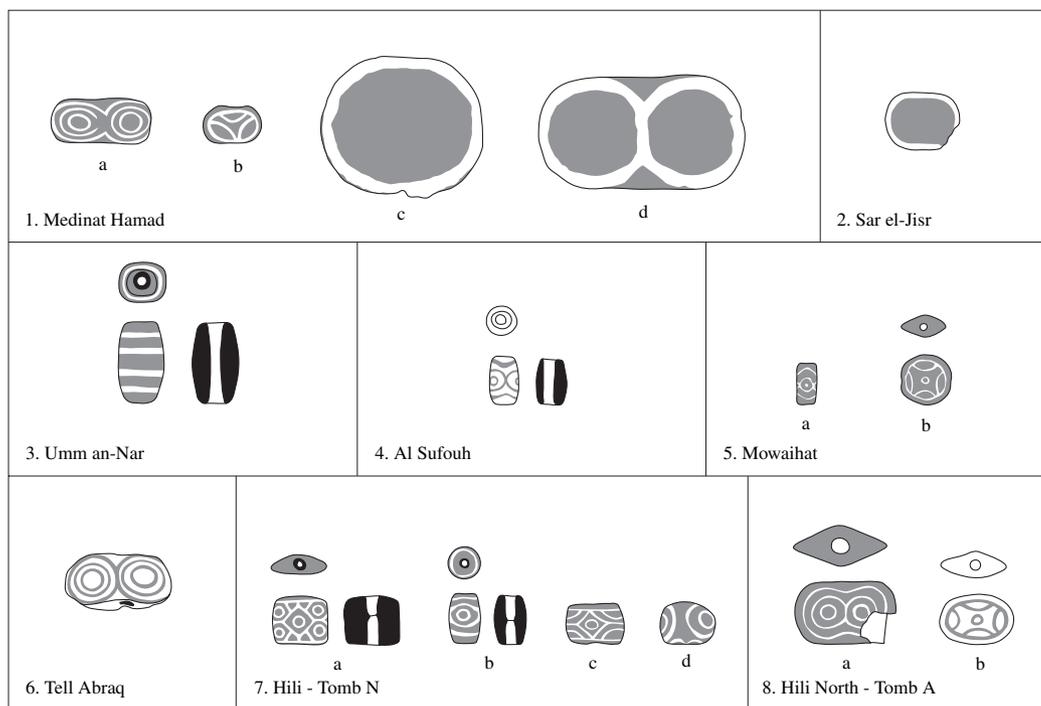


Fig. 2.

Etched beads from the Early Bronze Age, scale 1/1 (drawings by Erik Smekens after 1) Lombard, "La maison au bord du quai": 96 n° 94 and Aruz, *Art of the first cities*: 312 n° 208; 2) Ibrahim, *Excavations at Sār el-Jisr*: Pl. 56.3; 3) Frifelt, *The island of Umm an-Nar*: Fig. 238a-b; 4) Benton, *Excavations at Al Sufouh*: Fig. 149; 5) al-Tikriti, Umm an-Nar culture: Pl. 46: T-U; 6) Potts, *Ancient Magan*: 313 n° 209; 7) Méry, McSweeney, Van Der Leeuw & Al Tikriti, *New approaches*: Fig. 13; 8) Cleuziou & Vogt, *Tomb A at Hili north*: Fig. 5: 1–2).

The other one has a star design (Reade's type D10) (Fig. 2.5b) (51).

4. *Tell Abraç (Sharjah/Umm al-Qaiwain)* (Sharjah Archaeological Museum)

Grave TA 2106: one bead of the red-on-white type (Fig. 2: 6) decorated with three concentric circles touching each other (related to Reade's type D7/D8) (52).

5. *Shimal (Ras al-Khaimah)* (Ras al-Khaimah National Museum)

Tomb Sh 222: two beads. One is of the extremely rare black-on-red type and is etched with a rectilinear lozenge pattern (Reade's type E1/E2) (53).

6. *Hili (Abu Dhabi)* (Al-Ain Museum).

Tomb B: one oblong barrel-shaped bead with a dotted honeycomb design (related to Reade's type B8?) (54).

Tomb N: at least five white-on-red beads were found (55). One bead is etched with a rectilinear lozenge pattern filled with single circles (Reade's type E2) (Fig. 2.7a). Two beads are decorated with a pattern consisting of three concentric circles (repea-

ted 'eye design'; Reade's type B3) (Fig. 2.7b). Another bead shows a design related to Reade's type D10 (Fig. 2.7c). Similar etched beads have been found in Mesopotamia, India (e.g. Chanhu-Daro) (56) and Afghanistan (e.g. Shortugai) (57). Finally, the last bead is related to Reade's type C3 (Fig. 2.7d).

7. *Hili North (Abu Dhabi)* (Al-Ain Museum).

Tomb A: two beads. Bead m.100, with a lozenge-shaped section, is of the white-on-red type and is decorated with a pattern of three concentric circles (Reade's type D8) (Fig. 2.8a). The other one, m.146, is a black-on-white type etched bead with a star design (Reade's type D10) (Fig. 2.8b) (58).

Tomb B: five beads were found, but remain unpublished. They are etched with repeated 'eye designs' (Reade's type B3) (59).

### The Late Bronze Age (?) (c. 1600–1250 BCE)

A Wadi Suq period (2000–1600 BCE) tomb at Dhayah (Ras al-Khaimah) contained two etched beads, but they probably belong to a secondary

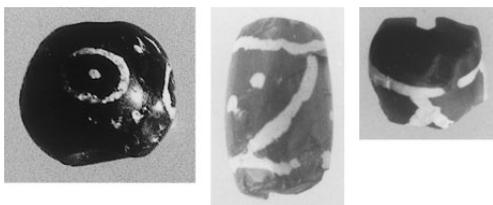


Fig. 3.  
The etched beads BQ 65, ED 18 and BQ 164 from ed-Dur, scale 2/1 (photographs by Erik Smekens).

PIR burial (see below). For the following period, preferably called the Late Bronze Age (60), one bead is reported. We know of at least one example from a tomb at *Qattarah (Abu Dhabi)* (Al-Ain Museum) (61). Unfortunately this bead remains unpublished and there is no further information available. Although seemingly found in a Late Bronze Age tomb, a critical approach is warranted. A later reuse of this tomb can by no means be excluded. Publications of the *Qattarah* assemblage are badly needed.

The almost complete absence of etched beads in second-millennium BCE contexts is most likely

linked to the disappearance of the Indus Civilisation, which was seemingly the main, if not the exclusive purveyor of etched carnelian beads. However, the technique was not lost since examples of etched beads reappear during the Iron Age.

#### The Iron Age (c. 1250–300 BCE) (Fig. 4)

During the Iron Age etched beads seem to be extremely rare. Three beads found in a stone vessel, hidden behind a wall of house F at Rumeilah (Abu Dhabi), were published as etched (62). However, information provided by Rémy Boucharlat clearly indicates that the three beads were made of glass paste (63).

According to Carl Phillips, one etched bead was found in an Iron Age tomb in the *Wadi al-Qawr (Ras al-Khaimah)* which, however, also included a later burial of first-second-century AD date (64). Unfortunately, more information on this bead and its context is lacking. At *Rawdah-Muqatta (al Jawf, Oman)* two beads (Fig. 5.1a-b) were found in tomb Mu1 and are attributed to the Lizq/Rumeilah period in the Omani chronology (65).



Fig. 4.  
Sites where etched beads from the Late Bronze Age, the Iron Age, the PIR-period and the Sasanian/Early Islamic era were found (map by Erik Smekens).

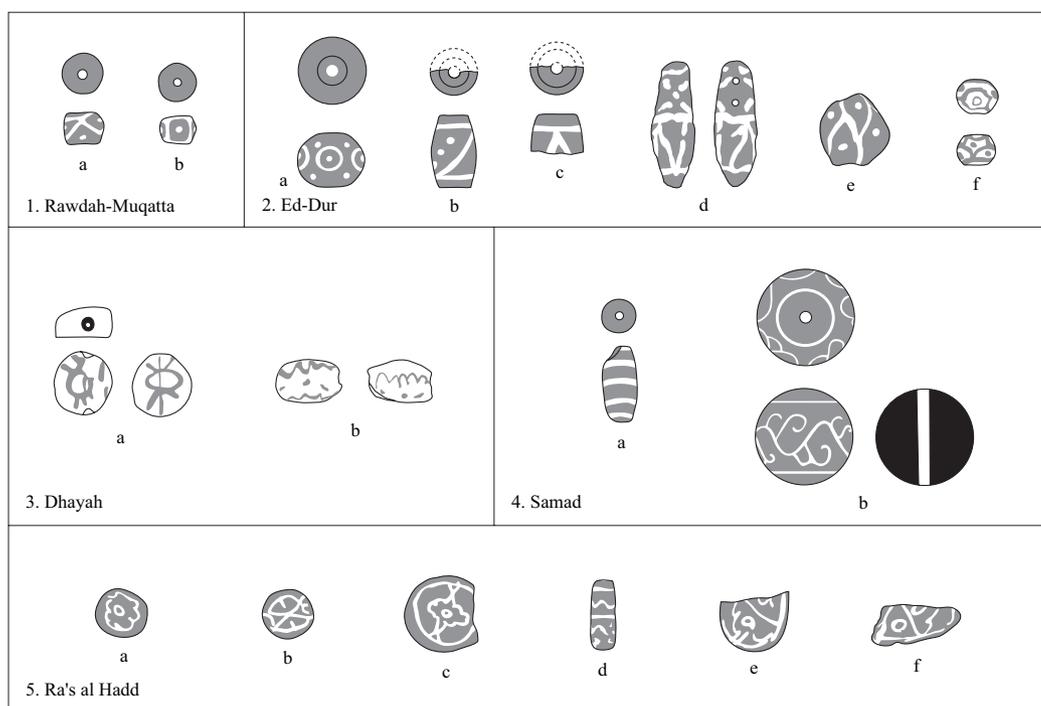


Fig. 5.

Etched beads from the Late Bronze Age, the Iron Age, the PIR-period and the Sasanian/Early Islamic era, scale 1/1 (drawings by Erik Smekens after 1) Yule, *Die Gräberfelder*: Tafel 531: 1.6; 3) Kästner, Some preliminary remarks: Fig. 2: a, h; 4) Yule, *Die Gräberfelder*: Tafel 99: 2.12, Tafel 450: 2; 5) Reade, Excavations at Ra's al-Hadd: Fig. 37.

#### PIR (Pré-islamique récent; late first millennium BCE-early centuries AD) (Fig. 4)

This period witnessed a major increase in international traffic, particularly through the Persian Gulf. Those goods from distant regions which passed through the Persian Gulf included etched carnelian beads of types which differ stylistically from those of the Bronze and Iron Age.

##### 1. *Ed-Dur* (*Umm al-Qaiwain*) (Umm al-Qaiwain Museum)

Three beads of the white-on-red type were found by the Belgian team (Fig. 3). Bead BQ 65 was found in tomb 10 of Area BQ. This unlooted tomb of a child was a simple pit burial. The child had a necklace made of stone, glass paste and shell beads, with a bronze bell in the centre. The necklace included one globular etched bead with dotted circles and dots in the field (Fig. 5.2a). The barrel-shaped beads BQ 164 (Fig. 5.2c) and ED 18 (Fig. 5.2b) were, unfortunately, surface finds (66).

During the British excavations at ed-Dur, one etched carnelian bead of the white-on-red type was found in tomb AP.1. The teardrop shape and place

of the two perforations strongly suggest it was a pendant (Fig. 5.2d) (67).

The French team found two etched carnelian beads in tomb 835 of the building in area F. Bead F 33 (Fig. 5.2e) is of the white-on-red and bead F 39 (Fig. 5.2f) of the red-on-white type (68). The tomb probably dates to the third/fourth century AD.

##### 2. *Dibba* (*Sharjah*) (Sharjah Archaeological Museum)

During the excavation of a tomb at Dibba in 2004, Sabah Abboud Jasim discovered no less than six etched beads, all of the white-on-red type. More information on this grave and the beads will be published in the future (69).

##### 3. *Kalba* (*Sharjah*)

One etched bead was discovered in a grave at Kalba. However, the date of the Kalba burials is difficult to determine. They are post-Iron Age, most likely from around the first-third centuries AD, although they might be later (70).

##### 4. *Dhayah* (*Ras al-Khaimah*) (Ras al-Khaimah Museum)

Tomb 1 at Dhayah yielded two etched beads (Fig. 5.3a-b) with rather careless decoration.

Although occurring in a tomb of the Wadi Suq period they most likely belong to a secondary PIR-period burial (71).

5. *Wadi al-Qawr (Ras al-Khaimah)*

An Iron Age tomb at Wadi al-Qawr was later reused for a first-second century burial. One bead was found and could belong to the PIR grave (72).

6. *Samad (Oman)*

Tomb S 10718 contained a barrel-shaped bead decorated with horizontal stripes (Fig. 5.4a) (73).

### The Sasanian/Early Islamic period (Fig. 4)

An etched bead was found in the grave of a woman at *Samad* (Tomb S 3018), together with thirty-five plain carnelian beads. It is a large globular bead with a white-on-red rank/scroll motif (Fig. 5.4b). It is not clear to which phase of the Samad period this bead belongs. A late reuse of the tomb in the Sasanian/Early Islamic period cannot be excluded (74). At *Ra's al Hadd (Oman)* (mound HD-4) several etched beads were found in a twelfth-century AD context (Fig. 5.5a–f) (75).

On the later beads (group C) St. J. Simpson remarks that they are less carefully manufactured (colour, shape and drill-holes). They would have originated in Iran during the Sasanian period (in India just a few examples were found), and they would have spread both geographically (outside the Sasanian Empire) and chronologically (until the Islamic period) (76).

### Conclusion

Like many other regions in the Near East, such as Iran or Iraq, the Arabian shores of the Persian Gulf and Oman were involved in long-distance trade between East and West. Etched/bleached beads are

only a minor element testifying to these multiple contacts. In general, the temporal distribution of these beads in northeast and southeast Arabia differs in no way from the picture we obtain from other regions. The relatively small number of etched beads found could be an indicator of the high value of these objects. Although the raw material was present in the Gulf region, only one possible workshop of agate and/or carnelian has yet been identified (at al-Ghail, 40 km south of Ras al-Khaimah). In addition, unworked nodules have been found in a second-millennium tomb at Shimal and at the medieval town of Julfar, both in the Emirate of Ras al-Khaimah (77). There is thus evidence of some open-cast mining of banded agate and carnelian, but until now there is no evidence of a major stone bead production in the area, and certainly not of etched beads. The latter therefore seem certainly to represent imports. In view of the available evidence it is reasonable to assume that the beads found in northeast and southeast Arabia were imported from workshops on the Indian subcontinent, whether through direct or indirect contacts. Another source, such as Mesopotamia, cannot be excluded at the moment. However, it is by no means certain that etched beads were ever produced there, even if some scholars have made this suggestion. The presence of etched carnelian beads in northeast and southeast Arabia is thus more likely to be linked to the transport of commodities produced in the Indus Valley by sea-faring merchants in the Persian Gulf, a phenomenon attested in several different periods.

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### References

1. Dubin LS. *The history of beads. From 30,000 B.C. to the present*. New York: Harry N. Abrams, 1995: 7; Jyotsna M. *Distinctive beads in ancient India*. Oxford: BAR Int Ser, 864: 2000: 2.
2. Beck HC. Etched carnelian beads. *The Antiquaries Journal* 13: 1933: 384–398.
3. During Caspers ECL. Etched carnelian beads. *Bulletin of the Institute of Archaeology* 8–9. 1972: 83–98.
4. Reade J. *Early etched beads and the Indus-Mesopotamia trade*. London: British Museum Occasional Paper, 2: 1979.
5. Tallon F. Introduction. In: Tallon F, ed. *Les pierres précieuses de l'Orient ancien des Sumériens aux Sassanides*. Paris: Éditions de la Réunion des musées nationaux, 1995: 12.
6. Inizan M.-L. Cornaline et agates: Production et circulation de la préhistoire à nos jours. In: Tallon, *Les pierres précieuses*: 21.

7. Arkell AJ. Cambay and the bead trade. *Antiquity* 10: 1936: 302.
8. Whitehouse D. Carnelian in the Persian Gulf. *Antiquity* 49: 1975: 129–130.
9. Vogt B. Bronze Age maritime trade in the Indian Ocean: Harappan traits on the Oman Peninsula. In: Reade J, ed. *The Indian Ocean in antiquity*. London-New York: Kegan Paul International, 1996: 112.
10. Mackay E. India: Technology. Decorated carnelian beads. *Man* 33: 1933: 145.
11. Tosi M. Karneol. *RIA* 5: 1976–1980: 449.
12. Simpson StJ. Sasanian beads: The evidence of art, texts and archaeology. In: Glover IC, Hughes-Brock H & Henderson J, eds. *Ornaments from the past: Bead studies after Beck*. London: Bead Study Trust, 2003: 64.
13. A catalogue of the etched carnelian beads from Bronze Age India can be found in Possehl GL. Meluhha. In: Reade, *The Indian Ocean in antiquity*: 154–157.
14. Possehl, Meluhha: 158. Catalogues of the already excavated Mesopotamian (and Indian) etched carnelian beads can be found in Beck, Etched carnelian beads: 388–392; During Caspers, Etched carnelian beads: 86–88, 92–95; as well as Reade, *Early etched beads*: 8–23.
15. For example During Caspers, Etched carnelian beads: 95; Reade, *Early etched beads*: 24; Jyotsna, *Distinctive beads*: 6.
16. Possehl, Meluhha: 158.
17. During Caspers, Etched carnelian beads: 97.
18. Tallon, Introduction: 13.
19. Reade, *Early etched beads*: 24; Possehl, Meluhha: 158.
20. There is, of course, the possibility that these beads were not yet excavated in India or that they are still unpublished.
21. Reade, *Early etched beads*: 24.
22. Jyotsna, *Distinctive beads*: 20.
23. Beck HC. *The beads from Taxila*. Delhi: Memoirs of the Archaeological Survey of India, 65, 1941: 3–4, Pl. I.1–7, Pl. II.1–31.
24. Reade, *Early etched beads*: 25.
25. Inizan, Cornaline et agates: 23.
26. Casson L. *The Periplus Maris Erythraei. Text with introduction, translation, and commentary*. Princeton: Princeton University Press, 1989: 206.
27. Beck, Etched carnelian beads: 388–395.
28. Beck, Etched carnelian beads: 390–395; Glover I. The archaeological evidence for early trade between India and Southeast Asia. In: Reade, *The Indian Ocean in antiquity*: 382–383.
29. Beck, Etched carnelian beads: 384.
30. During Caspers, Etched carnelian beads: 85.
31. Reade, *Early etched beads*: 5.
32. During Caspers, Etched carnelian beads: 85.
33. Beck, Etched carnelian beads: 384.
34. Mackay, India: Technology: 144.
35. Beck, Etched carnelian beads: 384, 386. However, the precise manufacturing technique of the black-on-white type is still unknown. Relying on H.C. Beck's experimental research, a copper nitrate solution seems to give the best results (During Caspers, Etched carnelian beads: 85).
36. Reade, *Early etched beads*: 5.
37. Mackay E. Bead making in ancient Sind. *JAOS* 57: 1937: 1–15.
38. Tosi, Karneol: 448–452.
39. Francis P, Jr. Beadmaking at Arikamedu and beyond. *World Archaeology* 23/1: 1991: 37–38.
40. Inizan, Cornaline et agates: 21–32.
41. Most of the carnelian nodules just extracted do not yet have their nice red colour (Inizan, Cornaline et agates: 22).
42. Tosi, Karneol: 452.
43. Tosi, Karneol: 450.
44. Reade, *Early etched beads*: 5.
45. Theunissen R, Grave P & Bailey G. Doubts on diffusion: Challenging the assumed Indian origin of Iron Age agate and carnelian beads in Southeast Asia. *World archaeology* 32: 2000: 84–105.
46. Lombard P. “La maison au bord du quai”: L'entrepôt du royaume. In: *Bahreïn. La civilisation des deux mers de Dilmoun à Tylos (Exposition présentée à l'Institut du monde arabe du 18 mai au 29 août 1999)*. Paris: Institut du monde arabe, 1999: 96, n° 94.
47. Aruz J, ed. *Art of the first cities. The third millennium B.C. from the Mediterranean to the Indus*. New York: The Metropolitan Museum of Art, 2003: 312, n° 208.
48. Ibrahim M. *Excavations of the Arab expedition at Sār el-Jīsr, Bahrain*. Bahrain: Ministry of Information, 1982: 21, 36, pl. 56: 3.
49. Frifelt K. *The island of Umm an-Nar. Volume I. Third millennium graves*. Aarhus: JASP, 26/1: 1991: 115–116, Fig. 238a-b; Reade, *Early etched beads*: 11.
50. Benton JN. *Excavations at Al Sufouh. A third millennium site in the Emirate of Dubai*. Turnhout: Abiel, 1: 1996: 126–127, Figs 133–134, 149–150.
51. al-Tikriti WY. Umm an-Nar culture in the northern Emirates: Third millennium BC tombs at Ajman. *AUAE* 5: 1989: 95, Pl. 46.T-U, Pl. 58B.
52. Potts DT. *Ancient Magan. The secrets of Tell Abraq*. London: Trident Press, 2000: 131; Potts DT. The Gulf: Dilmun and Oman. In: Aruz J, ed. *Art of the first cities. The third millennium B.C. from the Mediterranean to the Indus*. New York: The Metropolitan Museum of Art, 2003: 313, n° 209.
53. Vogt, Bronze Age maritime trade: 113.
54. Vogt B. The Umm an-Nar tomb A at Hili north: A preliminary report of three seasons of excavation, 1982–1984. *AUAE* 4: 1985: 33; Vogt, Bronze Age maritime trade: 113.
55. Al Tikriti WY & Méry S. Tomb N at Hili and the question of the subterranean graves during the Umm an-Nar period. *PSAS* 30: 2000: 217, Fig 11: 2–3; Méry S, McSweeney K, Van Der Leeuw S & Al Tikriti WY. New approaches to a collective grave from the Umm an-Nar period at Hili (UAE). *Paléorient* 30, 1: 2004: Fig. 13.
56. Reade, *Early etched beads*: Fig. 2: i; During Caspers, Etched carnelian beads: 87, Fig. 1: 13; Possehl, Meluhha: Fig. 9.
57. Francfort HP. *Fouilles de Shortughai. Recherches sur l'Asie Centrale proto-historique*. Mémoires de la Mission Archéologique Française en Asie Centrale, II. Paris: Diffusion de Boccard, 1989: Pl. 72.3, Pl. 36e.
58. Cleuziou S & Vogt B. Tomb A at Hili north (United Arab Emirates) and its material connections to Southeast Iran and the greater Indus Valley. In: Schotsmans J & Taddei M, eds. *South Asian archaeology 1983*. Naples: Istituto Universitario Orientale Dipartimento di Studi Asiatici Series Minor, 23: 1985: 257–258, Fig. 5.1–2; Vogt, The Umm an-Nar tomb A at Hili north: 33, Pl. 28.4–5.

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59. Vogt, The Umm an-Nar tomb A at Hili north: 33; Vogt, Bronze Age maritime trade: 113.
60. Velde C. Wadi Suq and Late Bronze Age in the Oman Peninsula. In: Potts D, Al Naboodah H & Hellyer P, eds. *Archaeology of the United Arab Emirates. Proceedings of the First International Conference on the Archaeology of the U.A.E.* London: Trident Press, 2003: 112.
61. Vogt, Bronze Age maritime trade: 113; Kästner J.-M. Some preliminary remarks concerning two recently excavated tombs in Dhayah/Ras al-Khaimah. In: Schippmann K, Herling A & Salles J.-F., eds. *Golf-Archäologie: Mesopotamien, Iran, Kuwait, Bahrain, Vereinigte Arabische Emirate und Oman*. Buch am Erlbach: Internationale Archäologie, 6: 1991: 241.
62. Boucharlat R & Lombard P. The oasis of Al Ain in the Iron Age: Excavations at Rumeilah 1981–1983. Survey at Hili 14. *AUAE*: 1985: 451.
63. We gratefully acknowledge Rémy Boucharlat's kindness in providing us with the original fieldnotes, other records and slides of these beads. The description 'pâte de verre' is present on the object-files of the three beads.
64. We thank Carl Phillips, who directed the excavation of the tomb, for kindly providing this information.
65. Yule P. *Die Gräberfelder in Samad al Shān (Sultanat Oman). Materialien zu einer Kulturgeschichte*. Rahden: Verlag Marie Leidorf, 2001: 396, Tafel 531: 1.6.
66. Haerinck E. *Excavations at ed-Dur (Umm al-Qaiwain, United Arab Emirates). Vol. II. The tombs*. Leuven: Peeters, 2001: Pl. 245.4 (=BQ 65). The two others—BQ 164 and ED 18—are unpublished, but presented here.
67. Information and illustration kindly provided by C. Phillips who directed the excavations of the British team at ed-Dur.
68. We thank Olivier Lecomte for kindly providing this information.
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70. Information kindly provided by C. Phillips.
71. Kästner, Some preliminary remarks: 235, 241, Fig. 2: a-h; Simpson, Sasanian beads: 66.
72. Information kindly provided by C. Phillips who excavated the tomb.
73. Yule, *Die Gräberfelder*: 253, Tafel 99: 2.12.
74. Yule, *Die Gräberfelder*: 358, Tafel 450: 2; Simpson, Sasanian beads: 66.
75. Reade J. Excavations at Ra's al-Hadd, 1988. Preliminary report. In: Cleuziou S, Reade J & Tosi M, eds. *The Joint Hadd Project. Summary report on the third season (October 1987-February 1988)*. Naples: Istituto Universitario Orientale, 1990: 42, Fig. 37; Nayeem MA. *The Sultanate of Oman*. Prehistory and Protohistory of the Arabian Peninsula, 4. Hyderabad: Hyderabad Publishers, 1996: Fig. 12.
76. Simpson, Sasanian beads: 66.
77. Vogt, Bronze Age maritime trade: 112.