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A Steatite–Cutting Atelier on the Surface of Moenjodaro

Introduction

It would be difficult to imagine a group of Harappan objects without any steatite item. Steatite seals and disk–beads alone could be invoked to demonstrate the unmistakable Harappan character of a site. The inventory of Harappan ornaments and leisure items produced in steatite or "artificial" steatite–based ceramics (Hegde et al. 1982) often showing traces of glazed coatings, would be probably extremely long and varied, demonstrating the long–date experience of protohistoric craftsmen in Baluchistan and India in manipulating this extraordinary material. Highly organized forms of intensive production of steatite disk–beads have been identified by J.F. Jarrige at Mehrgarh, in levels dating back to 4000 BC. (Samzoun n.d.). At the close of 3rd millenium BC, specialized ateliers were active within the major Mature Harappan urban contexts, providing the citizens and the administrators with the square stamp--seals representing the key–artefact in the interrelationships between the individual and the state, and a wide range of ornaments and status signs playing, with every probability, a significant role in intra–social communication. Steatite urban manufactures, furthermore, were interconnected with other industries through specific and systematic forms of recycling (Vidale n.d.) probably determining well defined economic and social bonds among different spheres of craft specialization. In this perspective, steatite–cutting may be deemed as a primary trait of Harappan urban behaviour. This paper presents the evidence gathered at Moenjodaro on the surface of a steatite–cutting atelier identified in 1983–84 and labelled Activity Area (hereafter AA.) 47 (Bondioli et al. 1984).

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Aspects of Steatite Production at Moenjodaro

According to the excavation reports, besides the mention of some isolated unfinished seals (Marshall 1931: 179, 184, 221) scattered within the urban architecture, and of a room in the "palace" in HR Area in which "many fragments of sawn and partially worked steatite" were noticed (ibidem: 184) not much is known on the localization of steatite–cutting workshops.

To the scanty information provided by the literature we may add the evidence of the surface evaluation of the craft activity areas of the town (Bondioli et al. 1984; Pracchia et al. 1985; Vidale n.d. a). The research resulted in the identification of AA. 14, an assemblage in secondary context in the excavated compound of DK–G North (Plate VIII) (Bondioli et al. 1984: fig. 15), of a large amounts of steatite debitage on the excavation dumps of the so–called Moneer site, and of a row of surface scatters of steatite fragments and functionally related indicators along the slopes in front of the DK–A ruins (from south to north AA. 9, 45, 46, 47, 38, 48).

This latter series of sites was discussed in a previous work published in this journal (Vidale n.d. a). Although sharing the common occurrence of steatite debitage with sawing marks, the six AA. presented different functional associations. In AA. 9, at south, the features of the discarded lithics suggested the performance of some refining activity, apparently with the purpose of separating the stone from its calcareous gangue as well as from its macro–crystalline fraction, unsuitable for further processing (Vidale n.d. a: fig. 5); heating treatments were probably involved. AA. 38 and, at some distance from the slopes, AA. 48 were distinguished by the presence, together with steatite, of vitreous–like, turquoise or pale–yellow slags, indicating specific technological connections between steatite production and glazing (Vidale n.d.). Similar associations were noticed at Chanhudaro (Sher and Vidale 1984) and, more recently, at Judeirjo–Daro and Harappa (Vidale n.d.).

The remaining AA. were characterized by the simple occurence of steatite–cutting debitage. This pattern of differential associations on surface lead us to hypothesize a form of tehcnological interconnection between the manufacturing units producing the various surface spreadings (Vidale n.d. a: fig. 20). In this perspective, the row of debitage concentrations outcropping along the slopes might be ascribed to an enlarged manufacturing context centered on the reductive transformational sequences identified in AA. 45, 46, 47.

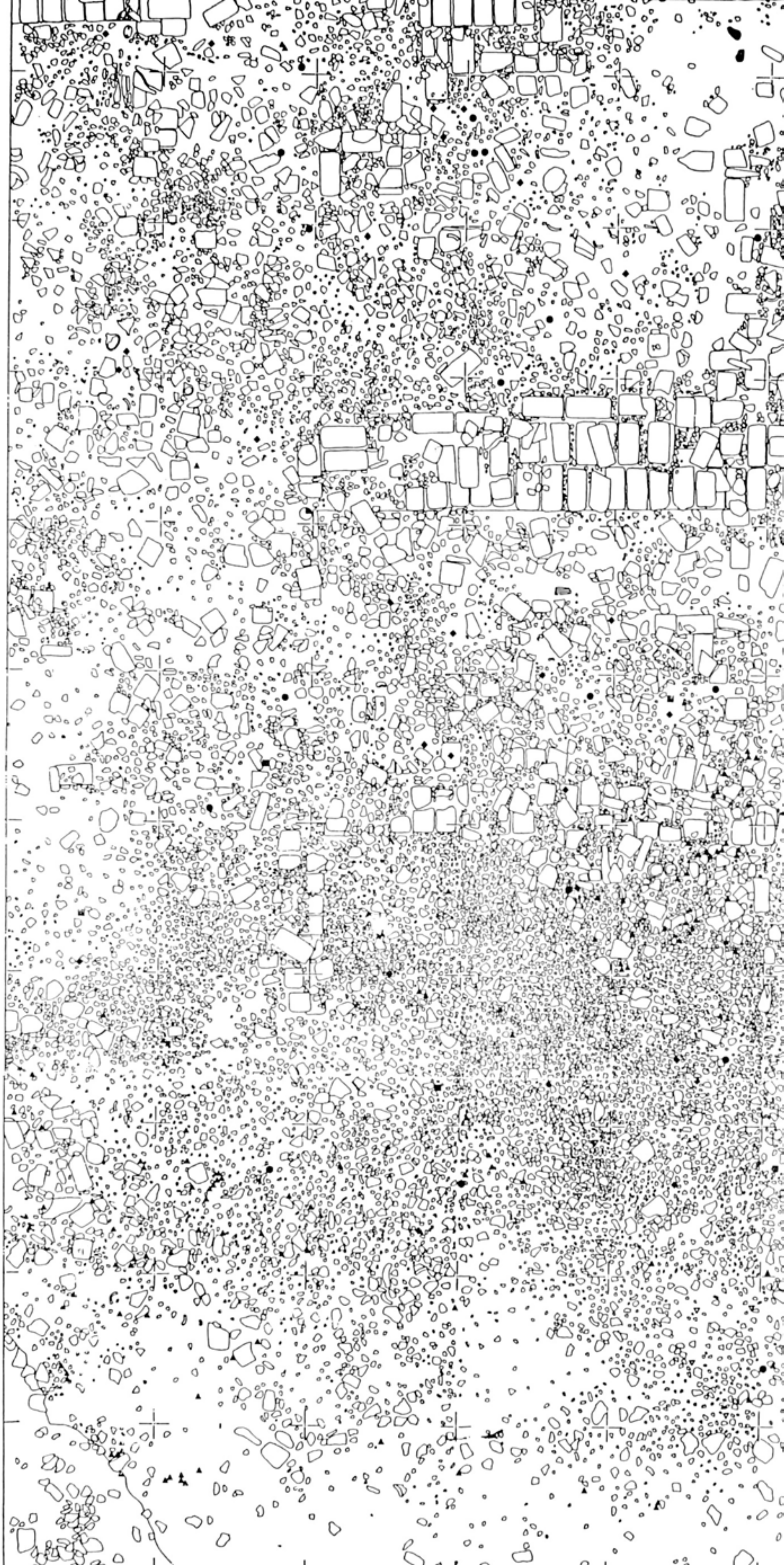
Among these latter sites, AA. 47 was by far the most interesting for its extension, its anomalous pattern of distribution of the steatite debitage, and for the consistent association between debitage and outcropping architectural features in a sub–horizontal context, ruling out the possibility of secondary clustering from downslope movements. The site, identified in 1983, was mapped in March 1985 by the writer and G.M. Shar of Sindh University, Khairpur. It took us about 8 days to map the distribution of industrial indicators and the architecture, enclosed in a rectangle of 10.5 × 13 m. The central cluster of steatite debitage was removed to preserve it from the fast aggression of salt, and stored in the Reserve Collection of the Moenjodaro Museum; the peripherical scatters of lithics and other artefacts were mapped and left in situ to keep the disturbance of the site at minimum. In 1986 we could observe that, after the collection of the sample, erosion brought to light a new, packed concentration of stone chips showing the basic distributional features of the previous year.

The Site (Plates I–II)

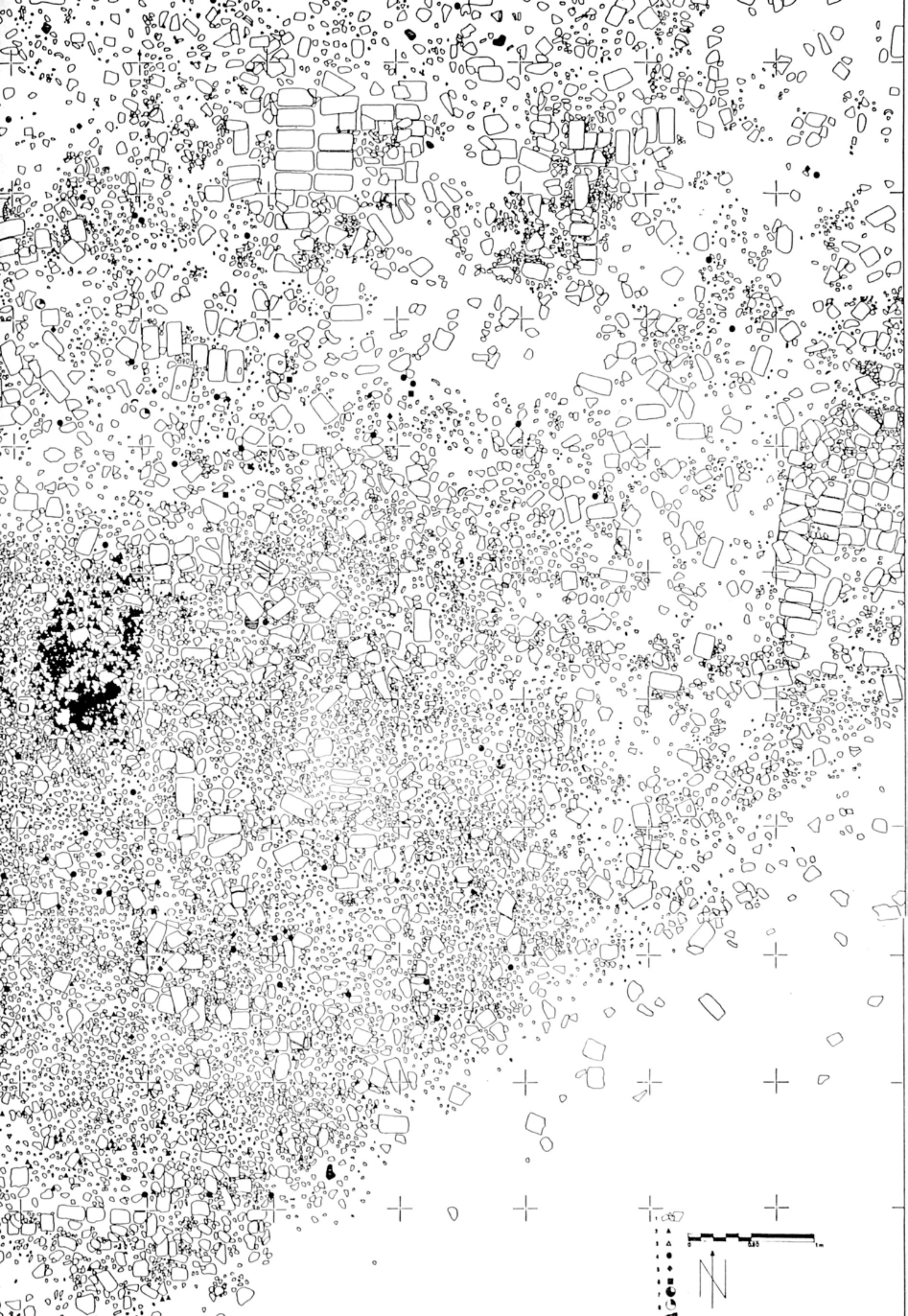
AA. 47 was discovered in the point marked by the 2825: 1445 coordinates of the RWTH grid system. The site is located at the mouth of a deep erosion gully running in west–east direction, formed by the confluence of three different valleys in a single estuary (Plates I–II). Substantial tracts of fired brick architecture are exposed across this erosive basin; the outcropping walls are, in some points, parallel to the gullies, while in other cases they work as orthogonal miniature dams or terraces, retaining the inner deposits as partially eroded *talus* or sub–tabular fillings. The strong drainage capacity of this geomorphological system is also demonstrated by the presence of several bushes crowding along the borders of the gullies or the edges of the micro–terraces.

This system cuts in an orthogonal direction a sector of the slopes that, for an extension of 35–40 m., at north and south, appears rather uniform. All along this extension the exposed architecture is filled with a huge amount of sherds washed out by rain and, in two cases, with mud–brick platforms. On the whole, the surface evidence would point to a possibly unitary system of smal raised cells (large no more than 9–12 sq.m.) partially analogous to the facing complex of DK–A (Plate II *b*).

AA. 47 is composed in a great part by a low, asymmetric hummock (Plate I) protruding, at south of the surveyed area, from the foot of this architectural–geomorphological complex; at the mouth of the estuary, the relief deviates towards south the alluviation products filling the bed of the gully. Towards north, the mound, about 10 × 10 m. large, has a low, gradual slope (Plate II *a*), while at south a rather abrupt gradient marks the boundary with the alluvial bed of the estuary (Plate I *b*). This is the



ig. 1 – Map of AA. 7. 1: fired bricks fragments and potsherds; 2: eatite debitage; 3: bone hips; 4: chert blades; 5: hert flakes; 6: chalcedoy flakes; 7: chert hamerstones; 8: chert hamerstone fragments; 9: uartzite grinding stones ragments. Sherds and verfired ceramics, for ake of simplicity, are not evidenced.



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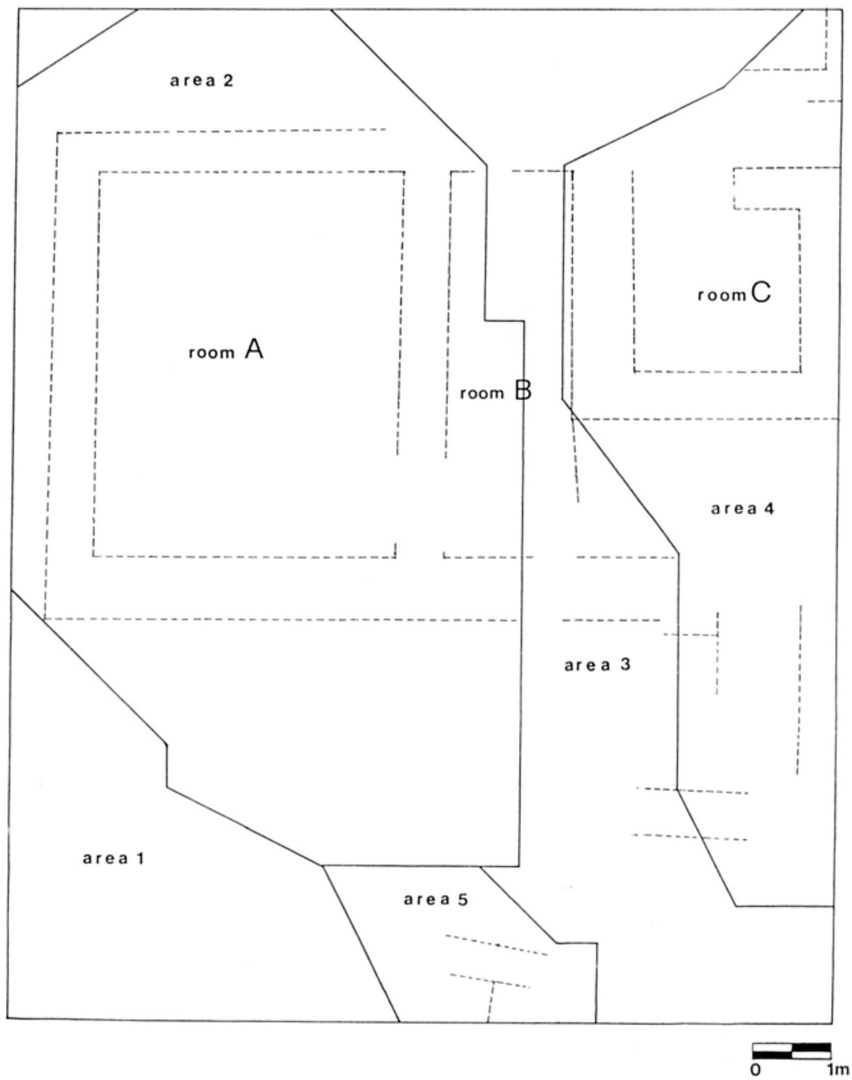


Fig. 2. – Map of AA. 47, showing the reconstructed outline of the main architectural features of the site and their relationships to the identified geo–morphological areas.

highest point of the hummock, rising about 1 m. high from the surrounding plane.

The hummock (representing for our purposes a geomorphological unit labelled Area 1) is therefore delimited at west and south by the erosive estuary (named Area 2); on the north side, it is isolated from the main geomorphological complex by a second line of erosion crossing from west to east the surveyed area (Area 3), partially deviated towards north by a badly demaged architectural feature surviving in the alluvial plane (Area 4). Along the northern side of the area, this second gully follows the foot of another sector of slope (Area 5) (fig. 2).

The exposed architectural features indicate that the mound covers the remains of 3–4 rooms, somehow connected with the major complex of the slope. The surface of the mound in Area 2 presents at south–west a substantial percentage of disaggregated silt, dark gray in colour due to the presence of charcoal particles; this surface covering has been partially protected from erosion by a bush located at the exterior south–western corner of the surveyed area. The remaining surface is totally washed out, exposing an extended formation of small sized sherds. The rooms of the hummock, therefore, appear to have been filled with a structural deposit of potsherds embedded in a silty altered matrix most probably produced by decayed mud–bricks.

Architecture and Distribution of Craft–Indicators

The west part of the mapped area (Fig. 5) contains a series of at least 3 north–south oriented rooms probably belonging to a same architectural context (rooms A, B, C, fig. 6). Room A, at south, in the centre of Area 2, is a rectangular space 6.25×5 m. wide, with a possible entrance on the north–eastern corner. Here room A might communicate with room B, a narrow passage–like space 2.10×6.25 m. large, whose architectural features directly affect the drainage capacity of Area 3. The north–western corner of a surveyed area shows the small, isolated room C, 3.15×3.60 m. wide, with a door on the west side, aligend with rooms B and A; room C corresponds to the western part of Area 5, while at east are visible preserved remains of walls.

If the surface identification of the potsherds covering of Area 2 as the residual evidence of an inner filling is correct, this deposit may be considered as a true architectural feature, not differently from its peripherical walls. As a matter of fact, this is the architectural component showing the closest spatial relationships with the distribution of industrial debitage. The limits of dispersion of steatite chips closely follow the boun-

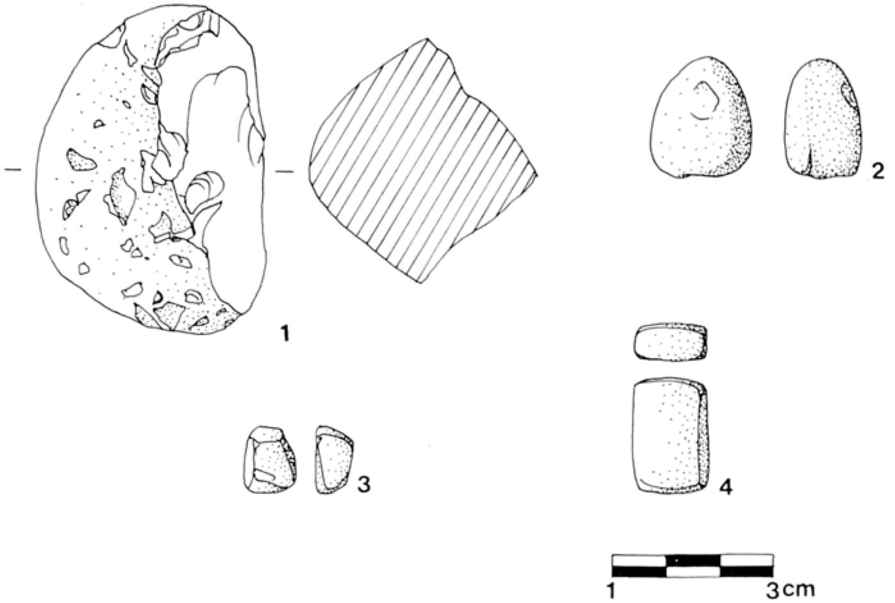


Fig. 3. – Lithic indicators recovered from the surface of the site: 1: fragmentary hammerstone; 2: highly worn quartzite pebble, probably used as a polisher; 3: possible unfinished limestone micro–weight; unfinished chlorite bead.

dary of the altered silt/sherds formation, clearly contained within the walls of the rectangular room A (Fig. 1). In absence of sub–surface tests, three alternative explanations may be offered for this close spatial relationship:

1. the potsherd filling in room A contains the indicators as secondary refuse (i.e., some baskets of deposit rich in debitage were thrown into the filling during the construction works);

2. the filling covers an underlying floor containing spreadings of primary or secondary refuse;

3. the filling represents the structural substratum of a partially washed-out floor covered by primary or secondary refuse, progressively concentrated within the potsherd and silt deposit.

Only a carefully oriented sub–surface observation test could solve the problem. Anyhow, one could observe that the presumable sub–primary nature of the main concentration of debitage in front of the possible door between rooms A and B (fig. 1, Plate III *a*) would point to models 2. and 3., as this clusters would fall outside the limits of the structural filling of A.

As the geo–morphological units labelled Areas 1–5 may be considered cumulative outputs of the post–depositional behaviour of the archaeological

TAB. 1. MOENJODARO, AA. 47: *Distribution of artefacts per geomorphological units*

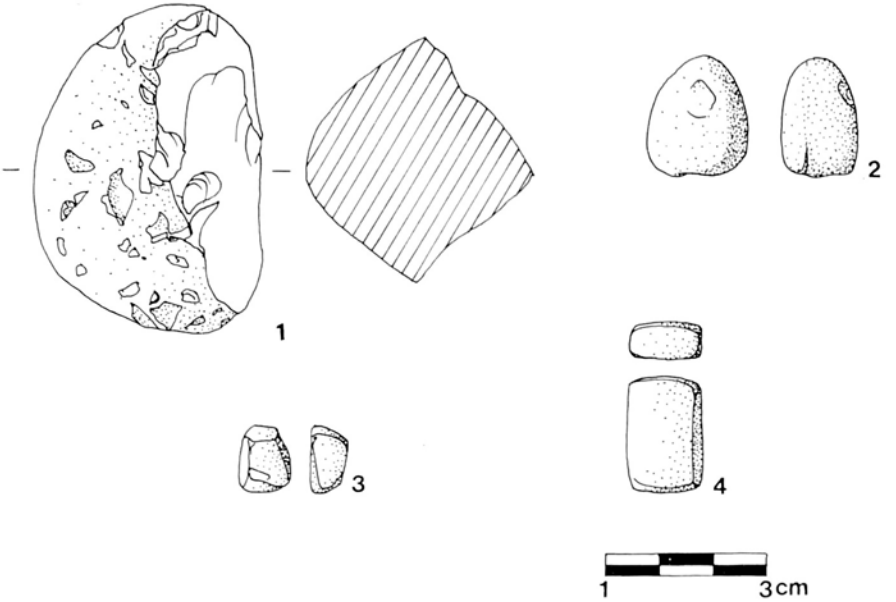
ext.	ST.	BL.	FL.	GS.	CH.	HM.	BN.	OV.
1 15,75	—	—	—	—	—	—	—	—
dens.	0	0	0	0	0	0	0	0
2 60.75	835	36	31	5	6	5	22	139
dens.	13.74	0.59	0.51	0.08	0.10	0.07	0.36	2.29
3 27.07	1	13	13	2	4	2	—	211
dens.	0.04	0.48	0.48	0.07	0.15	0.07	0	7.79
4 27.93	3	16	11	4	—	2	—	50
dens.	0.11	0.57	0.39	0.14	0	0.07	0	1.79
5 5.00	—	—	—	—	—	—	—	—
dens.	0	0	0	0	0	0	0	0

ext. = extension; dens. = density per sq. m.; ST. = steatite debitage; BL. = chert blades; FL. = chert flakes; GS. = quartzite grinding stones fragments; CH. = chalcedony flakes; HM. = chert hammerstones fragments; BN. = bone chips; OV. = overfired ceramic remains. Integer values refer to the absolute number of items per unit; decimal values are absolute density values per sq. m.

contexts of the visible architecture, they have been used to discuss the distribution of the artefacts on record (Tab. 1).

Areas 1 (the alluvial bed of the estuary) and 5 (a washed–out architectural feature) are void of artefacts. The association between the spread of steatite chips and Area 2 is immediately evident. Although the high density value for ST. in Area B is largely due to the central cluster (i.e. to a single episode in time), the association between Area 2/Room A/ potsherd filling and the deposit–dump of steatite industrial debris is the most important feature of the spatial distribution of artefacts in AA. 47. Other craft indicators such as chert blades and flakes and hammerstone pieces (Fig. 3.1) seem to have a more randomized distribution across the surveyed area. Rare flakes of chalcedony are present in Areas 2 and 3; this evidence may be referred to the find of a possible unfinished limestone weight and of a possible unfinished chlorite bead (Fig. 3.3, 4), showing the existence of a lesser degree of interference with the outputs of a semiprecious stone–working industry. Another "excentric" indicator is a highly worn quartzite pebble used as a polisher (Fig. 3.2).

Bone chips are found only within the boundaries of Area 2. This cooccurrence might be explained with the ascertained functional connection between bone and steatite remains in the context of the pyrotechnological treatments identified at Moenjodaro, Chanhudaro and Harappa (Vidale n.d. a; Sher & Vidale 1984; Vidale n.d.); but their preservation could simply be due to the protective action of silt in the filling deposit.



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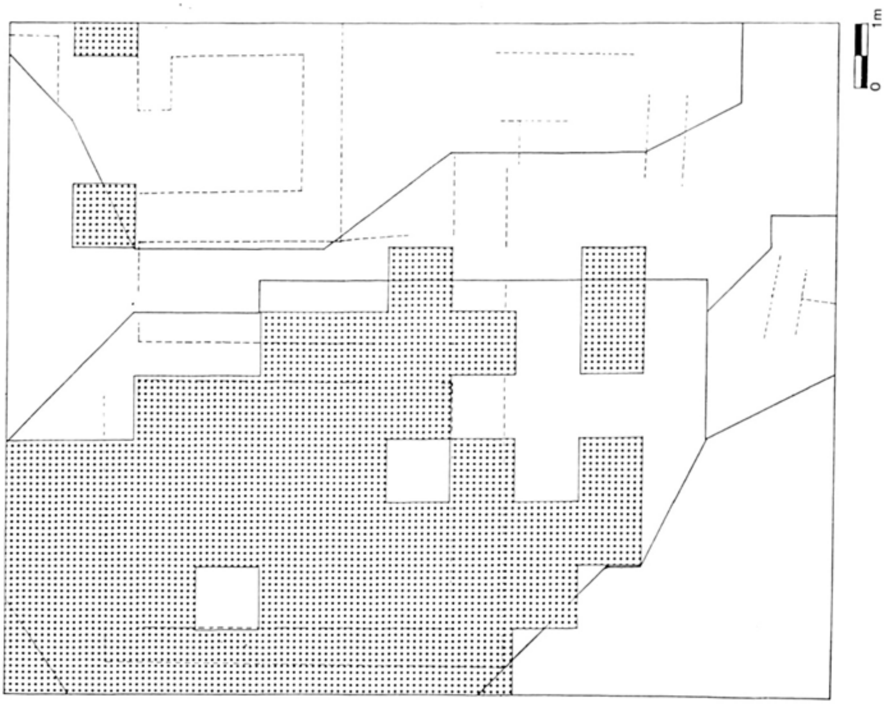


Fig. 4. – Distribution of steatite debitage across the surveyed area in terms of presence/absence per sq. m.

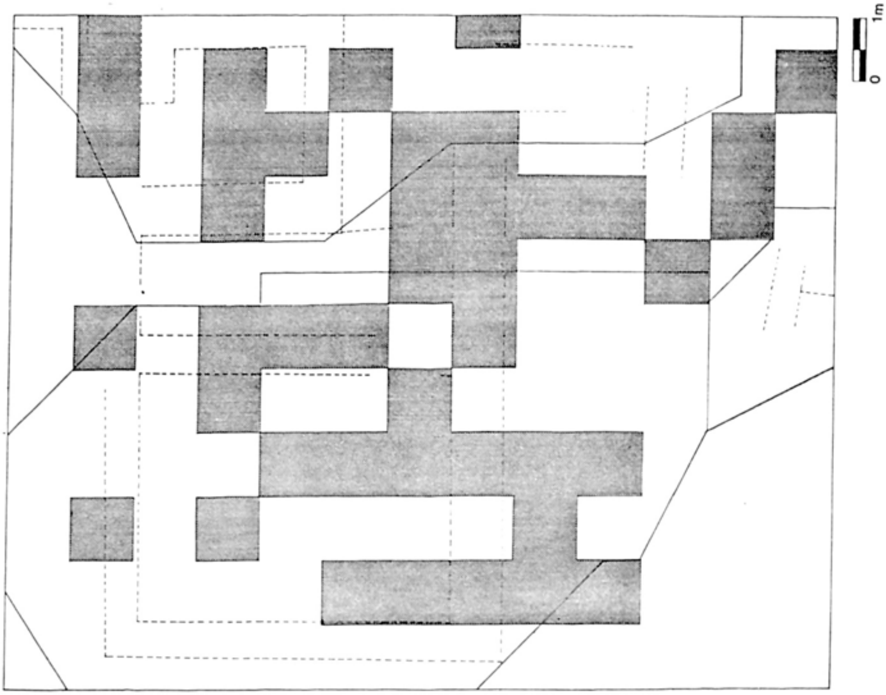


Fig. 5. – Distribution of chert blades across the surveyed area in terms of presence/absence per sq. m.

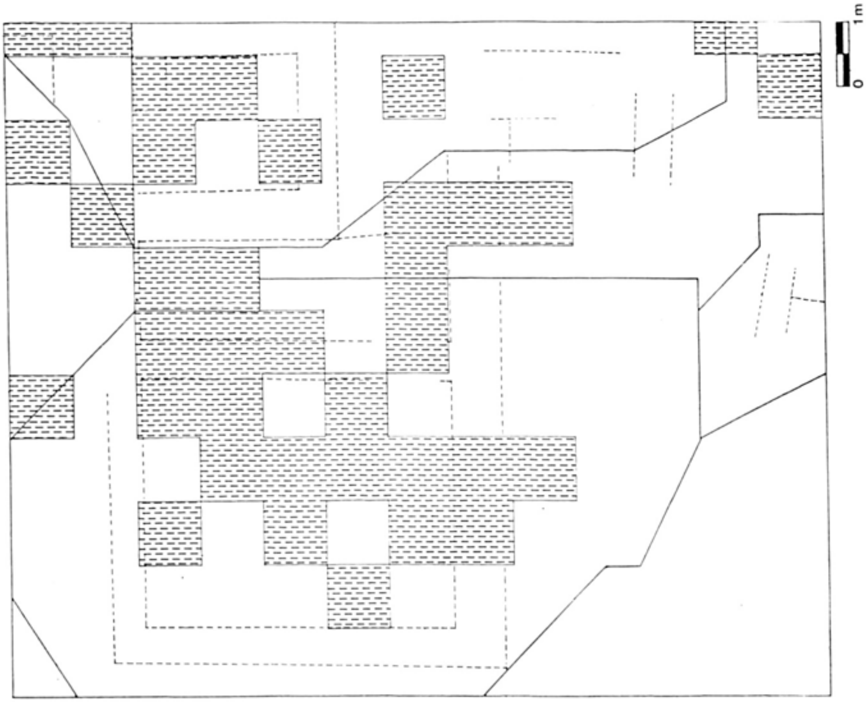


Fig. 6. – Distribution of chert flakes across the surveyed area in terms of presence/absence per sq. m.

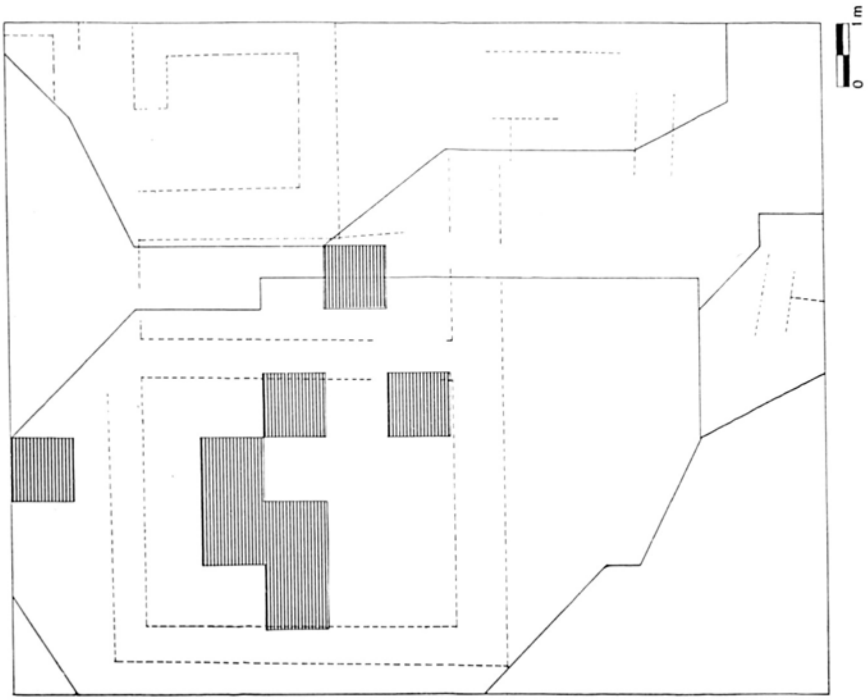


Fig. 7. – Distribution of bone pieces across the surveyed area in terms of presence/absence per sq. m.

Finally, overfired ceramic remains are strictly associated to Area 3. This relationship should be ascribed to the progressive capture of vitrified remains from the upper slopes (cf. the nearby KAI kiln described in Pracchia 1985) within an active line of erosion; as in the case of the Moneer South–East Area (Vidale n.d. c; cf. also Rick 1976), local micro–geomorphological costraints may be very effective in determining surface patterning of artefactual distributions.

Figs. 4–7 show the distribution of 4 classes of indicators (steatite debitage, chert blades, chert flakes and bone chips) within the described contexts, in terms of presence/absence per sq.m. The spatial configuration of steatite–bone distributions, mainly contained within the perimeter of room A, support the previous interpretations; a small amount of steatite pieces and bone fragments at west of the alignement of rooms A–C could suggest an extension of the assemblage in this direction. Chert blades and flakes appear randomly scattered, without visible clusters, all over the site. The degree of association among the various distributions has been measured with the Q coefficient as described by Hodder and Orton(1976; 202) (Tab. 2). The coefficient has been calculated across a network of 1 m. square cells, considering the cells of the northern row identical to the others. Being *a* the number of squares in which both artifacts X and Y are present, *b* the number of squares in which X is present and Y absent, *c* the number of squares in which X is absent and Y present, and *d* the number of squares in which both X and Y are absent, the spatial association between X and Y is calculated as

$$Q = \frac{ad - bc}{ad + bc}$$

and varies from a minimum of -1 to a maximum of $+1$.

TAB. 2. MOENJODARO, AA. 47: *Spatial association between the various artefactual classes measured with Q coefficient*

	ST.	BL.	FL.	GS.	CH.	HM.	BN.	OV.
ST.	—	0.279	0.333	0.067	0.348	−0.122	0.925	0.053
BL.	0.279	—	0.516	0.324	0.784	0.740	0.444	0.456
FL.	0.333	0.516	—	0.079	0.318	0.418	0.150	0.613
GS.	0.067	−0.324	0.079	—	0.647	0.234	0.048	0.064
CH.	0.348	0.784	0.318	0.647	—	0.509	0.333	0.703
HM.	−0.122	0.740	0.411	0.234	0.509	—	0.282	0.244
BN.	0.925	0.444	0.150	0.048	0.333	0.282	—	−0.427
OV.	0.053	0.456	0.613	0.064	0.703	0.244	−0.427	—

(for the explanation of abbreviations see Tab. 1).

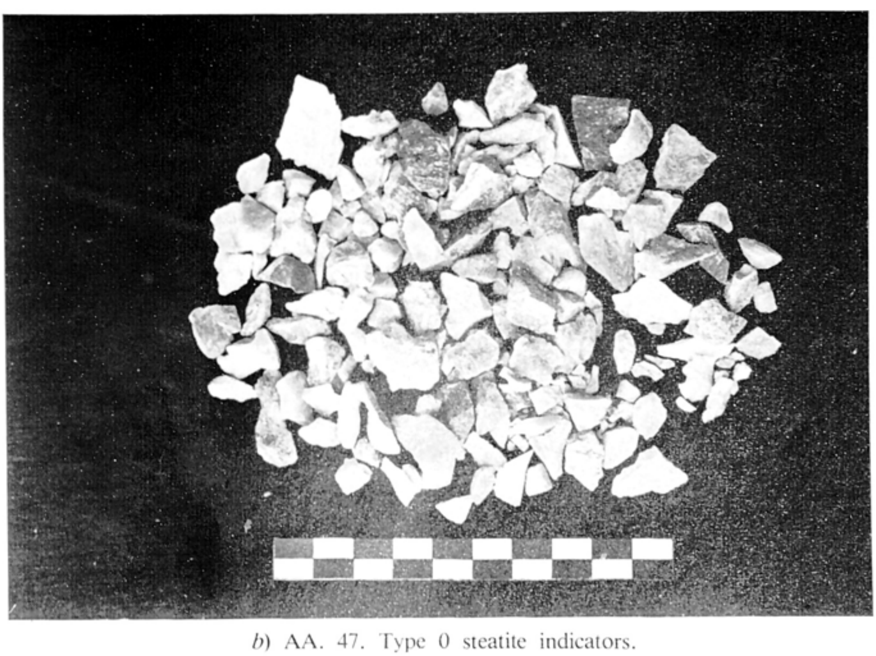
a) Moenjodaro, AA. 47. General view of the site from south. The figure stands in the centre of the surveyed area. Note the deep erosive gully cutting away the hummock from the slopes at south and west.

b) Moenjodaro, AA. 47. Closer view of the site from the southern side.

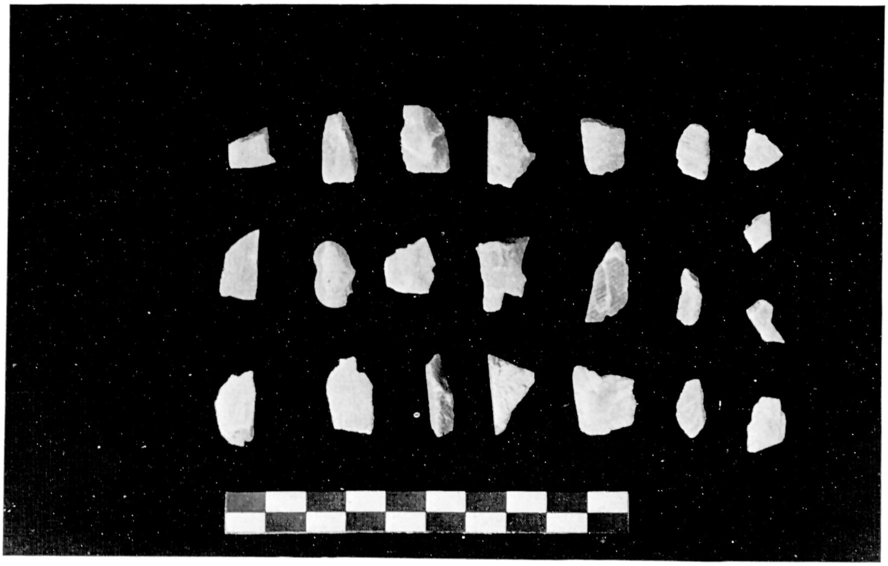
a) Moenjodaro, AA. 47. View of the site from east.

b) Moenjodaro, AA. 47. View of the site from the north-western corner of the surveyed area. On the background are visible the excavated remains of the DK-A complex.

a) Moenjodaro, AA. 47. Close up view of the main cluster of steatite debitage between room A and B (cf. Vidale n.d. a: fig. 12; Pracchia et al. 1985: fig. 26).



b) AA. 47. Type 0 steatite indicators.



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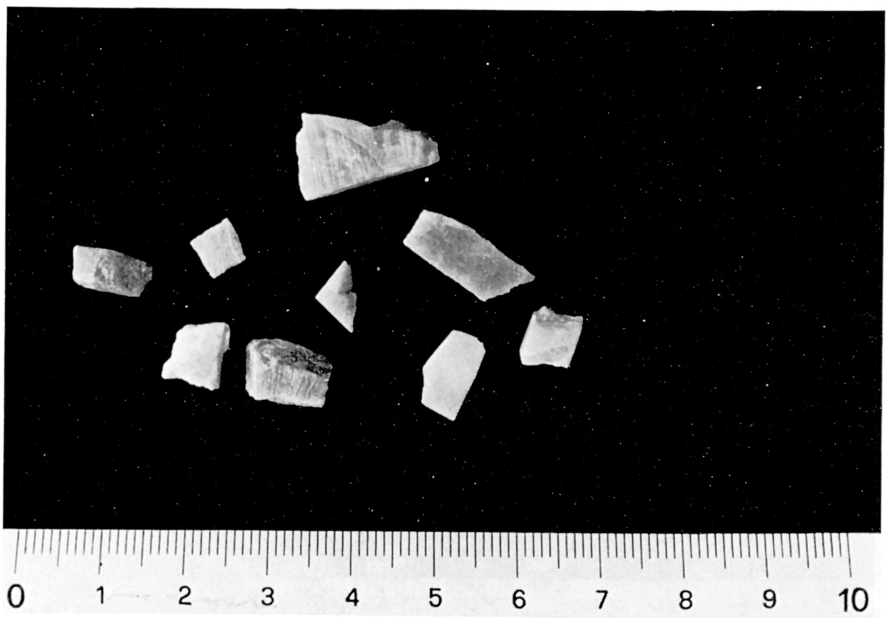
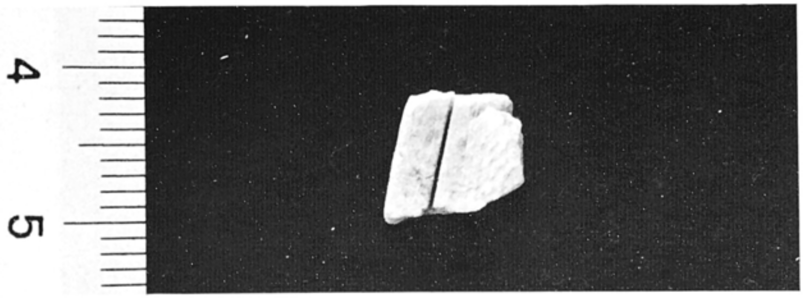
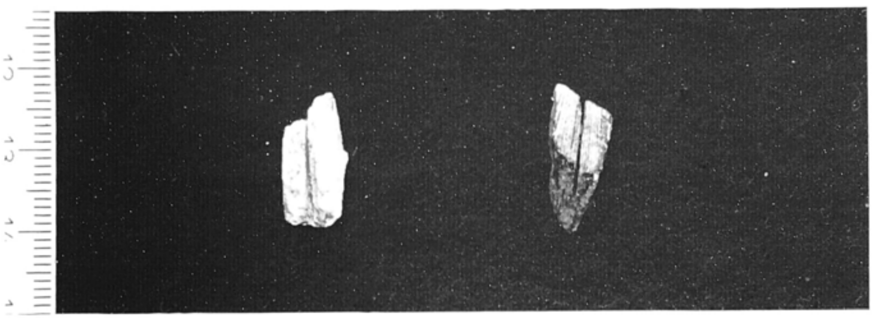


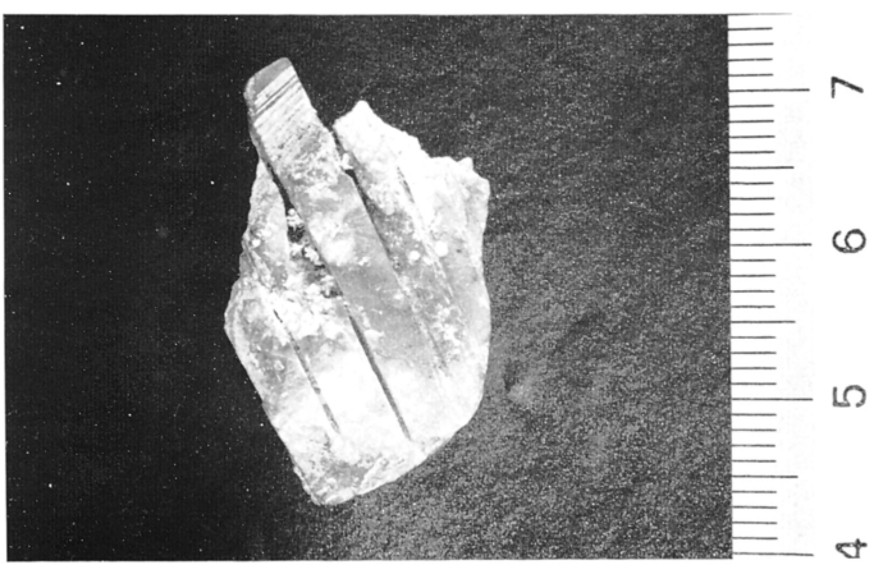
b) AA. 47. Type b and c steatite indicators.



a) Type d steatite indicator recovered from AA. 47.

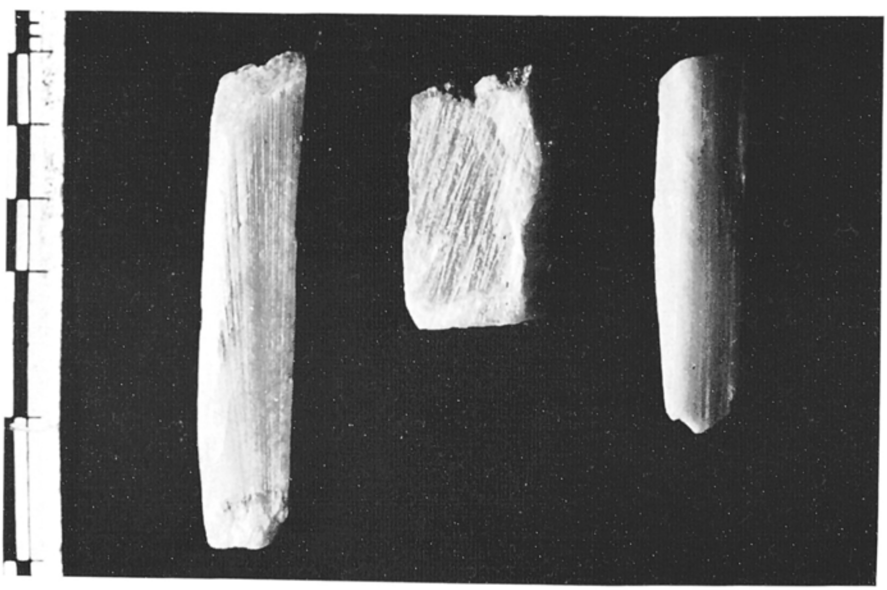


b) Type d steatite indicators from the surrounding activity areas.

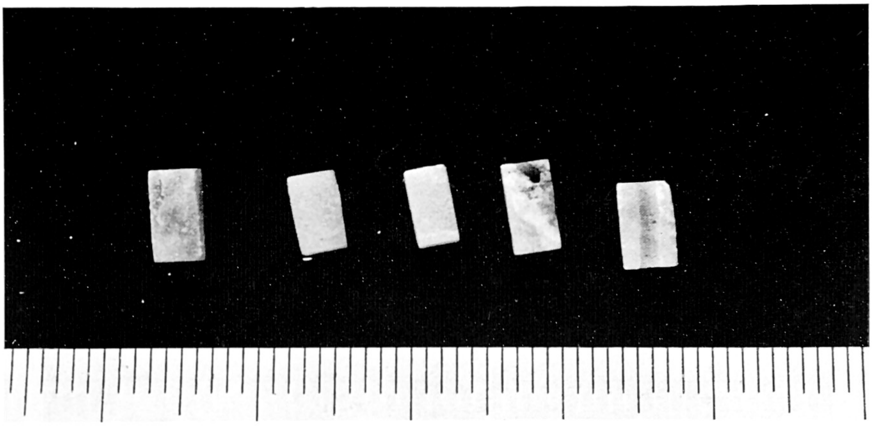


c) Type d steatite blank from Moneer south east area.

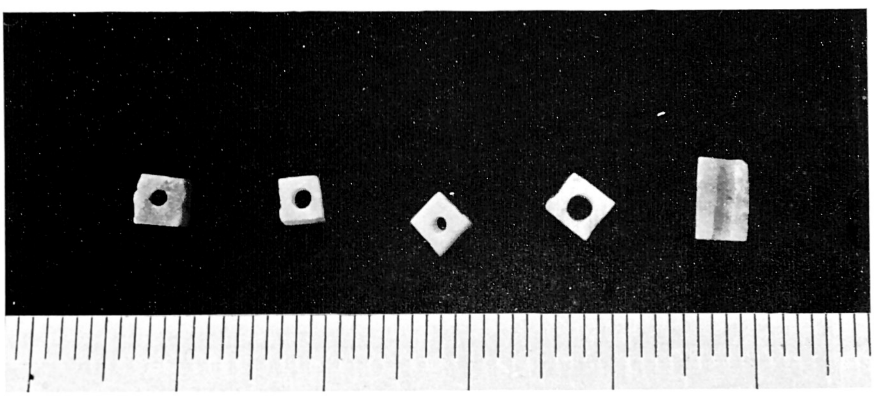
a) AA. 47. Type e steatite indicators (cf. Pracchia et al. 1985: fig. 27).



b) AA. 47. Type e steatite indicators.

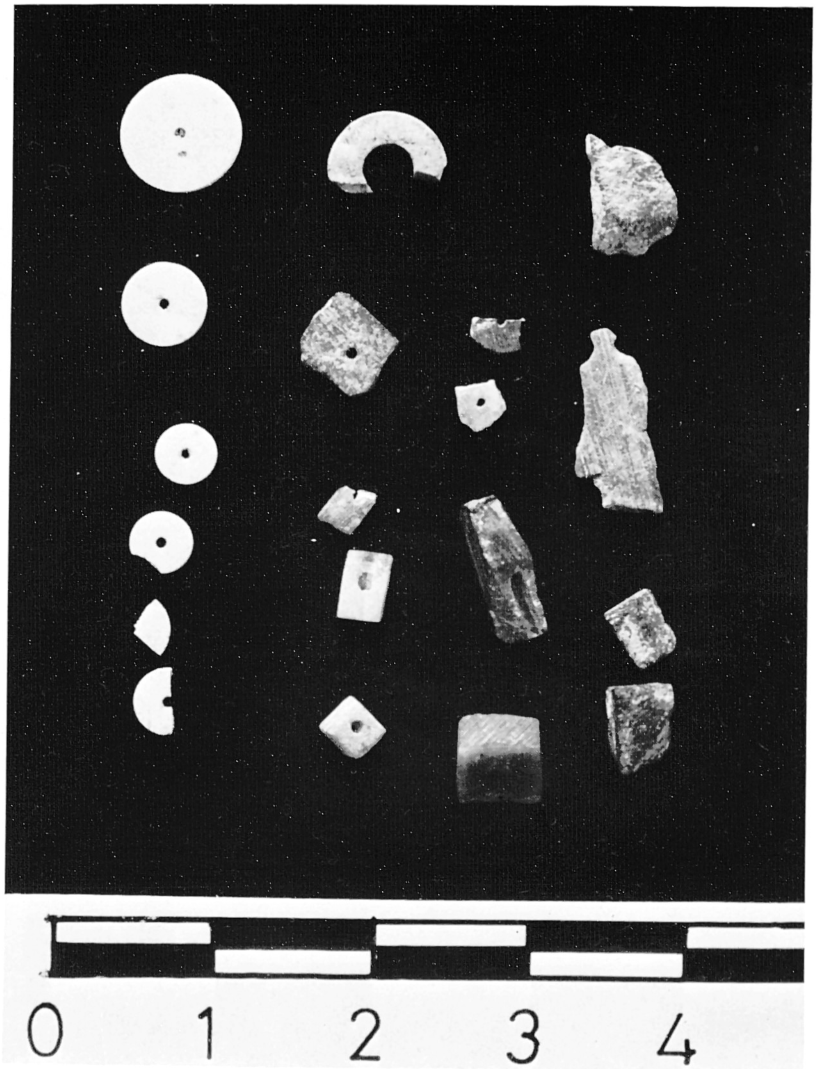


a) AA. 47. Type f steatite indicators (laterl view) (cf. Pracchia et al. 1985: fig. 28).



b) AA. 47. Type f steatite indicators (upper view).

c) AA. 47. Type f blocklet split in perforation.



Steatite industry and disk–beads from AA. 14. Note the sheet–like fragments with irregularly squared contour and central perforation, possibly connected with steatite disk–beads production (cf. Pracchia et al. 1985: fig. 25).

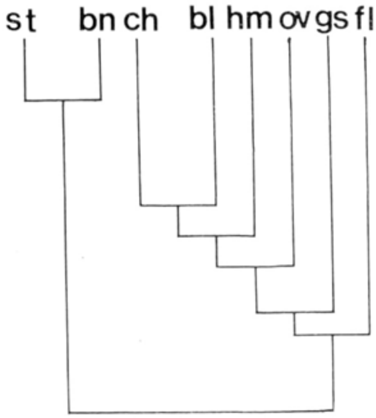


Fig. 8. – Spatial correlation among the different classes of artefacts as expressed by Q coefficient.

The most significant relationship of spatial cooccurrence is between steatite debitage and bone fragments. In decreasing order, this relationship is followed by the association between chert blades and chalcedony flakes, and between the former class and chert hammerstones chips; chalcedony flakes are then associated with overfired ceramics and with quartzite flakes from grinding stones. The overall pattern of spatial associations is summarized in the graph of Fig. 8. Negative correlations exist between bone fragments and overfired ceramics (possibly due to the secondary depositional context of the vitrified remains in Area 3), between chert blades and quartzite pieces, and between steatite debitage and hammerstone fragments.

On the whole, the distribution of steatite indicators exposed by erosion in AA. 47 would indicate the presence of a significant amount of industrial debitage within a rectangular room belonging to a larger complex, and possibly opening into a corridor; a major cluster of debitage, perhaps in sub–primary context of deposition, is progressively washed in front of an hypothetical door. The study of the spatial patterning of the major artefactual classes indicates that steatite debitage and bone chips represent an isolated assemblage, scarcely correlated with the other lithic or ceramic indicators on record. Chalcedony flakes, chert blades and hammerstones seem to belong the different technological contexts; as they are partially correlated with the concentration of overfired ceramics, their distribution could be affected by secondary dynamics. Further, the low spatial correlation between chert blades and flakes, together with the absence of cores and plunging blades, show that chert blades were not produced in this particular site.

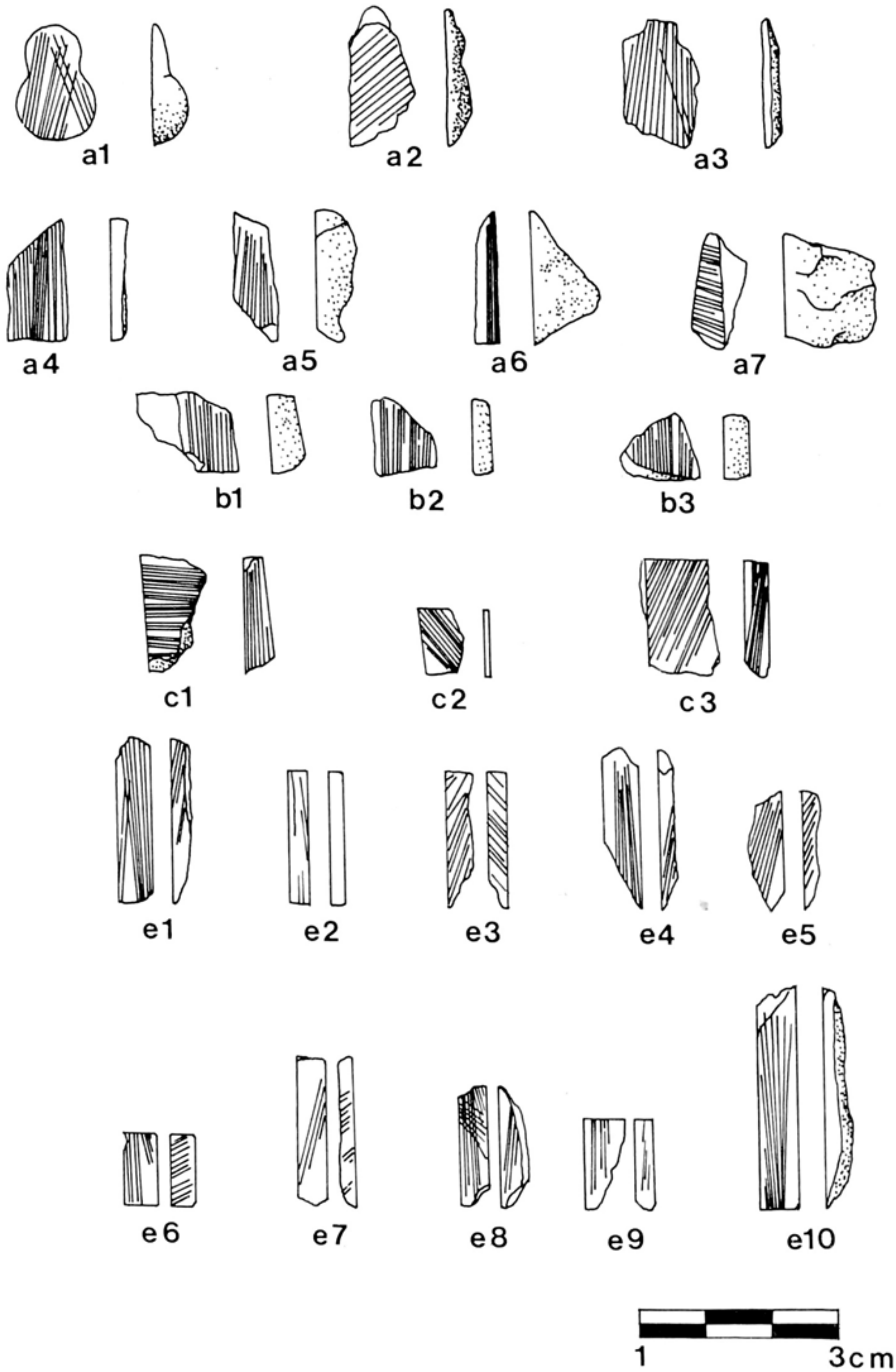


Fig. 9. – Steatite industry from AA. 47; types a, b, c, e.

The Steatite Industry

The steatite worked in AA. 47 was a light–green stone with spread whitish mottlings, some pieces being almost totally white. The stone appears an excellent, highly omogeneous material, totally free from calcareous gangue as well as from crystalline components. A lesser percentage, around 1/6 of the total, shows a grayish colour with whitish mineralizations.

Some preliminary observations were carried out on the sample of steatite debitage collected from the central cluster of AA. 47. The steatite indicators have been classified according to the presence/orientation of cutting marks, representing the residual evidence of the sequences of reduction of the stone lumps (for a preliminary ethnographic documentation see Shar and Vidale n.d.). The sawing marks, produced by metal or stone cutting edges, appear as sheafs of strokes radiating from the point of application of the cutting tool, most often parallel to the largest dimension of the separated pieces (Plate VI *b*).

Type O (Plate III *b*) is represented by stone fragments with no cutting marks. This type is the most represented in the collection, and amounts to not less than 96 g.; the larger pieces are about 2.1–2.5 cm. long, while the greatest majority wavers around 1–1.5 cm. Type O pieces have often an irregular romboidal shape.

Type a specimens (Plate IV *a*, Fig. 9.a1–a7) have a single cutting plane. They amount to about 20 g. The cutting surface generally present one sheaf of strokes, but some specimens exhibits two superimposed sheaf documenting the change of orientation of the cutting tool during the separation of the piece (see e.g. Fig. 9.a1). The surface opposed to the cutting plane is generally a rough, breaking plane. Fig. 9.a1 is a unique piece showing on the exterior a smoothed, breast–like shape. Considering length as the maximum expansion of the piece orthogonal to the cutting plane (always representing the minimum dimension), most of the pieces fall into two groups respectively 1–1.50 and 1.70–2.20 cm. long, with thickness values ranging between 0.30–0.70 cm. (Fig. 12).

Type b specimens (Plate IV *b*, Fig. 9.b1–b3) are pieces presenting two parallel cutting planes, representing inner fragments of tablet–shaped items; this type is comparatively rare, and amounts to about 8 g. of total weight. The fragments are small, triangular or sub–rhomboidal in shape; the cutting planes are often slightly convergent. Most of the pieces are 0.80 to 1.20 cm. long, with thickness values comprehended between 0.30 and 0.55 cm. (Fig. 12).

Type bb are pieces with two orthogonal cutting planes, scarcely defined from the morphological viewpoint, and probably forming corners of parallepiped–shaped elements like Types c or e. They amount to about 4.5 g. of weight.

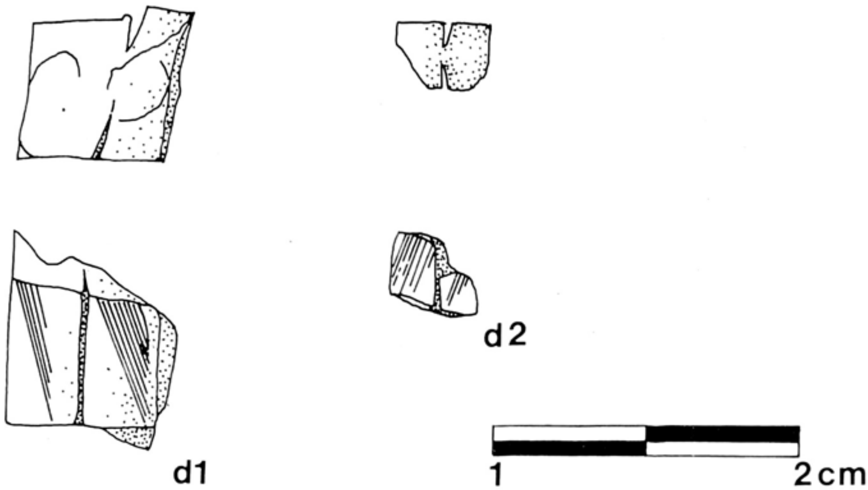


Fig. 10. – Steatite industry from AA. 47; type d blanks.

Type c (Plate IV *b*, Fig. 9 c1–c3) are rare steatite fragments with 3 cutting planes, one of which usually orthogonal to the others. This morphological type, with a total weight of only 3 g., may represent the distal or angular extremity of tablet–shaped elements partially similar to Type b.

Type d (3.5 g.) is attested only by two pieces of different dimensions (Pl. V *a*; Fig. 10). Other similar pieces were collected in the area during previous surveys (Plate V *b*), and a well preserved speciment was found in a sub–surface observation test in Moneer South East Area (Plate V *c*). In the proposed preliminary classification, the type is defined by complex patterns of discontinuous cutting planes, in our case more than 6. These geometric configurations are obtained by tracing out on the two faces of tablet–shaped blanks a bilateral, regular pattern of parallel cuttings; in the two observed specimens, the opposed grooves are perfectly aligned, and with a minimum effort the pieces could be split into well–designed bar–shaped segments. The cutting tool employed in this stage of reduction had a sharp thinning edge with a maximum thickness of 0.40–0.50 mm. The two pieces result from the breaking of two grooved tablets; d1 in Fig. 10 is 1 cm. thick, and the saw separates two identical bars 0.50×1.10 cm. large. The piece f2 in the same figure is equally formed by two parallel bars with a rectangular section, 0.62×0.45 cm. large.

Type e (Plate VI, fig. 9.e1–e10) are pieces with quadrangular section, defined by 4 to 6 cutting planes. Although, with a larger sample, one may expect that this type would include different types of parallelepipeds, in our case it defines a series of fragmentary barrettes with rectangular section; the largest measures on record would waver around

$2.30 \times 0.60 \times 0.35$ cm. These barrettes, with a total weight of 14 g., are relatively abundant in the collection. They appear almost all broken at the distal extremities; in many cases, the fracture follow the pieces in longitudinal direction. The sawing marks are, as a rule, parallel or oblique (never orthogonal) to the long side, showing that they were cut from tablet–shaped pieces horizontally held. Given the importance of this type in the reconstruction of the reduction sequence, I give the complete set of measurements of the recovered specimens (Tab. 3).

TAB. 3. MOENJODARO, AA. 47: *Measures of type E steatite indicators*

Length	*Width*	*Thickness*
1.92	0.52*	0.25*
2.09	0.48*	0.29*
2.10*	0.30*	0.21*
1.37	0.48*	0.35
2.45	0.57*	0.30*
1.73	0.42*	0.30
1.80	0.50	0.34*
2.30	0.47*	0.25
1.93	0.60*	0.31*
1.38	0.58*	0.33
1.82	0.48*	0.40
1.75	0.47*	0.34*
1.76	0.36*	0.32*
1.35	0.35*	0.26
0.78	0.46*	0.26*
1.12*	0.55*	0.28*
1.88	0.41*	0.30
1.08	0.55*	0.26*
0.70	0.57*	0.26*
1.25	0.48*	0.30*
0.81	0.62*	0.33*
0.99	0.50*	0.25*
0.89	0.54*	0.29*
0.79	0.49*	0.28*
0.75	0.44*	0.25*
0.50	0.55*	0.25*
0.79	0.61*	0.30

(* measurements obtained from functional cutting surfaces)

It may be observed that this list contains also fragmentary elements retaining only 3 of the 4 cutting planes defining the type. This is due to the inclusion in Type e of pieces having a pattern of sawing marks analogous to the one described for Type c, but morphologically so close to the barrettes to justify this empiric attribution.

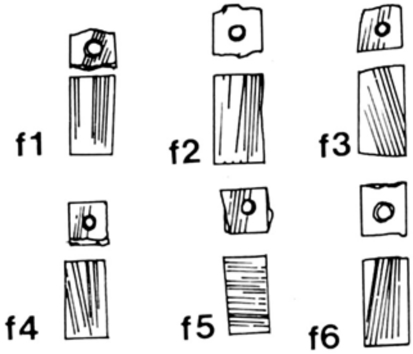


Fig. 11. – Steatite industry from AA. 47; type f blocklets.

Type f (about 3 g.) is a small parallelepiped with 6 regularly oriented cutting planes, plus a bipolar perforation on the long axis, as a kind of a small bead (Plate VII, Fig. 11). The section of the pieces is rather close to a square; the average proportions of the three dimensions are close to $1 \times 1 \times 1.65$. The two minor faces of the beads present smooth surfaces or simple sawing strokes of the described type, like two of the long sides. The other two opposed sides bear in at least 4 cases (Fig. 11.f1, f2, f3, f6) the small ridges remaining on the blocklets after their separation from the bilaterally grooved blanks described as Type d. The sides with the small ridges are slightly wider than the sides with the sawing strokes. In the specimens reproduced in Fig. 11.f1, f2, the separation ridges have a central, symmetrical position, while in f4 and f6 they appear along a corner, indicating that the tablet–like blank had been sawn from a single side (cf. Shar & Vidale 1986: fig. 37 1–7). No drill was found together with the steatite debitage; the perforation traces have a biconical contour. The recovered "beads" have the following measures (Tab. 4):

TAB. 4. MOENJODARO, AA. 47: *Measures of type F steatite indicators*

Length	*Width*	*Thickness*	*Perforation*	*M.D.*	*m.d.*
0.58	0.34	0.32		0.16	0.09
0.61	0.32	0.32		0.18	0.17
0.50	0.32	0.30		0.09	0.07
0.53	0.33	0.29		0.14	0.14
0.49	0.29	0.28		0.13	0.13
0.55	0.34	0.27		0.14	—
0.58	0.38	0.32		0.15	—
0.55	0.36	—		—	—

(M.D. = Maximum Diameter of perforation hole at the surface of the piece; m.d. = minimum diameter at the base of the hole). All measurements in cm.

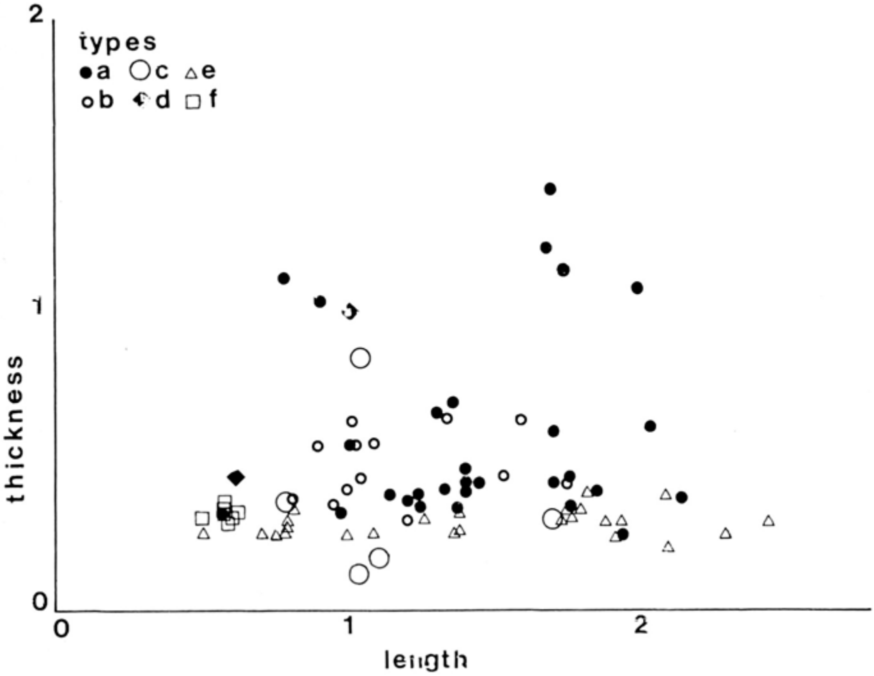


Fig. 12. – Scatter plot diagram of maximum and minimum dimensions of the different types of steatite debitage.

A Reconstruction of the Transformational Sequence

We have no information on the dimensional and morphological features of the raw steatite blocks imported within the town's compound. Evidence from AA. 9 suggests that in some cases steatite was imported still partially embedded in a calcareous gangue (Vidale n.d. a). In AA. 47, anyhow, indicators such as Type 0 and Type a show the same quality of stone of the other semifinished types; this indicates that in this atelier the preliminary hypothesis of reconstruction (Fig. 13) following to a certain extent the trace provided by an experience of ethnographic documentation (Shar & Vidale n.d.), the two types of indicators are produced while shaping a parallelepiped. Types 0 and a are poorly characterized from the technological viewpoint, and could be produced by several stages of reduction. If Type a can be considered an indicator of this preliminary block–shaping phase, the thickness of the waste planes should range around 0.30–1 cm. (Fig. 12); this stage represented probably one of the most wasteful operations of the sequence.

The parallelepiped (called *choras* by the Urdu–speaking soopstone–cutter working at Khairpur in Shar and Vidale n.d.) is subsequently subdivided in squared tablets (*takhti*). This stage is responsible for the fall of Type b and c pieces, wasted remains of defective or broken tablets. Given the rarity of Type c, the thickness of the tablets may be reconstructed from Type b fragments (Fig. 12). It may be noticed that thickness values of this type are generally greater than 0.30 cm., with a minor group wavering around 0.60. This values may be referred to the thickness of Type e pieces (0.25–0.30 cm) and, possibly, to the double of this value, indicating perhaps the progressive stages of cutting.

The tablets were then bilaterally cut to form Type d blanks. Out of the two recoverd pieces, the dimensions of the smaller fit exactly with the size of Type f "beads", supporting the graphic reconstruction of Fig. 13. The grooved blanks were subsequently sawn in normal direction to the cuttings; it is possible that the small squared blocklets with the two symmetrical ridges were directly separated by this operation. Type e barrets may be considered pieces of grooved blanks (most probably detached from the outer rows) broken in this latter sawing phase, as suggested by the prevalent longitudinal orientation of their fractures. The graph of Fig. 12 clearly shows the clustering of thickness values of the barrettes around 0.25–0.30 cm., the same values of Type f "beads".

The size of the perforated "beads" or blocklets appear strongly standardized (Fig. 12); they represent the point of arrival of the sequence of transformation recognized in AA. 47. Do they represent a kind of semifinished product? A soapstone–cutting sequence very close to the described one was studied at Tepe Hissar (Tosi 1986; Tosi 1986a), and interpreted as a manufacturing cycle of cylindrical beads; steatite cylindrical beads are not uncommon at Moenjodaro. In our case, the next step of manufacture would be the grinding of the blanks' corners and their final smoothing, but we have no artefactual evidence of these operations. Type f perforated blocklets were recovered from AA. 14 (Plate VIII), where they were associated to steatite sheets with irregular contour bearing a central perforations and to finished white disk–beads.

A possible alternative explanation of the function of Type f blocklets result from J.M. Kenoyer's reconstruction of the steatite disk–beads manufacturing process; "... it appears that the soft steatite was sawn into short bars which were then drilled along the long axis. Next, thin slices were sawn off with copper or brone saws to produce the bead blanks. These would have been strung on a cord and ground to make uniform diameters; then the whole set of beads would be fired possibly with a salt glaze" (Kenoyer 1986: 22). Again, we have no evidence of slice–like fragments in AA. 47; the fragments of steatite sheets recovered from AA. 14, on the other hand, appear too irregular to have been sawn

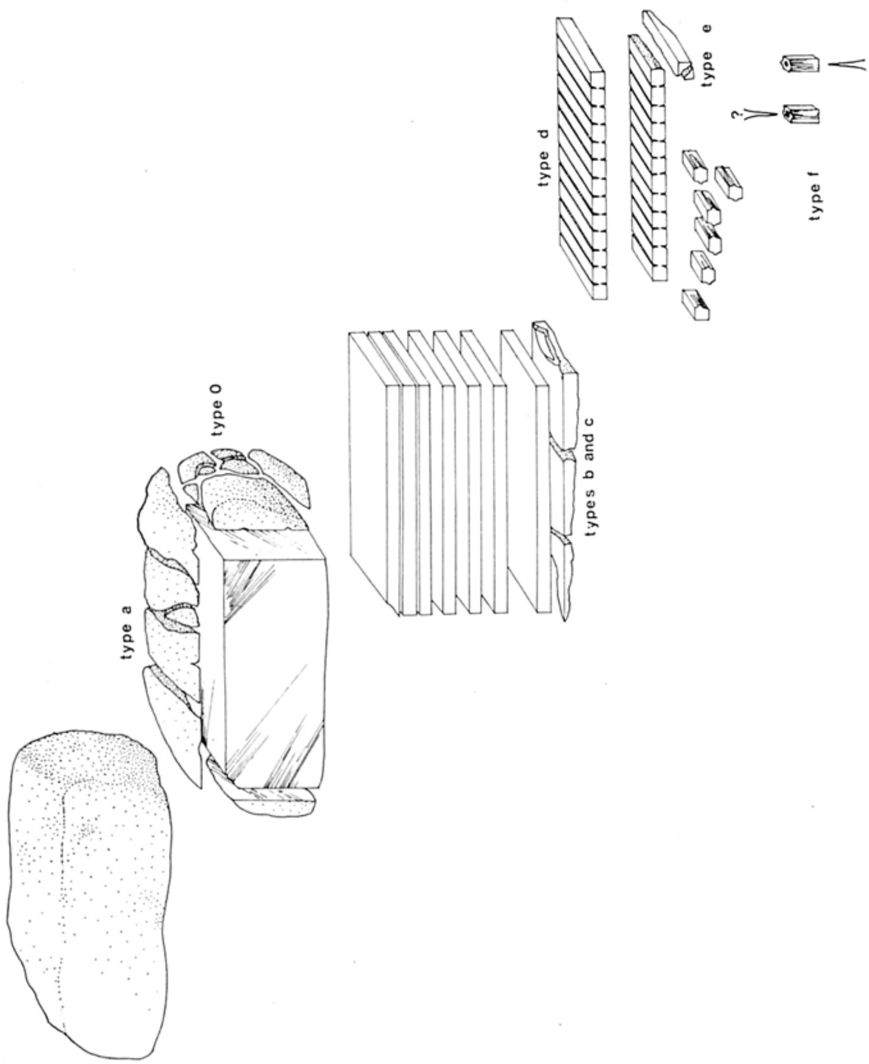


Fig. 13. – Graphic reconstruction of the transformational sequence archaeologially represented in AA. 47.

with the technique described by Kenoyer. A single blank of fired steatite with a regular square contour, possibly supporting Kenoyer's reconstruction, was found by the author at Chanhudaro, embedded within a ceramic fragment belonging to a glaze–smelting apparatus (Vidale n.d. b).

A third assemblage of debitage produced by a steatite disk–beads manufacture was found by Mackay at Chanhudaro (1937; 1943; 205). According to Mackay, "... possibly [the larger beads] were punched out of thin sheets of stone or paste, the hole being formed at the same time". No steatite barrets are mentioned; a macro–photograph of an unifinished bead (Mackay 1943: Pl. LXXXVI, a, 6) show a strange sub–triangular hole that could support Mackay's reconstruction.

Thus the problem of Type f perforated blocklets remains a controversial one. I actually would lean towards the "sheet–and–punch" party, but only a specific research will enable us to obtain a satisfactory reconstruction of the manufacturing cycle of steatite disk–beads, one of the most common find an the surface of Harappan towns (and, presumably, one of the most important products in the economy of Harappan craft).

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